IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

MONUMENT PEAK VENTURES, LLC, Plaintiff, v. BOSCH SECURITY SYSTEMS, LLC and ROBERT BOSCH LLC, Defendants.	CIVIL ACTION NO. 20-611-MN **JURY TRIAL REQUESTED**

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Monument Peak Ventures, LLC ("MPV"), by and through the undersigned counsel, hereby brings this action and makes the following allegations of patent infringement relating to U.S. Patent Nos. 6,282,317 (the "'317 Patent"), 6,654,506 (the "'506 Patent"), 6,654,507 (the "'507 Patent"), and 7,035,461 (the "'461 Patent") (collectively the "Asserted Patents") against Bosch Security Systems, LLC ("Bosch Security") and Robert Bosch LLC ("Bosch LLC") (collectively, "Defendants" or "Bosch") alleging as follows upon actual knowledge with respect to itself and its own acts, and upon information and belief as to all other matters:

THE PARTIES

1. Plaintiff MPV is a Texas limited liability company with its principal place of business in Plano, Texas.

2. Defendant Bosch Security is a limited liability company organized and existing under the laws of the State of Delaware.
3. Bosch Security has its principal place of business at 130 Perinton Parkway, Fairport, New York 14450.
4. Bosch Security was formerly known as Bosch Security Systems, Inc.
5. Bosch Security Systems, Inc. was a corporation organized and existing under the laws of the State of Delaware.
6. Bosch Security Systems, Inc. had its principal place of business at 130 Perinton Parkway, Fairport, New York 14450.
7. Bosch Security is the successor-in-interest to Bosch Security Systems, Inc.
8. Bosch Security was formed in Delaware on January 31, 2020.
9. The organizational structure of Bosch Security Systems, Inc. was converted from one form (corporation) to another (limited liability company) on or before January 31, 2020.
10. Upon information and belief, Bosch Security has assumed all of the liabilities of Bosch Security Systems, Inc.
11. Bosch Security is a wholly-owned subsidiary of Bosch GmbH.
12. Defendant Bosch LLC is a limited liability company organized and existing under the laws of the State of Delaware.

13. Bosch LLC has its principal place of business at 38000 Hills Tech Drive, Farmington Hills, Michigan 48331.

14. Bosch LLC is a wholly owned subsidiary of Bosch GmbH.

15. Bosch GmbH is a Gesellschaft mit beschränkter Haftung (German limited liability company) organized and existing under the laws of Germany.

16. Bosch GmbH has its principal place of business at Robert-Bosch-Platz 1, 70839 Gerlingen-Schillerhöhe, Baden-Wuerttemberg, Germany.

JURISDICTION AND VENUE

17. This Court has exclusive subject matter jurisdiction over this case pursuant to 28 U.S.C. §§ 1331 and 1338(a) on the grounds that this action arises under the Patent Laws of the United States, 35 U.S.C. § 1 *et seq*., including, without limitation, 35 U.S.C. §§ 271, 281, 284, and 285.

18. This Court has both general and specific personal jurisdiction over Bosch Security because Bosch Security is a Delaware LLC that has committed acts within this District giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Bosch Security would not offend traditional notions of fair play and substantial justice. Bosch Security, directly and through subsidiaries and intermediaries (including distributors, retailers, franchisees and others), has committed and, with respect to

the ’507 Patent and ’461 Patent, continues to commit acts of infringement in this District by, among other things, making, using, testing, selling, importing, and/or offering for sale products that infringe the Asserted Patents.

19. Bosch Security resides within this district.

20. Bosch Security transacts business within this District.

21. Bosch Security has committed and, with respect to the ’507 Patent and ’461 Patent, continues to commit acts of direct and indirect infringement within this district as alleged herein.

22. Venue is proper in this district with respect to Bosch Security pursuant to 28 U.S.C. § 1391(b)-(c) or 28 U.S.C. § 1400(b).

23. This Court has both general and specific personal jurisdiction over Bosch LLC because Bosch LLC is a Delaware LLC that has committed acts within this District giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Bosch LLC would not offend traditional notions of fair play and substantial justice. Bosch LLC, directly and through subsidiaries and intermediaries (including distributors, retailers, franchisees and others), has committed and, with respect to the ’507 Patent and ’461 Patent, continues to commit acts of infringement in this District by, among

other things, making, using, testing, selling, importing, and/or offering for sale products that infringe the Asserted Patents.

24. Bosch LLC resides within this district.

25. Bosch LLC transacts business within this District.

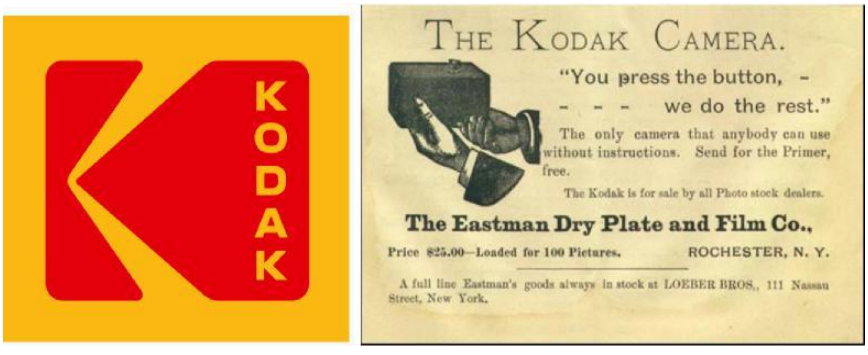
26. Bosch LLC has committed and, with respect to the '507 Patent and '461 Patent, continues to commit acts of direct and indirect infringement within this district as alleged herein.

27. Venue is proper in this district with respect to Bosch LLC pursuant to 28 U.S.C. § 1391(b)-(c) or 28 U.S.C. § 1400(b).

FACTUAL BACKGROUND

28. The Asserted Patents claim inventions born from the ingenuity of the Eastman Kodak Company ("Kodak"), an iconic American imaging technology company that dates back to the late 1800s.

29. The first model of a Kodak camera was released in 1888.



30. In 1935 Kodak introduced "Kodachrome," a color reversal stock for movie and slide film.

31. In 1963 Kodak introduced the Instamatic camera, an easy-to-load point-and-shoot camera.

32. By 1976 Kodak was responsible for 90% of the photographic film and 85% of the cameras sold in the United States.

33. At the peak of its domination of the camera industry, Kodak invented the first self-contained digital camera in 1975.

34. By 1986 Kodak had created the first megapixel sensor that was capable of recording 1,400,000 pixels.

35. While innovating in the digital imaging space Kodak developed an immense patent portfolio and extensively licensed its technology in the space.

36. In 2010, Kodak received $838,000,000 in patent licensing revenue.

37. As part of a reorganization of its business, Kodak sold many of its patents to some of the biggest names in technology that included Google, Facebook, Amazon, Microsoft, Samsung, Adobe Systems, HTC and others for $525,000,000.

38. While scores of digital imaging companies have paid to license the Kodak patent portfolio owned by MPV, Bosch, without justification, has refused to do so.

NATURE OF THE ACTION

39. MPV is the owner by assignment of all right, title and interest in and to the ’317 Patent, the ’506 Patent, the ’507 Patent, and the’461 Patent.

40. This is an action for patent infringement.

41. MPV alleges that Bosch has infringed the ’317 Patent and the ’506 Patent, and has infringed and continues to infringe the ’507 Patent and the ’461 Patent.

42. Exhibit A is a true and correct copy of the ’317 Patent.

43. The U.S. Patent and Trademark Office ("Patent Office") granted the ’317 Patent on August 28, 2001, after a full and fair examination.

44. The ’317 Patent is valid and enforceable.

45. Exhibit B is a true and correct copy of the ’506 Patent.

46. The Patent Office granted the ’506 Patent on November 25, 2003, after a full and fair examination.

47. The ’506 Patent is valid and enforceable.

48. Exhibit C is a true and correct copy of the ’507 Patent.

49. The Patent Office granted the ’507 Patent on November 25, 2003, after a full and fair examination.

50. The ’507 Patent is valid and enforceable.

51. Exhibit D is a true and correct copy of the ’461 Patent.

52. The Patent Office granted the ’461 Patent on April 25, 2006, after a full and fair examination.

53. The ’461 Patent is valid and enforceable.

54. On or about February 20, 2018, MPV, a technology licensing company, first contacted Bosch regarding the Asserted Patents and other patents in the portfolio. MPV’s communications highlighted that Bosch would benefit from a license to the portfolio and expressed its willingness to offer Bosch a license to the iconic Kodak portfolio outside of litigation.

55. Since MPV acquired the Kodak portfolio it has successfully licensed several companies without resorting to litigation and has successfully licensed during litigation when required.

56. Consistent with MPV's overall strategy to use litigation only as a last resort, from February 2018 through August 2018, MPV and Bosch had numerous communications and several meetings, but Bosch was unwilling to license the Asserted Patents.

57. On or about February 20, 2018, MPV informed Bosch of its infringement through a data room that included a full list of all patents owned by MPV and evidence of use presentations detailing Bosch's infringement of ten (10) MPV patents, including the Asserted Patents. The data room was accessible to Bosch for at least six months.

58. When it became clear that Bosch was unwilling to take a license, MPV decided to file suit on a subset of the MPV patents infringed by Bosch.

59. On August 28, 2018, MPV filed suit against Bosch Security Systems, Inc., the predecessor-in-interest to Defendant Bosch Security, for infringement of the '317 Patent, the '506 Patent, the '507 Patent, the '461 Patent and US Patent No. 7,148,908 (the "First MPV-Bosch Action").

60. As of the filing of the First MPV-Bosch Action, the data room was still available to Bosch.

61. Shortly after the filing of the First MPV-Bosch Action, Bosch indicated that it would be willing to discuss licensing of MPV's portfolio, including the Asserted Patents. Relying on Bosch's representations, MPV dismissed the First MPV-Bosch Action, without prejudice, and entered into discussions with Bosch. Those discussions proved fruitless for lack of Bosch participating in good faith.

62. Bosch then threatened MPV with Inter Partes Reviews ("IPRs") against its patents unless MPV granted rights to Bosch for free. On information and belief, Bosch never intended to take a license to MPV's patents, and instead induced MPV to dismiss its litigation so that Bosch could institute a plan to hold MPV up for free rights to MPV's patents with a one-way threat of IPRs. MPV did not grant Bosch the requested free rights to its patents.

63. In Case IPR 2019-01472, the Patent Trial and Appeal Board ("PTAB") has instituted IPR with respect to claims 1-4, 6, 18-23, 25 and 37 of the '317 Patent.

64. In Case IPR 2019-01472, Defendant Bosch LLC is the Petitioner and Defendants Bosch LLC and Bosch Security (as successor-in-interest to Bosch Security Systems, Inc.) along with Bosch GmbH are named as real parties in interest.

65. Bosch did not seek review of claim 5 of the ’317 patent in Case IPR 2019-01472, and accordingly claim 5 of the ’317 Patent remains unaffected by any outcome in Case IPR 2019-01472.

66. MPV asserts herein that Defendants infringe claim 5 of the ’317 Patent.

67. Defendants can no longer petition for IPR of claim 5 of the ’317 Patent.

68. In Case IPR 2019-01474, the PTAB has instituted IPR with respect to claims 9-11, 20-22, 31-33, and 42-44 of the ’506 Patent.

69. In Case IPR 2019-01474, Defendant Bosch LLC is the Petitioner and Defendants Bosch LLC and Bosch Security (as successor-in-interest to Bosch Security Systems, Inc.) along with Bosch GmbH are named as real parties in interest.

70. Bosch did not seek review of claim 12 of the ’506 patent in Case IPR 2019-01474, and accordingly claim 12 of the ’506 Patent remains unaffected by any outcome in Case IPR 2019-01474.

71. MPV asserts herein that Defendants infringe claim 12 of the ’506 Patent.

72. Defendants can no longer petition for IPR of claim 12 of the ’506 Patent.

73. In Case IPR 2019-01473, the PTAB has instituted IPR with respect to claims 1, 8, and 14 of the ’507 Patent.

74. In Case IPR 2019-01473, Defendant Bosch LLC is the Petitioner and Defendants Bosch LLC and Bosch Security (as successor-in-interest to Bosch Security Systems, Inc.) along with Bosch GmbH are named as real parties in interest.

75. Bosch did not seek review of claim 3 of the ’507 patent in Case IPR 2019-01473, and accordingly claim 3 of the ’507 Patent remains unaffected by any outcome in Case IPR 2019-01473.

76. MPV asserts herein that Defendants infringe claim 3 of the ’507 Patent.

77. Defendants can no longer petition for IPR of claim 3 of the ’507 Patent.

78. In Case IPR 2019-01475, the PTAB has instituted IPR with respect to claims 1, 2, 9, and 15-17 of the ’461 Patent.

79. In Case IPR 2019-01475, Defendant Bosch LLC is the Petitioner and Defendants Bosch LLC and Bosch Security (as successor-in-interest to Bosch Security Systems, Inc.) along with Bosch GmbH are named as real parties in interest.

80. Bosch did not seek review of claim 3 of the ’461 patent in Case IPR 2019-01475, and accordingly claim 3 of the ’461 Patent remains unaffected by any outcome in Case IPR 2019-01475.

81. MPV asserts herein that Defendants infringe claim 3 of the ’461 Patent.

82. Defendants can no longer petition for IPR of claim 3 of the ’461 Patent.

83. Because Bosch still refuses to take a license to the claims of the Asserted Patents that are not subject to IPR and which Bosch infringes, MPV brings this action alleging that Defendants directly and indirectly infringe and/or have infringed the Asserted Patents, including, but not limited to, claim 5 of the '317 Patent, claim 12 of the '506 Patent, claim 3 of the '507 Patent, and claim 3 of the '461 Patent, by currently, or in the past, making, using, offering for sale, selling, and/or importing various models of security cameras and security systems. MPV seeks damages and other relief for Bosch's infringement of the Asserted Patents.

SUBJECT MATTER OF THE '317 PATENT

84. The '317 Patent relates generally to the field of digital image processing and, more particularly, to locating main subjects or regions of photographic interest in a digital image.

85. The '317 Patent is directed to solving problems particular to automatically detecting the main subjects in digitally captured images.

86. At the time the application for the '317 Patent was filed, conventional main subject detection methods were, generally, either pixel-based or region-based. The prior art pixel-based systems and methods were designed to locate interesting pixels, spots, or blocks of a digital image, which usually do not correspond to entities of objects or subjects in an image. The prior art region-based systems

and methods were designed to locate interesting regions that correspond to entities of objects or subjects in an image.

87. The prior art pixel-based systems and methods did not explicitly detect regions of interest corresponding to semantically meaningful subjects in the scene or digital image. Rather, these prior art methods attempted to detect regions where certain changes occur in order to direct attention or gather statistics about the scene.

88. The prior art region-based systems were, in general, directed to targeted types of images: video-conferencing or TV news broadcasting images, where the main subject is a talking person against a relatively simple static background; museum images, where there is a prominent main subject centered in the image against a large area of relatively clean background; and toy-world images, where the main subject are a few distinctively colored and shaped objects.

89. The prior art region-based systems were not designed for unconstrained photographic images and the criteria and reasoning processes used were inadequate for unconstrained images, such as photographic images.

90. The shortcomings in the pixel-based and region-based conventional prior art were solved by the unconventional and inventive methods claimed by the ’317 Patent.

91. Claim 5 of the ’317 Patent covers “[a] method for detecting a main subject in an image, the method comprising the steps of: a) receiving a digital image; b) extracting regions of arbitrary shape and size defined by actual objects from the image; c) extracting for each of the regions at least one structural saliency feature and at least one semantic saliency feature; and, d) integrating the structural saliency feature and the semantic saliency feature using a probabilistic reasoning engine into an estimate of a belief that each region is the main subject, [ ] wherein step (d) includes using a collection of human opinions to train the reasoning engine to recognize the relative importance of the saliency features.”

92. A person of ordinary skill in the art at the time of the invention would recognize that the steps and methods claimed in at least claim 5 of the ’317 Patent were unconventional and describe extracting and combining both structural and semantic saliency features using a probabilistic reasoning engine into a belief estimate using a collection of human opinions in a way that was not routine.

93. A person of ordinary skill in the art at the time of the invention of the ’317 Patent would understand that the conventional way of locating a main subject in a digital image involved either the pixel-based approaches of the prior art or the region-based approaches of the prior art. A skilled artisan would recognize that the conventional pixel-based approaches and region-based approaches presented the

problems of not explicitly detecting regions of interest corresponding to semantically meaningful subjects in the scene or digital image (for pixel-based solutions) and were not designed for unconstrained photographic images and the criteria and reasoning processes used were inadequate for unconstrained images, such as photographic images (for region-based solutions).

94. The ’317 Patent, in at least one embodiment, provides technical solutions to these and other deficiencies in the prior art by receiving a digital image, extracting regions of arbitrary shape and size defined by actual objects from the digital image, extracting for each region at least one structural saliency feature and at least one semantic saliency feature, and integrating the structural saliency feature and the semantic saliency feature using a probabilistic reasoning engine into an estimate of a belief that each region is the main subject, the integration step includes using a collection of human opinions to train the reasoning engine to recognize the relative importance of the saliency features.

95. The ’317 Patent, in at least one embodiment, receives an input image of a natural scene in digital form. That image is segmented into regions of homogeneous properties (i.e., regions of arbitrary shape and size defined by actual objects from the digital image). The regions are evaluated for their saliency using two independent yet complementary types of saliency features – structural saliency

features and semantic saliency features. The structural saliency features, including a set of low-level early vision features and a set of geometric features, are extracted and further processed to generate a set of self-saliency features and a set of relative saliency features. Then, the structural and sematic saliency features are integrated using a probabilistic reasoning engine to yield a belief map of the main subject. This step, in at least one embodiment, uses a Bayes net to integrate the saliency features to yield the belief map. Further, the integration step also includes using a collection of human opinions to train the reasoning engine to recognize the relative importance of the saliency features.

96. A person skilled in the art at the time of the invention of the ’317 Patent would understand that the claims, including at least claim 5, recite steps operating in an unconventional manner to achieve an improved method of detecting a main subject in a digital image.

97. These technological improvements provide the advantages of: 1) a robust image segmentation method capable of identifying object regions of arbitrary shapes and sizes, based on physics-motivated adaptive Bayesian clustering and non-purposive grouping; 2) emphasis on perceptual grouping capable of organizing regions corresponding to different parts of physically coherent subjects; 3) utilization of a non-binary representation of the ground-truth, which captures the

inherent uncertainty in determining the belief of main subject, to guide the design of the system; 4) a rigorous systematic statistical training mechanism to determine the relative importance of different features through ground truth collection and contingency table building; 5) extensive, robust feature extraction and evidence collection; 6) combination of structural saliency and semantic saliency, the latter facilitated by explicit identification of key foreground- and background- subject matters; 7) combination of self and relative saliency measure for structural saliency features; and 8) a robust Bayes net-based probabilistic inference engine suitable for integrating incomplete information.

98. The novel use and arrangement of the specific combinations and steps recited in at least claim 5 of the ’317 Patent were not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions. In particular, the order of steps in at least at least claim 5 of the ’317 Patent was not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions. Similarly, the combination of the steps of at least claim 5 of the ’317 Patent, particularly the step of integrating the structural saliency feature and the semantic saliency feature using a probabilistic reasoning engine into an estimate of a belief that each region is the main subject, the integration step includes using a collection of human opinions to train the

reasoning engine to recognize the relative importance of the saliency features was not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions.

SUBJECT MATTER OF THE '506 PATENT

99. The '506 Patent relates generally to the field of digital image processing and digital image understanding and, more particularly, to a process for creating a digital belief map to automatically create cropped and zoomed versions of digital photographic images.

100. At the time the application for the '506 Patent was filed, conventional systems and methods for automatic cropping of images did not examine the overall content of the image or were effective only when uncropped images contained regions where intensity levels were uniform and other regions where intensity levels varied considerably.

101. The prior art systems and methods did not provide a system or method for having photographs automatically cropped or zoomed based upon the main subject in the image.

102. Shortcomings in the prior art were solved by the unconventional and inventive methods claimed by the '506 Patent.

103. Claim 12 of the ’506 Patent covers “[a] method of cropping an image comprising: inputting a belief map of a photographic image, said belief map comprising a plurality of belief values, each belief value at each location in said belief map indicating an importance of a photographic subject at said location wherein a photographic subject having a highest belief value comprises a main subject; selecting a crop window; positioning said crop window such that said crop window is centered around said main subject; and cropping said image according to said crop window [and] further comprising clustering regions of said belief map into belief categories.”

104. ’506 Claim 12, which depends from Claim 9 recites:

> 9. A method of cropping an image comprising:
> inputting a belief map of a photographic image, said belief map comprising a plurality of belief values, each belief value at each location in said belief map indicating an importance of a photographic subject at said location wherein a photographic subject having a highest belief value comprises a main subject;
> selecting a crop window;
> positioning said crop window such that said crop window is centered around said main subject; and
> cropping said image according to said crop window.
>
> 12. The method in claim 9, further comprising clustering regions of said belief map into belief categories.

105. Claim 12 is directed to a method of digitally processing a digital image to recognize and thereby assign useful meaning to human understandable objects,

attributed or conditions by generating belief values and a belief map for cropping an image based upon belief values.

106. Advantages of the claimed subject matter include the ability to automatically crop and zoom digital images based upon scene contents to produce high-quality zoomed or cropped images regardless whether the background is uniform or not. ’506 at 3:39-46.

107. At the time of the inventions claimed in the ’506 Patent, automatic zoom and crop was a nontrivial operation that was considered impossible for unconstrained images, which do not necessarily contain uniform background without a certain amount of scene understanding. ’506 at 4:62-5:1.

108. Techniques for cropping that were known or conventional at the time of the ’506 Patent invention concentrated on simply using a centered crop at a fixed magnification factor, or removing a uniform background touching the image borders. ’506 at 5:1-6. The inventors recognized the drawbacks of this centered-crop technique and noted that it was found unappealing to customers.

109. The ’506 Patent describes a “belief map” as a list of segmented regions ranked in descending order of their likelihood (or belief) as potential main subjects for a generic or specific application that can be converted into a map in which the brightness of a region is proportional to the main subject belief of the region. A

belief map is more than a binary map that only indicated location of the determined main subject. The map reflects determined values corresponding to regions with high confidence or belief of being part of the main subject, overcoming a drawback in the prior art techniques involving subjective human decisions ("different observers may disagree on certain subject matter while agreeing on other subject matter in terms of main subjects"). '506 at 5:7-23. Using the belief map for cropping delivers several advantages: avoiding making an irreversible bad cropping decision using a binarized map and inclusion of every region or object associated with a likelihood of being included. '506 at 5:28-50.

110. The claimed method delivers processing of digital images that is demonstrably improved over the prior art. For example, using the disclosed algorithm to generate a belief map produces a modified image that includes objects of secondary importance according to the belief map that would not be included if the prior art technique taught by Bradley and Bollman was used. One of ordinary skill in the art would appreciate that the modified image created using the patented method produces a more balanced cropped picture. '506 at 9:33-45.

111. A person of ordinary skill in the art at the time of the invention would recognize that the steps and methods recited in claim 12 of the '506 Patent were

unconventional and describe a method for processing and modifying a digital image that departs from conventional techniques at the time of the patents and overcomes drawbacks and disadvantages of then-existing techniques.

112. A person of ordinary skill in the art at the time of the invention of the ’506 Patent would understand that the conventional way of automatically identifying objects in a digital image and modifying, for example by cropping, images involved attempting to remove relatively homogeneous margins around the borders of an image, cropping based on different intensity levels within an image, or using a centered crop at a fixed zoom (magnification) factor. A skilled artisan would recognize that the conventional approaches presented the problems of not analyzing an image to determine the main subject according to criteria and algorithmic analysis and zooming or cropping based on a main subject of the image and may also include secondary objects in the image field.

113. The ’506 Patent, in at least one embodiment, provides technical solutions to these and other deficiencies in the prior art by inputting a belief map of a photographic image, the belief map comprising a plurality of belief values, each belief value at each location in the belief map indicating an importance of a photographic subject at said location wherein a photographic subject having a highest belief value comprises a main subject; selecting a crop window;

positioning the crop window such that the crop window is centered around the main subject; and cropping the image according to the crop window and further comprising clustering regions of the belief map into belief categories.

114. A person skilled in the art at the time of the invention of the '506 Patent would understand that the claims, including at least claim 12, recite steps operating in an unconventional manner to achieve an improved method of automatically cropping an image around a main subject.

115. Clustering portions of the belief map into belief categories was not a known technique at the time of the '506 inventions. Clustering may include replacing belief values with mean belief of the cluster in the region. This provides several advantages: improved background separation by grouping low-belief background regions together to form a uniformly low-belief background region; removing noise in belief ordering; and thus generating a threshold for the background that can be used for further image processing relating to the determined background. *See* '506 at 8:9-61.

116. These technological improvements provide the advantages of being able to perform automatic zoom and crop on unconstrained digital images regardless of whether the background of the image is uniform or not.

117. Processing digital image data to generate a belief map, assigning belief values to objects and clusters of secondary objects in the image field, and modifying the digital image based upon the belief map to improve the digital image based upon primary and secondary objects are techniques that were not conventional or well-known at the time of the invention claimed in Claim 12 of the ’506 Patent.

118. The novel use and arrangement of the specific combinations and steps recited in at least claim 12 of the ’506 Patent were not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions. In particular, the order of steps in at least at least claim 12 of the ’506 Patent was not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions. Similarly, the combination of the steps of at least claim 12 of the ’506 Patent, particularly the steps of inputting the claimed belief map, cropping the image according to a crop window that is centered on a main subject, and clustering regions of the belief map into belief categories were not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions.

SUBJECT MATTER OF THE ’507 PATENT

119. The ’507 Patent relates generally to the field of digital image processing and more particularly to digitally processing a digital image to recognize and thereby

assign useful meaning to human understandable objects, attributes or conditions that are used to create cropped and zoomed versions of the digital image. *See, e.g.*, '507 at 11:11-17.

120. An object of the inventions claimed in the '507 Patent is to provide a method for producing a portion of a digital image (a cropped image) by accurately identifying a main subject of the digital photographic image—generic object recognition—to automate cropping and zooming. At the time the application for the '507 Patent was filed, conventional systems and methods for automatic cropping of images did not examine the overall content of the image and were effective only when uncropped images contained regions where intensity levels were uniform and other regions where intensity levels varied considerably. The conventional prior art could not deal with images with nonuniform background.

121. Prior art systems and methods did not provide a system or method for having photographs automatically cropped or zoomed based upon the main subject in the image. At the time, conventional image manipulation software did not use scene content in determining the automatic crop amount. '507 at 2:1-3.

122. Conventional techniques suffered from shortcomings addressed by the '507 Patent. For example, conventional techniques examined image border lines checking for variation within the lines, which had to be uniform to be cropped.

This technique did not examine overall content of the image and was effective only when pixel variation was significant. '507 at 2:11-29.

123. Another technique that was conventional at the time of the '507 Patent analyzed intensity levels within the image by calculating the mean and variance of intensity levels for blocks of pixels to determine a threshold based on distribution of variance in the blocks. This technique suffers the drawback of working effectively only when uncropped images contain regions where intensity levels vary considerably. '507 at 2:31-44.

124. A shortcoming of conventional techniques in the prior art was the inability to accurately identify objects of interest in a digital image having a nonuniform background. '507 at 2:49-50. The '507 Patent solved these problems by employing unconventional and inventive techniques recited in the method of Claim 3 of the '507 Patent.

125. Claim 3 of the '507 Patent covers "[a] method of producing an image of at least a portion of a digital image, comprising: a) providing a digital image having pixels; b) computing a belief map of the digital image by using the pixels of the digital image to determine a series of features using such features to assign a probability of a location of a main subject of the digital image in the belief map; c) determining a crop window having a shape factor and a zoom factor, the shape

and the zoom factors determining a size of the crop window; and d) cropping the digital image to include a portion of the image of high subject content in response to the belief map and the crop window [ ] wherein cropping the digital image includes: i) selecting an initial position of the crop window at a location which includes a center of mass; ii) using belief values corresponding to the crop window to select the position of the crop window to include a portion of the image of high subject content in response to the belief map; and iii) cropping the digital image according to the position of the crop window."

126. '507 Claim 3, which depends from Claim 1 recites:

> 1. A method of producing an image of at least a portion of a digital image, comprising:
> a) providing a digital image having pixels;
> b) computing a belief map of the digital image by using the pixels of the digital image to determine a series of features and using such features to assign a probability of a location of a main subject of the digital image in the belief map;
> c) determining a crop window having a shape factor and a zoom factor, the shape and the zoom factors determining a size of the crop window; and
> d) cropping the digital image to include a portion of the image of high subject content in response to the belief map and the crop window.
> 3. The method of claim 1 wherein cropping the digital image includes
> i) selecting an initial position of the crop window at a location which includes a center of mass;
> ii) using belief values corresponding to the crop window to select the position of the crop window to include a portion of the image of high subject content in response to the belief map; and
> iii) cropping the digital image according to the position of the crop window.

127. A person of ordinary skill in the art at the time of the invention would recognize that the steps and methods claimed in at least claim 3 of the '507 Patent were unconventional and describe digital image cropping around a main subject in a way that was not routine.

128. A person of ordinary skill in the art at the time of the invention of the '507 Patent would understand that the conventional way of automatically cropping images involved attempting to remove relatively homogeneous margins around the borders of an image, cropping based on different intensity levels within an image, or using a centered crop at a fixed zoom (magnification) factor. A skilled artisan would recognize that the conventional approaches presented the problems of not analyzing an image to determine the main subject and zooming or cropping based on the main subject of the image.

129. The '507 Patent, in at least one embodiment, provides technical solutions to these and other deficiencies in the prior art by producing an image of at least a portion of a digital image by performing the method of: a) providing a digital image having pixels; b) computing a belief map of the digital image by using the pixels of the digital image to determine a series of features using such features to assign a probability of a location of a main subject of the digital image in the belief map; c) determining a crop window having a shape factor and a zoom

factor, the shape and the zoom factors determining a size of the crop window; and d) cropping the digital image to include a portion of the image of high subject content in response to the belief map and the crop window wherein cropping the digital image includes: i) selecting an initial position of the crop window at a location which includes a center of mass; ii) using belief values corresponding to the crop window to select the position of the crop window to include a portion of the image of high subject content in response to the belief map; and iii) cropping the digital image according to the position of the crop window.

130. A person skilled in the art at the time of the invention of the ’507 Patent would understand that the claims, including at least claim 3, recite steps operating in an unconventional manner to achieve an improved method of cropping an image around a main subject.

131. These technological improvements provide the advantages of being able to perform automatic zoom and crop on unconstrained digital images regardless of whether the background of the image is uniform.

132. The novel use and arrangement of the specific combinations and steps recited in at least claim 3 of the ’507 Patent were not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions. In particular, the order of steps in at least at least claim 3 of the ’507 Patent was

not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions. Similarly, the combination of the steps of at least claim 3 of the '507 Patent, particularly the steps of computing the belief map to assign a probability of a location of a main subject, determining the claimed crop window, and cropping the digital image to include a portion of the image of high subject content in response to the belief map, the crop window by selecting an initial position of the crop window at a location including a center of mass, using belief values corresponding to the crop window to select the position of the crop window to include a portion of the image of high subject content in response to the belief map and cropping the image according to the position of the crop window were not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions.

SUBJECT MATTER OF THE '461 PATENT

133. The '461 Patent relates generally to the field of digital image processing and, more particularly, to a method for detecting an object in a digital image by using two segmentation maps and pattern matching in both maps.

134. At the time the application for the '461 Patent was filed, conventional object detection techniques, particularly with respect to the detection of redeye in photographs, were dependent on detecting pixels in an image that had the color

characteristics of the redeye defect. These conventional techniques relied on detecting candidate redeye pixels based on shape, coloration, and brightness, and in certain circumstances only searching those portions of an image that were skin-colored.

135. The prior art systems/methods did not, however, determine whether the candidate pixels are located in a face or part of a human eye and/or could not detect face regions in their entirety or, more specifically, detect face regions as well separated skin color regions.

136. Shortcomings in the conventional prior art were solved by the unconventional and inventive methods claimed by the ’461 Patent.

137. Claim 3 of the ’461 Patent covers “[a] method for detecting objects in a digital image, comprising the steps of: a) generating a first segmentation map of the digital image according to a non-object specific criterion; b) generating a second segmentation map of the digital image according to a object specific criterion; and c) detecting objects in the digital image using both the first and second segmentation maps [ ] further comprising the step of detecting objects using pattern matching in the first and second segmentation maps respectively and merging the detected objects.”

138. Claim 3 is directed to a method of digitally processing or analyzing an image to detect objects, including human understandable objects, by generation two segmentation maps of the image, one based on a non-object specific criterion, and the other based on a object-specific criterion, detecting objects in each by using pattern matching, and then merging the detected objects. '461 at 22:10-16 and 22:22-38.

139. A person of ordinary skill in the art at the time of the invention would recognize that the steps and methods recited in at least claim 3 of the '461 Patent were unconventional and describe a method for detecting objects in a digital image in a way that departs from conventional techniques at the time of the patent and overcomes drawbacks and disadvantages of then-existing techniques.

140. A skilled artisan would recognize that the conventional digital image object detection approaches presented the problems of not being able to fully recognize objects, for instance, faces.

141. The '461 Patent, in at least one embodiment, provides technical solutions to these and other deficiencies in the prior art by teaching a method for detecting objects in a digital image, comprising the steps of: a) generating a first segmentation map of the digital image according to a non-object specific criterion; b) generating a second segmentation map of the digital image according

to a object specific criterion; and c) detecting objects in the digital image using both the first and second segmentation maps and further comprising the step of detecting objects using pattern matching in the first and second segmentation maps respectively and merging the detected objects. '461 at 4:4-12.

142. A person skilled in the art at the time of the invention of the '461 Patent would understand that the claims, including at least claim 3, recite steps operating in an unconventional manner to achieve an improved method of detecting objects in a digital image.

143. These technological improvements provide the advantages of: increasing the detection rate of objects in digital images; and for detecting faces with redeye defects, the detection rate is increased over the prior art method by increasing the correct detection of face regions in input digital images through the use of multiple segmentation maps. '461 at 2:3-8. The technique of correctly detecting faces with redeye defects and face regions through the use of multiple segmentation maps is equally applicable to the improvement of correct detection of other objects in digital images. '461 at 3:6-12.

144. The novel use and arrangement of the specific combinations and steps recited in at least claim 3 of the '461 Patent were not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions.

In particular, the order of steps in at least at least claim 3 of the ’461 Patent was not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions. Similarly, the combination of the steps of at least claim 3 of the ’461 Patent, particularly the step of detecting objects using pattern matching in the first segmentation map (which was generated according to a non-object specific criterion) and a second segmentation map (which was generated according an object specific criterion) respectively and merging the detected objects. was not well-understood, routine, or conventional to a person skill in the relevant field at the time of the inventions.

145. The claimed method delivers processing of digital images and detection of objects that is demonstrably improved over the prior art. For example, using the disclosed technique of generating a first segmentation map and a second segmentation map, using pattern matching to detect objects in each, and then merging the objects, provides an increased correct detection rate for objects in a digital image. ’461 at 2:3-8.

146. Generating both first and second segmentation maps from a digital image, where the first is generated according to non-object specific criterion and the second is generated based on object specific criterion, detecting objects in each

by using pattern matching, and then merging the objects was not a known technique at the time of the '461 inventions.

147. Generating both first and second segmentation maps from a digital image, where the first is generated according to non-object specific criterion and the second is generated based on object specific criterion, detecting objects in each by using pattern matching, and then merging the objects are techniques that were not conventional or well-known at the time of the invention claimed in Claim 3 of the '461 Patent.

COUNT I –INFRINGEMENT OF THE '317 PATENT

148. MPV realleges and incorporates by reference the allegations set forth above, as if set forth verbatim herein.

149. MPV owns by assignment the entire right, title, and interest in the '317 Patent, including the right to sue for past infringement.

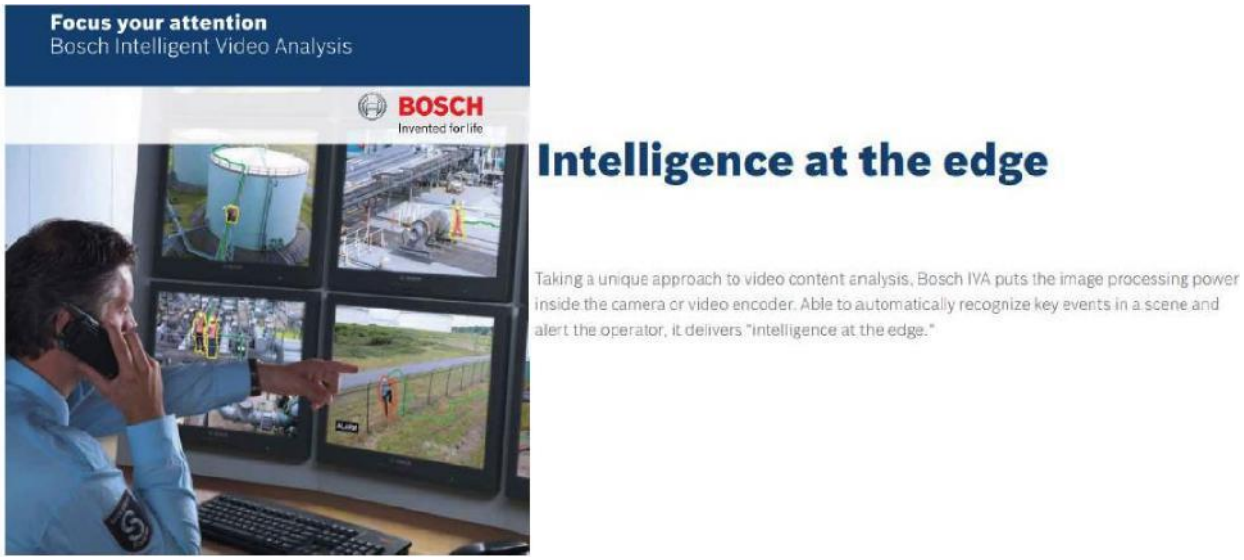
150. The '317 Patent was issued by the United States Patent and Trademark Office on August 28, 2001 and is titled "Method for Automatic Determination of Main Subjects in Photographic Images." *See* Exhibit A.

151. Upon information and belief, Defendants directly infringed at least claim 5 of the '317 Patent by making, using, testing (including their own use and testing), selling, offering for sale, importing and/or licensing in the United States without

authority devices such as the Bosch IP security cameras equipped with Intelligent Video Analysis (IVA) that performed a method for detecting a main subject in an image (collectively "the Accused Infringing Devices" or "Accused Infringing Products") in an exemplary manner as described below.

152. The Accused Infringing Devices satisfied each and every element of each asserted claim of the '317 Patent either literally or under the doctrine of equivalents.

153. The Accused Infringing Devices performed a method for detecting a main subject in an image.



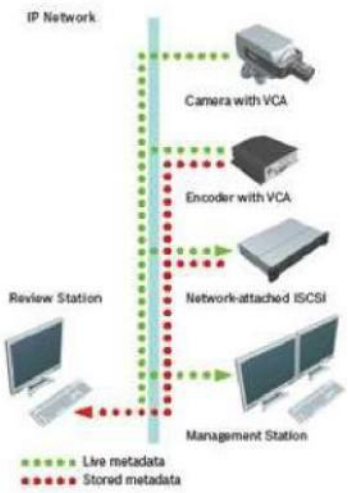
Take action with Bosch Intelligent Video Analysis

No matter how few or how many cameras your system uses, monitoring everything effectively presents a serious challenge. Even observing just a single screen for long periods pushes concentration to the limit – after only 20 minutes, an operator can miss as much as 90% of the activity in a scene.

Bosch Intelligent Video Analysis (IVA) helps operators stay focused by introducing a new level of automation to CCTV monitoring. Edge-based, real-time processing identifies alert conditions, giving your security team the information it needs to react swiftly and take action.

CCTV surveillance re-invented

A major asset to overall surveillance, Bosch IVA technology supports your security personnel with a comprehensive and efficient event detection and alarm system. This next-generation, intelligent digital image processing system greatly improves security and safety, keeping a constant, unblinking eye on any scene.



Working independently on each camera, Bosch IVA operates without a central analytics server. You can choose a wide variety of advanced detection functions, ranging from idle object to trajectory tracking. Live images are analyzed instantly and the resulting data stream accompanies the video feed.

Source: Focus Your Attention IVA Brochure (Exhibit H)

154. The Accused Infringing Devices equipped with Intelligent Video Analysis ("IVA") performed a method for detecting objects such as humans and vehicles (among other things) (i.e., a "main subject") in an image.

4 Basics for Intelligent and Essential Video Analytics

This chapter describes basic information when using Intelligent Video Analytics and Essential Video Analytics.

4.1 Camera image

A camera image is that part of a area which is monitored by the camera.

4.2 Objects

Objects are typically people or vehicles moving within the area seen by the camera. Objects can be filtered according to certain properties (size, aspect ratio, direction of movement, speed, location, color). An alarm event can be generated if objects match certain parameters. Objects that do not match the criteria you define are filtered out and do not generate an alarm event.

In general the base point of an object is relevant for generating an alarm event. Some tasks allow you to make another selection.

Source:

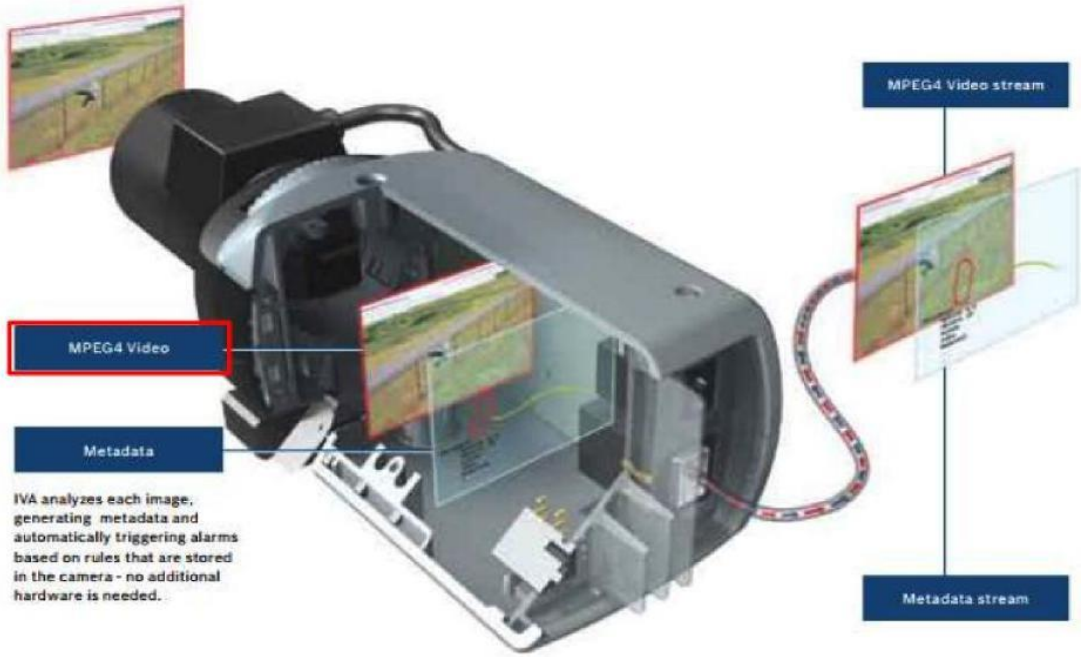
Previously available at https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

Now available at: https://web.archive.org/web/20170517131328/https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

See also VCA Software Manual (Exhibit F) and

https://resources-boschsecurity-cdn.azureedge.net/public/documents/VCA_Operation_Manual_enUS_23098106251.pdf

155. The Accused Infringing Devices received a digital image.



Source: Focus Your Attention IVA Brochure (Exhibit H).

156. The Accused Infringing Devices extracted regions of arbitrary shape and size defined by actual objects from the digital image.

157. The Accused Infringing Devices generated metadata that contained details on all objects within an image.

Image information

Depending on the configuration of Intelligent Video Analytics and Essential Video Analytics, additional overlays in the image, for example object outlines, can provide more information. These object outlines are displayed in real time and are always synchronized exactly with the moving object. During life view, the metadata arrive one frame after the respective camera image, and thus the outlines do not always exactly surround the object.

	Indicates that an object is detected as person.
	Indicates that an object is detected as car.
	Indicates that an object is detected as truck.
	Indicates that an object is detected as bike.

Source:
Previously available at https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

Now available at:
https://web.archive.org/web/20170517131328/https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

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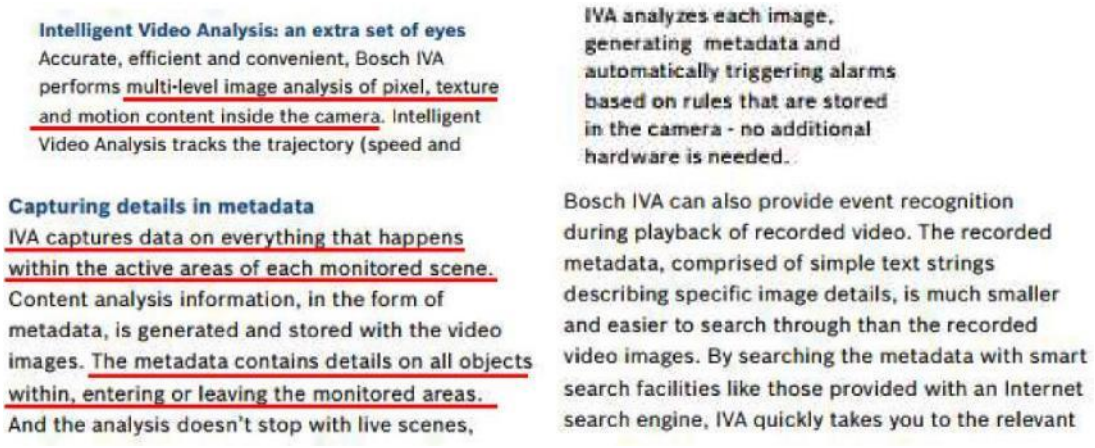
http://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf



Source: Focus Your Attention IVA Brochure (Exhibit H).

158. The document found at http://resource.boschsecurity.us/documents/VCA_Operation_Manual_enUS_69574327051.pdf is entitled Video Content Analysis VCA 7.10 Software Manual (hereinafter "VCA Software Manual").

159. Exhibit F is a true and correct copy of the VCA Software Manual.

160. The VCA Software Manual was published by Bosch.

161. The VCA Software Manual relates to the Accused Infringing Devices as it describes the VCA process used by the Accused Infringing Devices to automatically analyze video images to alarm on predefined events like the detection of moving objects in the monitored area or tampering with the camera.

162. The VCA algorithms provided in the Accused Infringing Devices are described in the VCA Software Manual.

163. The VCA algorithms provided in the Accused Infringing Devices include, among others, Intelligent Video Analytics, Intelligent Video Analytics Flow, and Essential Video Analytics.

164. The VCA Software Manual describes the metadata created and collected through the Bosch VCA algorithms in the Accused Infringing devices.

165. The Accused Infringing Devices included and used the Intelligent Video Analytics software and algorithms described in the VCA Software Manual.

166. The document found at http://www.bosell.com.tr/Assets/Documents/IVA450Intellige_Brochure_IVA_enUS_T5573588107_20110604_163330.pdf and available on Internet Archive from May 19, 2017 at https://web.archive.org/web/20170519062330/http://resource.boschsecurity.com:80/documents/Commercial_Brochure_enUS_1558886539.pdf?KeepThis=true&TB_iframe=true&height=600&width=800&content=[.cntWrapper is entitled "Focus your attention [-] Bosch Intelligent Video Analysis" (hereinafter "Focus Your Attention IVA Brochure").

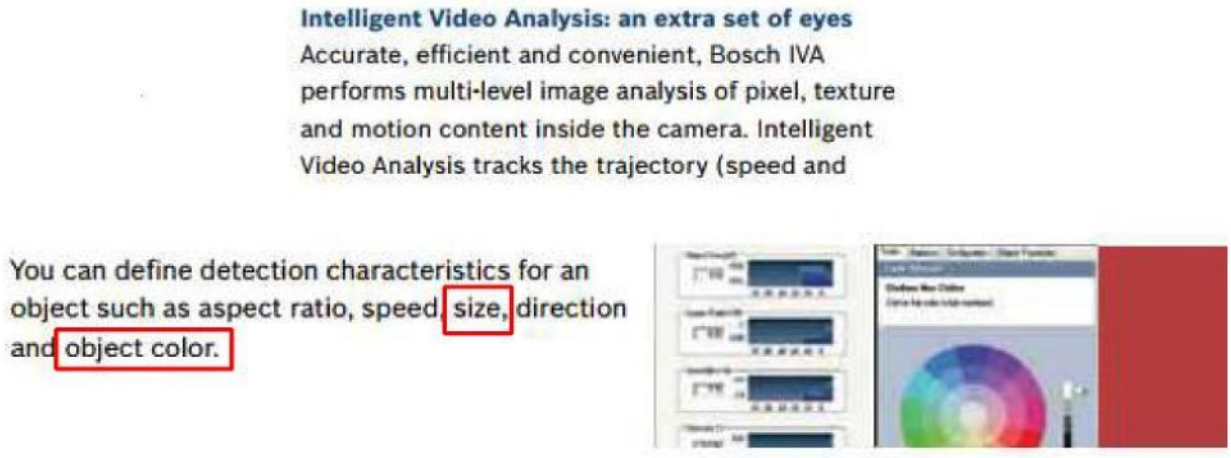
167. Exhibit H is a true and correct copy of the Focus Your Attention IVA Brochure.

168. The Focus Your Attention IVA Brochure was published by Bosch.

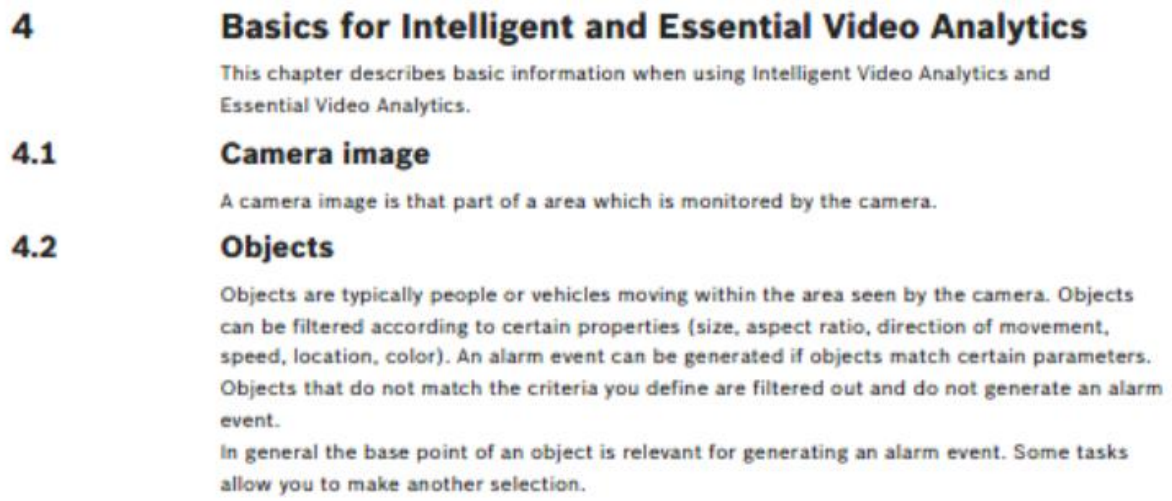
169. The Focus Your Attention IVA Brochure relates to the Accused Infringing Devices and their use of the Bosch Intelligent Video Analysis ("IVA") software and algorithms described in the VCA Software Manual.

170. The VCA Software Manual relates to the Accused Infringing Devices as it describes the VCA process used by the Accused Infringing Devices to automatically analyze video images to alarm on predefined events like the detection of moving objects in the monitored area or tampering with the camera.

171. The Accused Infringing Devices extracted for each of the regions at least one structural saliency feature (for example, geometric features such as direction, size, speed, aspect ratio change over time) and at least one semantic saliency feature (for example, key subject matters or classes, such as persons, bikes, or vehicles).



Source: Focus Your Attention IVA Brochure (Exhibit H).



4 Basics for Intelligent and Essential Video Analytics

This chapter describes basic information when using Intelligent Video Analytics and Essential Video Analytics.

4.1 Camera image

A camera image is that part of a area which is monitored by the camera.

4.2 Objects

Objects are typically people or vehicles moving within the area seen by the camera. Objects can be filtered according to certain properties (size, aspect ratio, direction of movement, speed, location, color). An alarm event can be generated if objects match certain parameters. Objects that do not match the criteria you define are filtered out and do not generate an alarm event.
In general the base point of an object is relevant for generating an alarm event. Some tasks allow you to make another selection.

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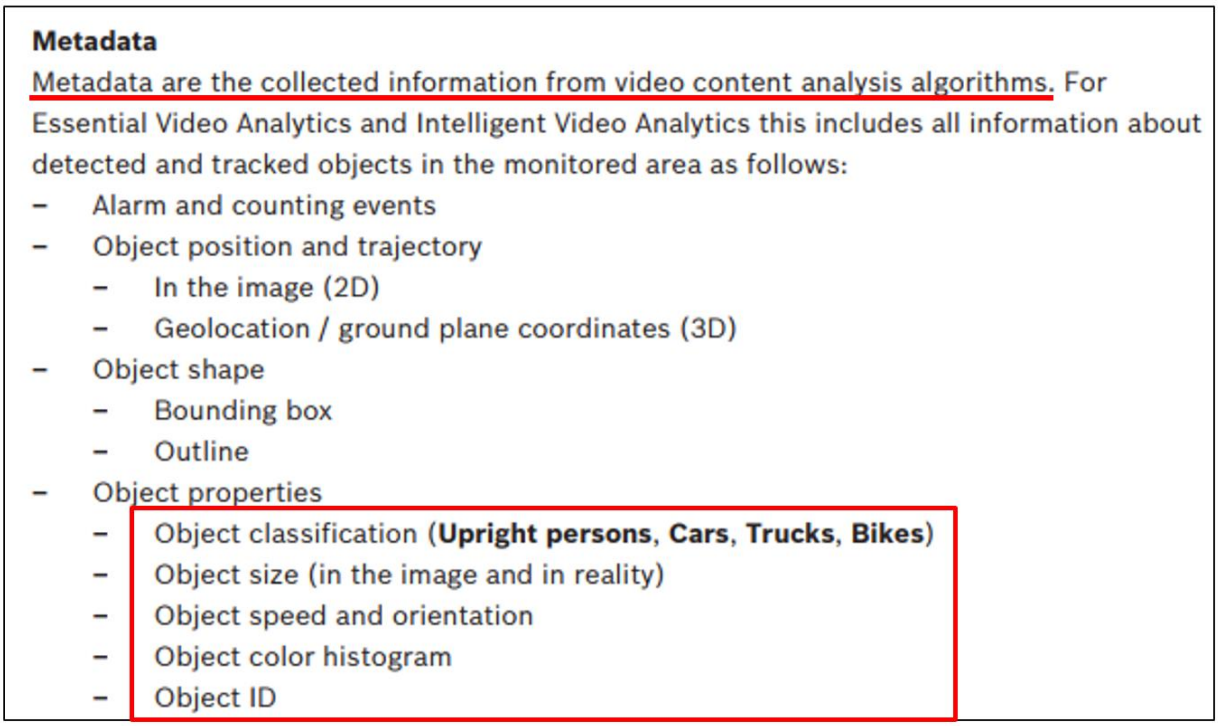
See also VCA Software Manual (Exhibit F); and

https://resources-boschsecurity-cdn.azureedge.net/public/documents/VCA_Operation_Manual_enUS_23098106251.pdf



Metadata

Metadata are the collected information from video content analysis algorithms. For Essential Video Analytics and Intelligent Video Analytics this includes all information about detected and tracked objects in the monitored area as follows:

- Alarm and counting events
- Object position and trajectory
  - In the image (2D)
  - Geolocation / ground plane coordinates (3D)
- Object shape
  - Bounding box
  - Outline
- Object properties
  - Object classification (**Upright persons**, **Cars**, **Trucks**, **Bikes**)
  - Object size (in the image and in reality)
  - Object speed and orientation
  - Object color histogram
  - Object ID

Source:
Previously available at https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

Now available at:
https://web.archive.org/web/20170517131328/https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

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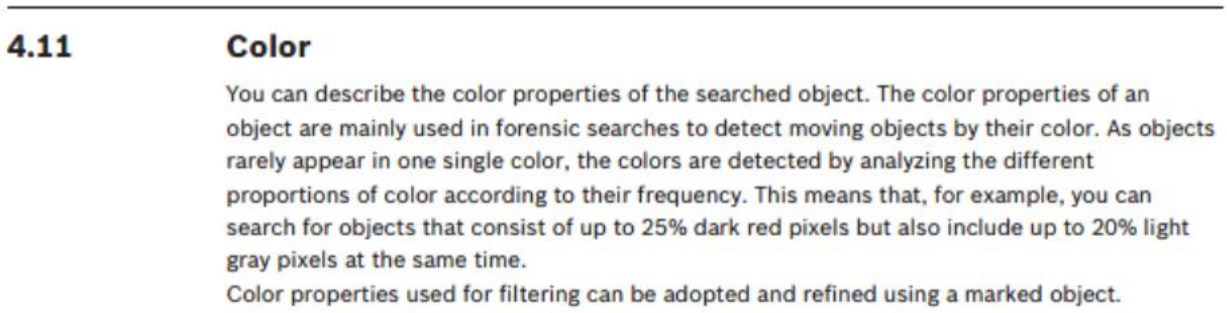

4.11 Color

You can describe the color properties of the searched object. The color properties of an object are mainly used in forensic searches to detect moving objects by their color. As objects rarely appear in one single color, the colors are detected by analyzing the different proportions of color according to their frequency. This means that, for example, you can search for objects that consist of up to 25% dark red pixels but also include up to 20% light gray pixels at the same time.
Color properties used for filtering can be adopted and refined using a marked object.

Source:
Previously available at https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

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https://web.archive.org/web/20170517131328/https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

See also VCA Software Manual (Exhibit F); and

http://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf

172. The VCA Software Manual relates to the Accused Infringing Devices as it describes the VCA process used by the Accused Infringing Devices to automatically analyze video images to alarm on predefined events like the detection of moving objects in the monitored area or tampering with the camera.

173. The VCA algorithms provided in the Accused Infringing Devices are described in the VCA Software Manual.

174. The VCA algorithms provided in the Accused Infringing Devices include, among others, Intelligent Video Analytics, Intelligent Video Analytics Flow, and Essential Video Analytics.

175. The VCA Software Manual describes the metadata created and collected through the Bosch VCA algorithms in the Accused Infringing devices.

176. The Accused Infringing Devices included and used the Intelligent Video Analytics software and algorithms described in the VCA Software Manual.

177. The Accused Infringing Devices integrated the structural saliency feature and the semantic saliency feature using a probabilistic reasoning engine, Bosch's analytics engine, into an estimate of a belief that each region is the main subject.

Metadata

Metadata are the collected information from video content analysis algorithms. For Essential Video Analytics and Intelligent Video Analytics this includes all information about detected and tracked objects in the monitored area as follows:

- Alarm and counting events
- Object position and trajectory
  - In the image (2D)
  - Geolocation / ground plane coordinates (3D)
- Object shape
  - Bounding box
  - Outline
- Object properties
  - Object classification (**Upright persons**, **Cars**, **Trucks**, **Bikes**)
  - Object size (in the image and in reality)
  - Object speed and orientation
  - Object color histogram
  - Object ID

Filters

To enhance robustness, the software can be configured to ignore specified image areas and small objects. For calibrated cameras, the software automatically distinguishes between upright persons, bikes, cars, and trucks. Furthermore, object size, speed, two-way direction, aspect ratio, and color filters can be used in any combination to create specific detection rules for exactly the objects you are looking for. Statistics on object properties are stored and can be displayed for fine tuning the object filters. Object properties can also be defined by selecting an appropriately similar object in the video.

Source:
Previously available at https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

Now available at:
https://web.archive.org/web/20170517131328/https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

See also VCA Software Manual (Exhibit F); and

http://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf

178. The Accused Infringing Devices used a collection of human opinions to tune and train the reasoning engine to recognize the relative importance of the saliency features including, for example, relative size in image and in reality, shape, color, speed, and orientation to improve robustness and distinguish between objects that are of interest such as vehicles and upright persons and other objects such as leaves moving in the wind or near-field raindrops or wind-blown debris.

179. Human opinion information was provided to train the Accused Infringing Devices to better detect and distinguish objects entering, leaving, or moving within an area, combinations of movement or objects moving on a route or in directions or at rates comparable to other objects, and idle objects among other things.

180. Human opinion information provided to train the Accused Infringing Devices includes, without limitation, calibration information entered in the Accused Infringing Devices to set up and calibrate camera views, fields of vision, and perspective information to give the Bosch software the ability to interpret scenes and detect people and things and automatically classify detected objects in a field of view.

181. Examples of human opinion information used to train the analytics engine of the Accused Infringing Devices in the calibration function include image and actual size and perspective opinion information to calibrate the system image data to expected objects to be detected. This human opinion information improves the ability of the analytics engine of the Accused Infringing Devices to understand and automatically classify objects, realize best-performance long-distance detection, identify people for counting, and the like (i.e., "to recognize the relative importance of the saliency features").

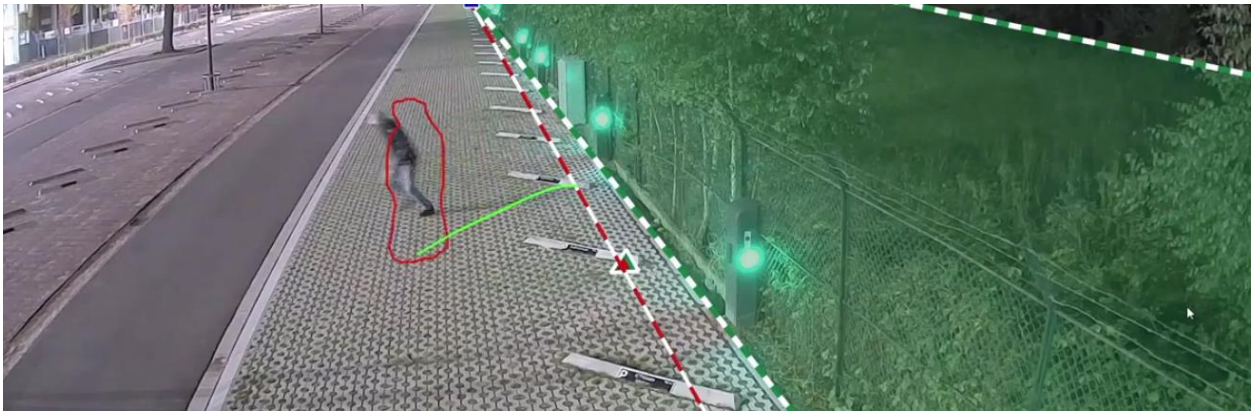
182. By collecting manually input perspective information to adjust tilt angle, roll angle, camera height, and focal length, the Accused Infringing Devices are tuned to improve the accuracy of object detection by more closely matching expected features with captured image data based upon the human opinion data. The Accused Infringing Devices neither calculated nor verified values for at least tilt angle, roll angle, or camera height.[1] If focal length was variable, it was also not calculated nor verified by the Accused Infringing Devices. All such value reflected human opinion information generated in connection with turning and calibrating camera view and capture performance based upon location and perspective information of the camera.

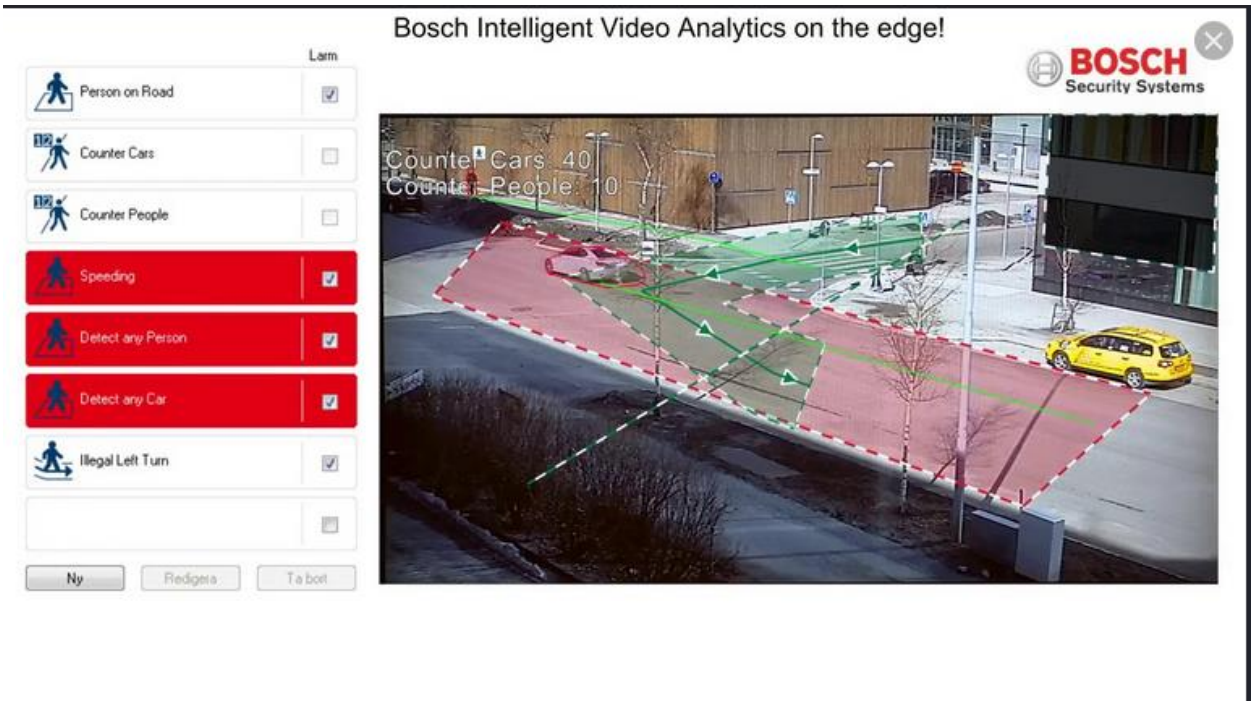
183. Accordingly, under these circumstances, each of the manually input values for at least tilt angle, roll angle, and camera height, (and, if focal length as well, if variable) were "human opinions." Bosch provided instruction that "[t]he flatter the tilt angle is set, the less accurate the estimate of object sizes and speeds will be" and that "[t]he camera must be recalibrated each time the camera position is changed." Bosch further provided instruction with respect to camera calibration

[1] For certain Bosch devices the roll and tilt angle was set automatically, but could be changed manually on demand. Similarly, for certain Bosch devices, the focal length was set automatically but could be changed manually on demand.

that "[w]ith camera calibration a link is made for each camera position between the size of the real-life situation and the dimensions as they appear on the camera image. For example, you tell the software that an object on the camera image is 2 m high in reality." The manual entry to the Accused Infringing Devices of the perceived height "in reality" of an object was the collection of a human opinion. Bosch defined "camera calibration" for the Accused Infringing Devices as "[t]eaching a camera about its field of view and perspective to obtain 3D metric information from a 2D camera image." Because (1) the Accused Infringing Devices were manually calibrated through entry of one or more of at least the tilt angle, roll angle, camera height, focal length, the perceived height of a real-life object that appears on the camera image, (2) calibration of the Accused Infringing Devices was "necessary to detect objects correctly" for certain features, the Accused Infringing Devices, (3) calibration of the Accused Infringing Devices taught ("trained") the camera about its field of view and perspective to obtain 3d metric information from a 2D camera image, and (4) the detection of objects by the Accused Infringing Devices used a probabilistic reasoning engine (Bosch's analytics engine) that integrated the structural saliency feature and the semantic saliency feature, the Accused Infringing Devices used a collection of human opinions to train the reasoning engine to recognize the relative importance of the

saliency features as recited in Claim 5.





Calibration

Camera calibration is necessary to detect objects correctly for the following features:

- Object filter for size and speed in the metric or imperial system.
- Object filter of the following type:
  - **Upright persons**
  - **Bikes**
  - **Cars**
  - **Trucks**
- **3D tracking** mode, which tracks objects on the ground plane
- **3D people tracking** mode, which interprets everything as person and tracks these on the ground plane. Use this tracking mode for people counting, optimally for a top-down view.
- Geolocation, the output of the positions of tracked objects in relation to the camera position.
- Double detection distance (only for Intelligent Video Analytics on CPP6 and CPP7 cameras).

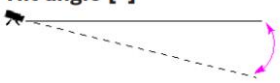
Glossary

camera calibration

Teaching a camera about its field of view and perspective to obtain 3D metric information from a 2D camera image.

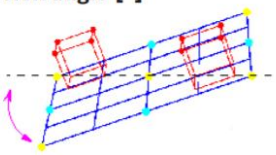
With camera calibration a link is made for each camera position between the size of the real-life situation and the dimensions as they appear on the camera image. For example, you tell the software that an object on the camera image is 2 m high in reality.
To obtain a calibration, some known camera values are set automatically by the system. Other values must be entered manually, for example, tilt angle, roll angle, camera height, focal length (if variable).

Tilt angle [°]



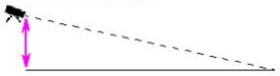
The angle between the horizontal and the camera.
A tilt angle of 0° means that the camera is mounted parallel to the ground.
A tilt angle of 90° means that the camera is mounted vertically in birds eye view perspective.
The flatter the tilt angle is set, the less accurate the estimate of object sizes and speeds will be.
The settings must be between 0° and 90°.
Estimates are no longer possible when you have reached 0°.

Roll angle [°]



The angle between the roll axis and the horizontal plane.
The setting can deviate from the horizontal by up to 45 degrees.

Elevation [m]



The vertical distance from the camera to the ground plane of the captured image.
Typically the elevation of the mounted camera above the ground.

Focal length [mm]

The focal length is determined by the lens. The shorter the focal length, the wider the field of view. The longer the focal length, the narrower the field of view and the higher the magnification.

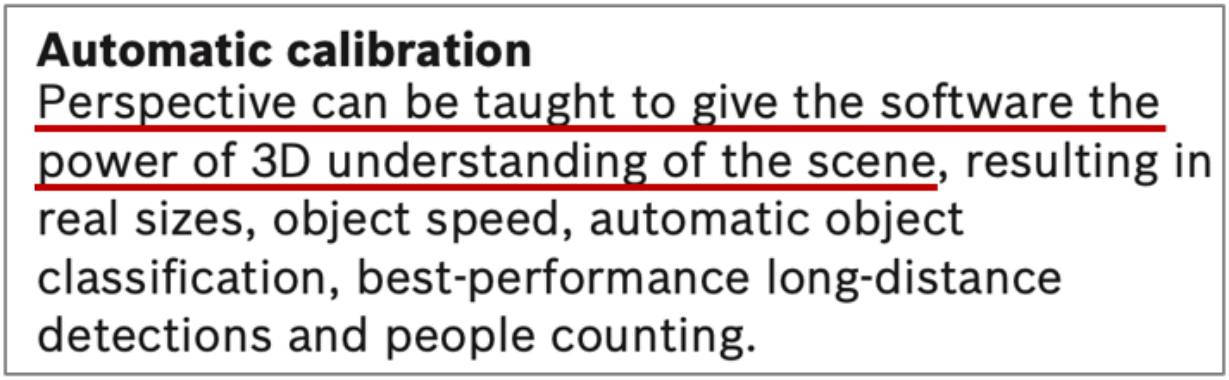
Notice!
The camera must be recalibrated each time the camera position is changed.

Source:
Previously available at https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

Now available at:
https://web.archive.org/web/20170517131328/https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/iva/6_30/software_manual_vca_630_en.pdf

See also VCA Software Manual (Exhibit F); and

http://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf


Automatic calibration
Perspective can be taught to give the software the power of 3D understanding of the scene, resulting in real sizes, object speed, automatic object classification, best-performance long-distance detections and people counting.

Source:
https://resources-boschsecurity-cdn.azureedge.net/public/documents/DS_IVA_6_30_Data_sheet_enUS_23000569867.pdf

184. Bosch thus infringed at least claim 5 of the ’317 Patent by making, using, testing, selling, offering for sale, importing and/or licensing the Accused Infringing Devices, and operating them such that all steps of at least claim 5 were performed.

185. Defendants’ infringing activities were without authority or license under the ’317 Patent.

186. Bosch’s users, customers, agents and/or other third parties (collectively, “third-party infringers”) infringed, including under 35 U.S.C. § 271(a), at least claim 5 of the ’317 Patent by using the Accused Infringing Devices.

187. Bosch had, since at least no later than February 20, 2018, known or been willfully blind to the fact that the third-party infringers’ use of the Accused Infringing Devices directly infringed the ’317 Patent.

188. Bosch's knowledge of the '317 Patent, which covered operating the Accused Infringing Devices in their intended manner such that all limitations of at least claim 5 of the '317 Patent were met, made it known to Bosch that the third-party infringers' use of the Accused Infringing Devices directly infringed the '317 Patent, or, at the very least, rendered Bosch willfully blind to such infringement.

189. Having known or been willfully blind to the fact that the third-party infringers' use of the Accused Infringing Devices in their intended manner such that all limitations of at least claim 5 of the '317 Patent were met directly infringed the '317 Patent, Bosch, upon information and belief, actively encouraged the third-party infringers to directly infringe the '317 Patent by making, using, testing, selling, offering for sale, importing and/or licensing said Accused Infringing Devices, and by, for example: marketing the Accused Infringing Devices to the third-party infringers; supporting and managing the third-party infringers' use of the Accused Infringing Devices; and providing technical assistance to the third-party infringers during their continued use of the Accused Infringing Devices by, for example, publishing the following instructional information directing third-party infringers how to make and use the Accused Infringing Devices to infringe claim 5 of the '317 Patent:

- www.boschsecurity.com;

- VCA Software Manual (Exhibit F);
- https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf;
- https://www.boschsecurity.com/us/en/partners/integration-tools/ ;
- https://www.boschsecurity.com/us/en/solutions/video-systems/video-analytics/technical-documentation-for-video-analytics/ ;
- https://resource.boschsecurity.com/documents/DS_IVA_6_30_Data_sheet_enUS_23000569867.pdf ;
- http://resource.boschsecurity.us/documents/RL_VCA_7_10_Release_Note_enUS_70505156619.pdf ; and
- http://resource.boschsecurity.us/documents/DS_IVA_7.10_Data_sheet_enUS_69630079883.pdf.

190. Bosch induced the third-party infringers to infringe at least claim 5 of the ’317 Patent by directing or encouraging them to operate the Accused Infringing Devices which, alone or in combination with the third-party infringers’ devices, satisfied all limitations of claim 5 of the ’317 Patent. For example, Bosch advertised and promoted the features of the Accused Infringing Devices and encouraged the third-party infringers to operate the Accused Infringing Devices in an infringing manner. Bosch further provided technical assistance as to how

the Accused Infringing Devices should be used by the third-party infringers by, for example, publishing the following instructional information directing third-party infringers how to make and use the Accused Infringing Devices to infringe claim 5 of the ’317 Patent:

- www.boschsecurity.com;
- VCA Software Manual (Exhibit F);
- https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf;
- https://www.boschsecurity.com/us/en/partners/integration-tools/ ;
- https://www.boschsecurity.com/us/en/solutions/video-systems/video-analytics/technical-documentation-for-video-analytics/ ;
- https://resource.boschsecurity.com/documents/DS_IVA_6_30_Data_sheet_enUS_23000569867.pdf ;
- http://resource.boschsecurity.us/documents/RL_VCA_7_10_Release_Note_enUS_70505156619.pdf ; and
- http://resource.boschsecurity.us/documents/DS_IVA_7.10_Data_sheet_enUS_69630079883.pdf.

191. In response, the third-party infringers acquired and operated the Accused Infringing Devices such that all limitations of claim 5 of the ’317 Patent were practiced.

192. Bosch specifically intended to induce, and did induce, the third-party infringers to infringe at least claim 5 of the ’317 Patent, and Bosch knew of or was willfully blind to such infringement. Bosch advised, encouraged, and/or aided the third-party infringers to engage in direct infringement, including through its encouragement, advice, and assistance to the third-party infringers to use the Accused Infringing Devices.

193. Based on, among other things, the foregoing facts, Bosch induced infringement under 35 U.S.C. § 271(b) of at least claim 5 of the ’317 Patent.

194. Further, Bosch sold, provided and/or licensed to the third-party infringers Accused Infringing Devices especially made and adapted—and specifically intended by Bosch—to be used as components and material parts of the inventions covered by the ’317 Patent. For example, Bosch cameras with IVA software which the third-party infringers used in a manner such that all limitations of at least claim 5 of the ’317 Patent were met, and without which the third-party infringers would have been unable to use and avail themselves of the Accused Infringing Devices in their intended manner.

195. Upon information and belief, Bosch also knew that the Accused Infringing Devices operated in a manner that satisfied all limitations of at least claim 5 of the ’317 Patent.

196. The IVA, main subject detection technology in the Accused Infringing Devices was specially made and adapted to infringe at least claim 5 of the ’317 Patent. Upon information and belief, the IVA, main subject detection technology in the Accused Infringing Devices was not a staple article or commodity of commerce, and, because the functionality was designed to work with the Accused Infringing Devices solely in a manner that is covered by the ’317 Patent, it did not have a substantial non-infringing use. At least by no later than February 20, 2018, based on the foregoing facts, Bosch knew of or was willfully blind to the fact that such functionality was especially made and adapted for—and was in fact used in—the Accused Infringing Devices in a manner that is covered by the ’317 Patent.

197. Based on, among other things, the foregoing facts, Bosch contributorily infringed at least claim 5 of the ’317 Patent under 35 U.S.C. § 271(c).

198. Bosch’s acts of infringement of the ’317 Patent were willful and intentional under the standard of *Halo Elecs., Inc. v. Pulse Elecs., Inc.*, 136 S. Ct. 1923 (2016). Since at least February 20, 2018, Bosch willfully infringed the ’317

Patent by refusing to take a license. Instead of taking a license to the '317 Patent, Bosch made the business decision to "efficiently infringe" the '317 Patent. In doing so, Bosch willfully infringed the '317 Patent.

199. Bosch's acts of direct and indirect infringement caused damage to MPV and MPV is entitled to recover from Defendants the damages sustained by Plaintiff as a result of Defendants' infringing acts in an amount subject to proof at trial, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court, pursuant to 35 U.S.C. § 284.

COUNT II –INFRINGEMENT OF THE '506 PATENT

200. Plaintiff realleges and incorporates by reference the allegations set forth above, as if set forth verbatim herein.

201. MPV owns by assignment the entire right, title, and interest in the '506 patent.

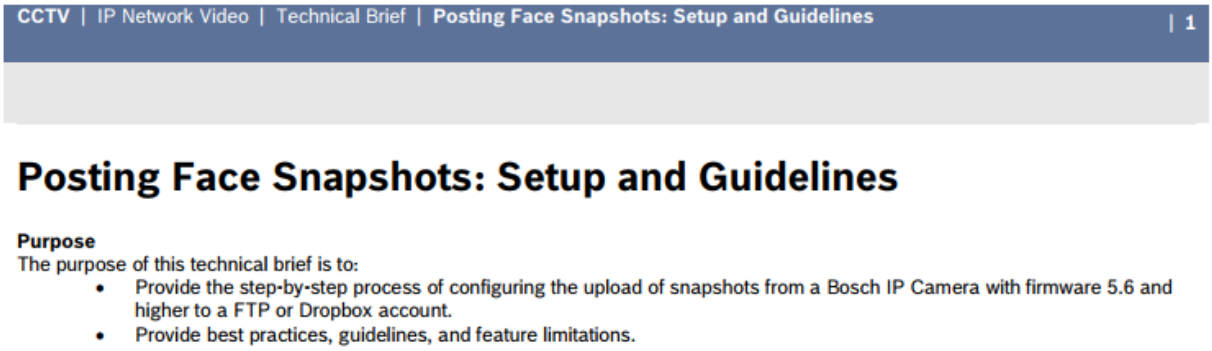
202. The '506 Patent was issued by the United States Patent and Trademark Office on November 25, 2003 and is titled "Method for Automatically Creating Cropped and Zoomed Versions of Photographic Images."

203. Upon information and belief, Bosch directly infringed at least claim 12 of the '506 Patent by making, using, testing, selling, offering for sale, importing and/or licensing in the United States without authority devices such as Bosch security cameras (e.g., Dinion 1080p) and related Intelligent Video Analysis (IVA)

software that practiced a method of cropping an image (collectively the "Accused Infringing Devices" or "Accused Infringing Products") in an exemplary manner as described below.

204. The Accused Infringing Devices practiced a method of cropping an image. The images that are cropped by the Accused Infringing Devices were created and provided by at least one or more images from the digital images (video frames) created and provided by the operation of the Accused Infringing Devices. In general, the accused image cropping occurred through the operation of facial detection on the images and subsequent cropping of the image create the facial image.

Source:
http://resource.boschsecurity.com/documents/NBN_932_Data_sheet_enUS_16676724107.pdf



Posting Face Snapshots: Setup and Guidelines

Purpose
The purpose of this technical brief is to:

- Provide the step-by-step process of configuring the upload of snapshots from a Bosch IP Camera with firmware 5.6 and higher to a FTP or Dropbox account.
- Provide best practices, guidelines, and feature limitations.

Source: https://web.archive.org/web/20170517131045/http://st-tpp.resource.bosch.com:80/media/technology_partner_programm/10_public/iva/posting_face_snapshots_setup_and_guidelines_ver_1_7_18_13.pdf

205. The Accused Infringing Devices inputted a belief map of a photographic image, said belief map comprising a plurality of belief values, each belief value at each location in said belief map indicating an importance of a photographic subject at said location wherein a photographic subject having a highest belief value comprises a main subject.

206. The Accused Infringing Devices inputted an image map (i.e., "belief map") including a foreground object map and a background map of an image, the image map comprising tracked confidence, image confidence, and classification score values (i.e., "a plurality of belief values"), each value at each location in the image map indicating detection of a foreground object/background (i.e., "importance of a photographic subject") at the location wherein a foreground object having, for example, highest confidence and score values indicating that a

face, a person, a car, etc. has been detected (i.e., "a photographic subject having a highest belief value comprises a main subject").

207. The document found at https://media.boschsecurity.com/fs/media/pb/media/partners_1/integration_tools_1/developer/boschvcd640-live.pdf is entitled Video Content Description Format – Live Version 6.40 (hereinafter "VCD Format Manual").

208. Exhibit E is a true and correct copy of the VCD Format Manual.

209. The VCD Format Manual was published by Bosch.

210. The VCD Format Manual relates to the Accused Infringing Devices and their transmission and storage of the results of a Video Content Analysis (VCA) algorithm.

211. The Accused Infringing Devices performed the VCA algorithm described in the VCD Format Manual.

212. The Accused Infringing Devices performed the Video Motion Detection ("VMD") process described in the VCD Format Manual.

213. The Video Content Description Format described in the VCD Format Manual was used by the Accused Infringing Devices and was used to encode the results of the VCA algorithm used by those devices.

2 Introduction

2.1 Purpose & scope

This Video Content Description (VCD) format is intended to be used for transmission and storage of the results of a Video Content Analysis (VCA) algorithm.

The goal was to design a protocol that is

- easy to generate,
- easy to parse and decode,
- flexible and easily extensible to add new features.

The international standards MPEG-7 / MPEG-4 that could also be used to describe metadata are not used due to their high complexity.

A short analysis of the capabilities of this protocol can be found in chapter 3.

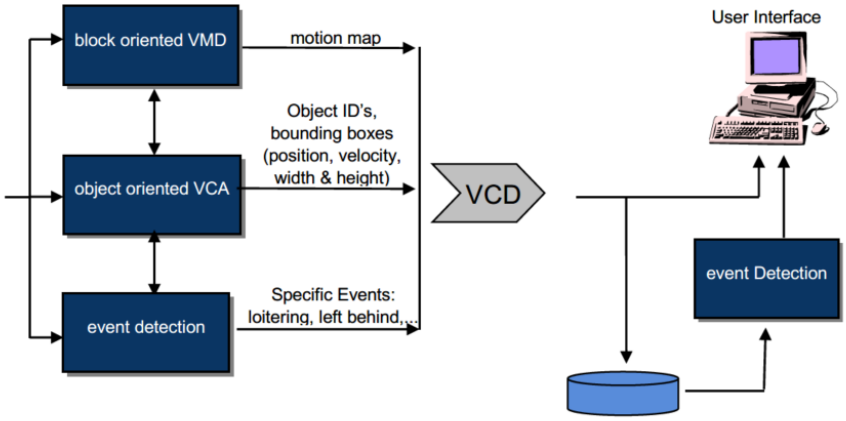


Figure 1: Flow of VCD data in a surveillance system.

The Video Content Description Format (VCD) is defined to encode the results of video content analysis algorithms for transmission to user interfaces or to databases. VCD data can be transmitted independently form encoded video streams and is linked to the video data via *RTP* timestamps. The way the VCD data is stored in databases is beyond the scope of this format and will strongly depend on the database architecture itself.

Source: VCD Format Manual (Exhibit E).

214. The VCA Software Manual relates to the Accused Infringing Devices as it describes the VCA process used by the Accused Infringing Devices to automatically analyze video images to alarm on predefined events like the detection of moving objects in the monitored area or tampering with the camera.

215. The VCA algorithms provided in the Accused Infringing Devices are described in the VCA Software Manual.

216. The VCA algorithms provided in the Accused Infringing Devices include, among others, Intelligent Video Analytics, Intelligent Video Analytics Flow, and Essential Video Analytics.

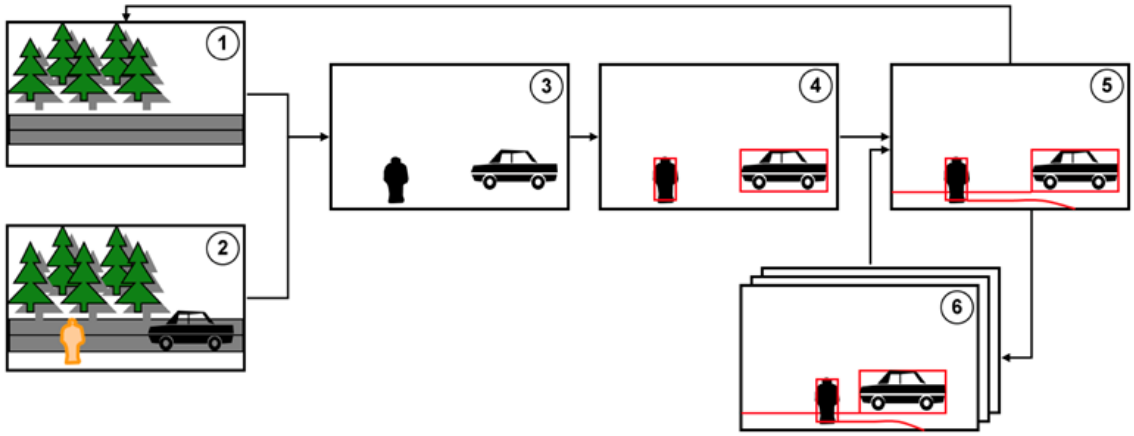
217. The VCA Software Manual describes the metadata created and collected through the Bosch VCA algorithms in the Accused Infringing devices, and such metadata includes object position and trajectory, object shape (bounding box and outline), and various object properties.

218. The Accused Infringing Devices included and used the Intelligent Video Analytics software and algorithms described in the VCA Software Manual.

219. The Accused Infringing Devices use of the IVA software and algorithms included the use of background subtraction as part of the object detection process. One type of object that was detected by the Accused Infringing Devices use of the IVA software and algorithms was a face.

Background subtraction Intelligent Video Analytics and Essential Video Analytics

Intelligent Video Analytics and Essential Video Analytics use background subtraction technique to extract the image foreground from the background for further processing.



1	Background image	**2**	Current image
3	Foreground (background update)	**4**	Detected objects (background update)
5	Tracking (background update)	**6**	Tracks in previous frames (background update)

Source: VCA Software Manual (Exhibit F).

The *face_object_properties_tag* number is **0x003E**.

With this tag the properties of a detected face in a video frame can be described.

face_object_id specifies the unique ID of the face. IVA starts face object IDs with 1 and does not use 0, even after a range overflow.

alarm_flag specifies whether this face object has triggered an alarm.

assigned_object_flag specifies whether this face is assigned to an object.

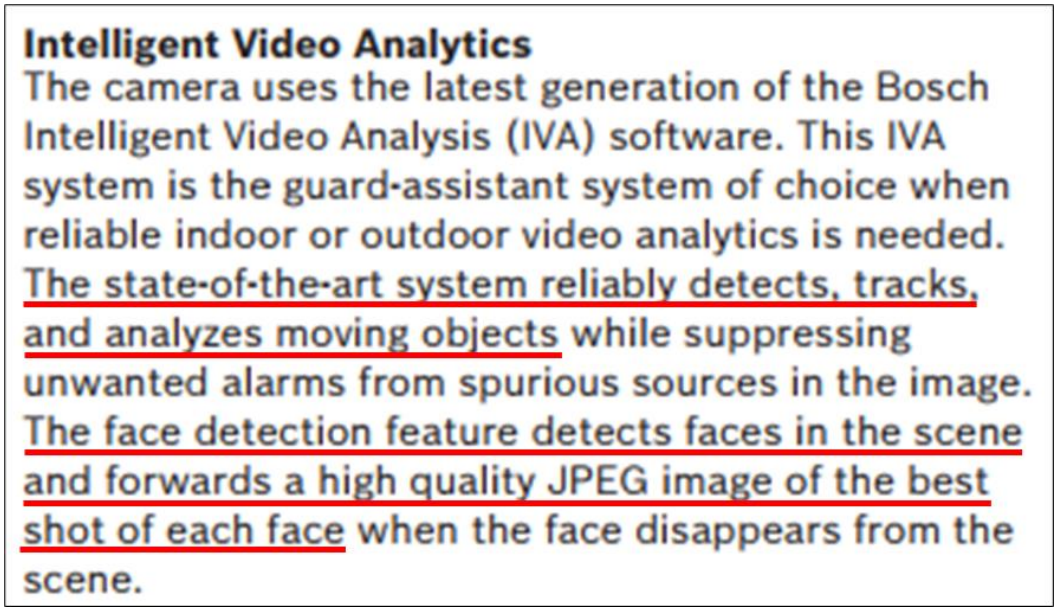
bounding_box_ul_x, **bounding_box_ul_y**, **bounding_box_lr_x** and **bounding_box_lr_y** define the bounding box of the face object with the coordinates of the upper left and lower right corner.

tracked_confidence specifies how sure it is that this face is correctly identified as a face. The range of the value is 0...32768, which corresponds to a confidence between 0 and 1. This confidence is determined by an update of the **image_confidence** during face tracking.

image_confidence specifies how sure it is that this face is correctly identified as a face. The range of the value is 0...32768, which corresponds to a confidence between 0 and 1. This confidence is determined inside an image only without consideration of the temporal history.

classification_score specifies the current classification score of the face. It corresponds to the quality of the best detection in the face detection.

Source: VCD Format Manual (Exhibit E); VCD Format Manual (Exhibit E).



Intelligent Video Analytics

The camera uses the latest generation of the Bosch Intelligent Video Analysis (IVA) software. This IVA system is the guard-assistant system of choice when reliable indoor or outdoor video analytics is needed. The state-of-the-art system reliably detects, tracks, and analyzes moving objects while suppressing unwanted alarms from spurious sources in the image. The face detection feature detects faces in the scene and forwards a high quality JPEG image of the best shot of each face when the face disappears from the scene.

Source: http://resource.boschsecurity.com/documents/NBN_932_Data_sheet_enUS_16676724107.pdf

220. One of the use cases for the Intelligent Video Analytics described in the VCA Software Manual and used in the Accused Infringing Devices is to take snapshots of faces.

221. The Accused Infringing Devices used the Intelligent Video Analytics software for frontal face detection, included face information in the metadata stream and automatically generated and uploaded to FTP or Dropbox accounts snapshots of the best face images. These snapshots of the best face images were cropped from digital images (video frames) created and provided by the operation of the Accused Infringing Devices.

2 System overview

General information about video content analysis (VCA)

Video content analysis is the process of automatically analyzing video images to alarm on predefined events like the detection of moving objects in the monitored area or tampering with the camera. It can also be used to gather statistics about the detected objects.

Depending on the camera type the following VCA algorithm are available in Bosch cameras:

- Intelligent Video Analytics:
  Mission-critical, long-distance intrusion detection in extreme weather conditions. Detection and tracking of moving objects.
  (see *Intelligent Video Analytics, page 10*)
- Intelligent Video Analytics Flow:
  Basic motion detection of cells in a grid with velocity and direction. Used for counter flow detection in crowds.
  (see *Intelligent Video Analytics, page 10*)
- Essential Video Analytics:
  Reliable video analytics for small and medium businesses, large retail stores, commercial buildings, and warehouses. Detection and tracking of moving objects.
  (see *Essential Video Analytics, page 12*)
- MOTION+:
  Basic change detection of cells in a grid. Can be used to trigger recordings.
  (see *MOTION+, page 25*)
- Tamper detection:
  Detects camera occlusion, turning away from the monitored scene, extreme lighting conditions and basic idle / removed object detection.
  (see *Tamper detection, page 27*)

Metadata

Metadata are the collected information from video content analysis algorithms. For Essential Video Analytics and Intelligent Video Analytics this includes all information about detected and tracked objects in the monitored area as follows:

- Alarm and counting events
- Object position and trajectory
  - In the image (2D)
  - Geolocation / ground plane coordinates (3D)
- Object shape
  - Bounding box
  - Outline
- Object properties
  - Object classification (**Upright persons**, **Cars**, **Trucks**, **Bikes**)
  - Object size (in the image and in reality)
  - Object speed and orientation
  - Object color histogram
  - Object ID

For MOTION+, the amount of change for each cell in the MOTION+ grid is included in the metadata. For Intelligent Video Analytics Flow, the metadata describe the computed motion direction.

3.1.2 Use cases Intelligent Video Analytics

Intelligent Video Analytics is suitable for mission-critical applications and delivers extremely reliable results even under severe environmental conditions.
Intelligent Video Analytics covers the following use cases, for example:

- Perimeter protection:
  - Critical infrastructure
  - Airports and industries
  - Government buildings
  - Jails
  - Border patrol
- Harbor, canal and coast surveillance
- Traffic monitoring:
  - Enforce no-parking zones
  - Wrong-way detection
  - Monitor road side for broken cars
  - Traffic counts
- Protection of valuable items (alarm on touch or removal of museum exhibits)
- People counting
- Occupancy, queue and crowd detection

Dedicated tracking modes

Intelligent Video Analytics includes dedicated tracking modes optimized for the following tasks:

- Intrusion detection
- Indoor people counting
- Asset protection (don't touch!)
- Tracking of ships

Alarm and statistic tasks

The following alarm and statistic tasks are available:

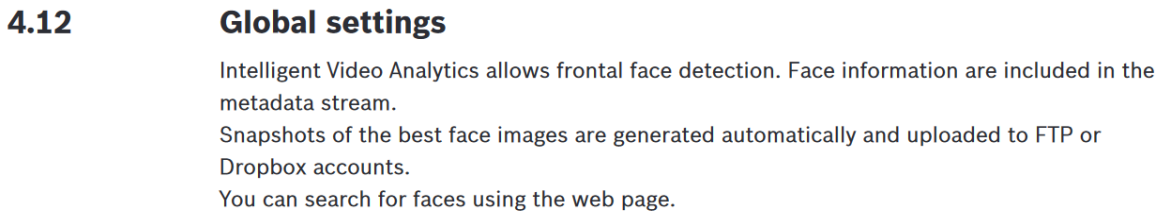
- Detect objects within, entering, or leaving a single area or up to 3 areas in a specified order
- Detect multiple line crossing from single line up to 3 lines combined in a specified order
- Detect objects traversing a route

- Detect loitering in an area related to radius and time
- Detect objects which are idle for a predefined time span
- Detect removed objects
- Detect objects who's properties such as size, speed, direction, and aspect ratio change within a configured time span according to specification (for example something falling down)
- Count objects crossing a virtual line
- Count objects within an area and alarm if a predefined limit is reached
- Detect a certain crowd level in a predefined field
- Detect specified motion direction and speed even in crowds (for example a person moving the wrong way in a one-way gate)
- Detect objects that move contrary to the motion of all other objects in the scene, even in crowds
- Take snapshots of frontal faces
- Combine tasks using scripts

Filters

To enhance robustness, the software can be configured to ignore specified image areas and small objects. For calibrated cameras, the software automatically distinguishes between upright persons, bikes, cars, and trucks. Furthermore, object size, speed, two-way direction, aspect ratio, and color filters can be used in any combination to create specific detection rules for exactly the objects you are looking for. Statistics on object properties are stored and can be displayed for fine tuning the object filters. Object properties can also be defined by selecting an appropriately similar object in the video.

Others	Essential Video Analytics	Intelligent Video Analytics
Calibration	✓	✓
Geolocation	✓	✓
VCA Masking	✓	✓
Face detection	-	✓
Camera Trainer (only in combination with Bosch Cloud Based Services)		✓
Robustness for extreme weather conditions	-	✓



4.12 Global settings

Intelligent Video Analytics allows frontal face detection. Face information are included in the metadata stream.
Snapshots of the best face images are generated automatically and uploaded to FTP or Dropbox accounts.
You can search for faces using the web page.

Source: VCA Software Manual (Exhibit F).

222. The document found at https://web.archive.org/web/20170517131045/http://st-tpp.resource.bosch.com:80/media/technology_partner_programm/10_public/iva/posting_face_snapshots_setup_and_guidelines_ver_1_7_18_13.pdf is titled "Posting Face Snapshots: Setup and Guidelines" (hereinafter "Posting Face Snapshots Guide")).

223. Exhibit G is a true and correct copy of the Posting Face Snapshots Guide.

224. The Posting Face Snapshots Guide was published by Bosch.

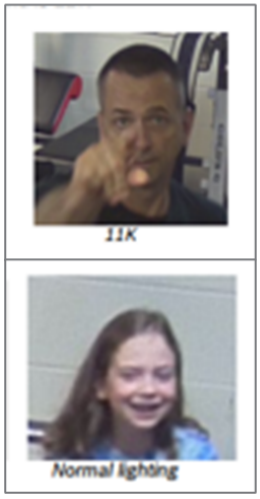
225. The Posting Face Snapshots Guide relates to the Accused Infringing Devices as it describes the step-by-step process of configuring the upload of snapshots from the Accused Infringing Devices using the IVA software described in VCA Software Manual to a FTP or Dropbox account. Step 1 of the process is to "[e]nsure that one of the IVA algorithms has been enabled on the device you are working with." The Posting Face Snapshots Guide instructs that for optimal processing "the Field of View (FOV) should have a uniform background. Highly

textured objects in the background can reduce performance." Upon information and belief, the process used by the Accused Infringing Devices used background subtraction and the IVA algorithms to perform the facial detection, tracking, cropping and uploading described in the Posting Face Snapshots Guide.

226. At least the use case of the Accused Infringing Devices to detect, crop, and post (as described in the Posting Face Snapshots Guide) detected faces based on the Face Object Properties, among other things, described in the VCD Format Manual using the IVA algorithm and software described in the VCA Software Manual demonstrate that the Accused Infringing Devices inputted an image map (i.e., "belief map") including a foreground object map and a background map of an image, the image map comprising tracked confidence, image confidence, and classification score values (i.e., "a plurality of belief values" including for the detected faces), each value at each location in the image map indicating detection of a foreground object/background (for example, a detected face) at the location wherein a foreground object having, for example, highest confidence and score values indicating that a face has been detected (i.e., "a photographic subject having a highest belief value comprises a main subject"). The detection of a face by the Accused Infringing Devices according to the face detection process described in Exhibits E, F, and G, performs the step of inputted a belief map of a

photographic image, said belief map comprising a plurality of belief values, each belief value at each location in said belief map indicating an importance of a photographic subject at said location wherein a photographic subject having a highest belief value comprises a main subject.

227. The Accused Infringing Devices selected an extraction, or crop, window.

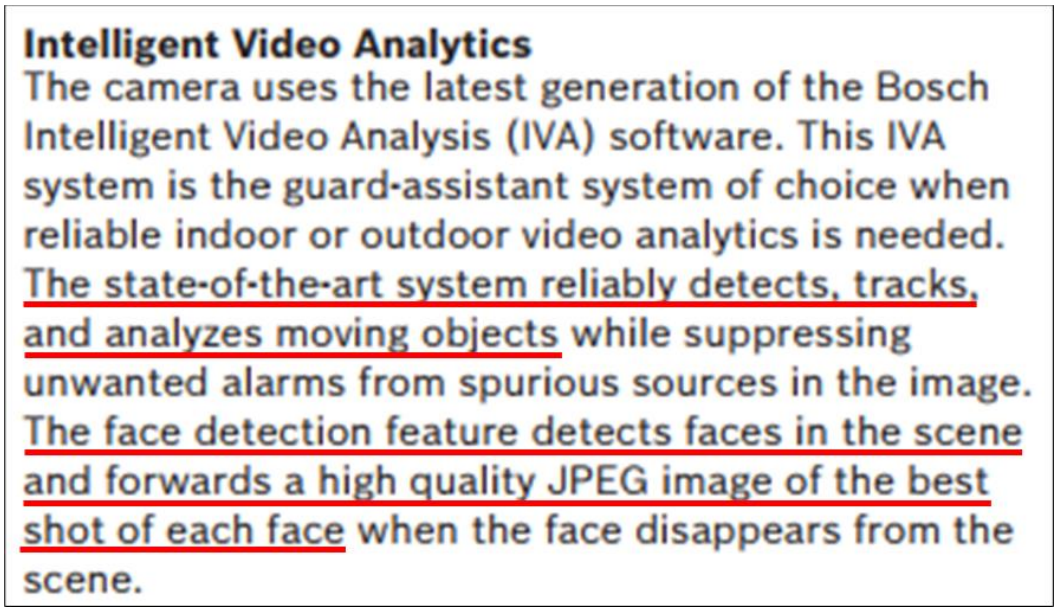


Results and What to Expect

- The following are sample results taken from a Dinion 1080P HD Camera mounted at an elevation of 10 ft. Pictured to the right is the base Field of View (FOV) as seen by the camera:

- Once a face is detected, the best snapshot of that face is extracted from the scene in the specified format.
- File size can vary based on where the face was detected in the FOV.
- From a sample of 200 faces files, sizes range from 3K to 30K with the average being between 8K and 20K

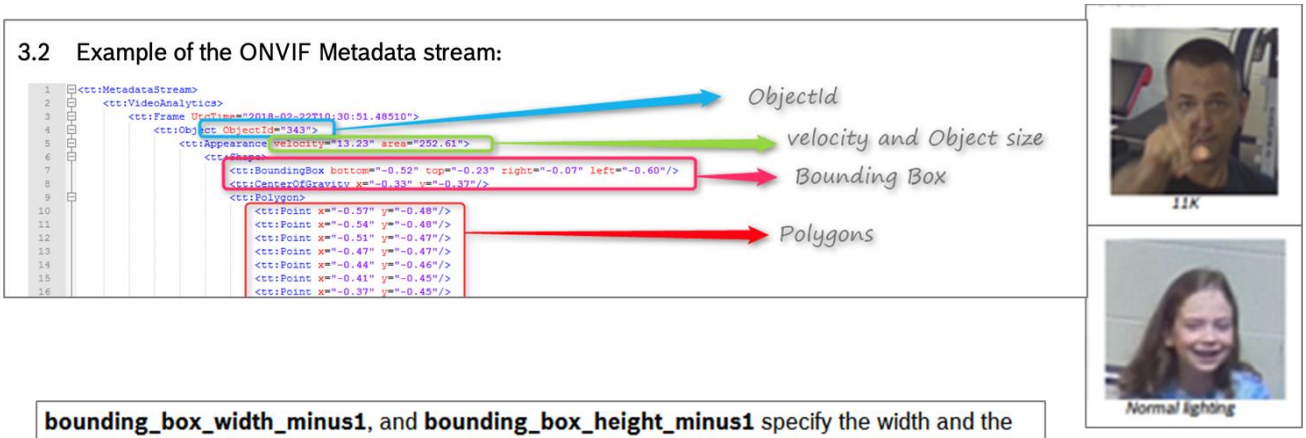
Source: Posting Face Snapshots Guide (Exhibit G).



Intelligent Video Analytics
The camera uses the latest generation of the Bosch Intelligent Video Analysis (IVA) software. This IVA system is the guard-assistant system of choice when reliable indoor or outdoor video analytics is needed. The state-of-the-art system reliably detects, tracks, and analyzes moving objects while suppressing unwanted alarms from spurious sources in the image. The face detection feature detects faces in the scene and forwards a high quality JPEG image of the best shot of each face when the face disappears from the scene.

Source:
http://resource.boschsecurity.com/documents/NBN_932_Data_sheet_enUS_16676724107.pdf

228. The Accused Infringing Devices positioned the extraction (crop) window such that the extraction (crop) window was centered around the bounding box that was centered around the detected face (i.e., "centered around said main subject"). Bosch then extracted (cropped) the face from the image (i.e., "cropping said image") according to the extraction (crop) window.

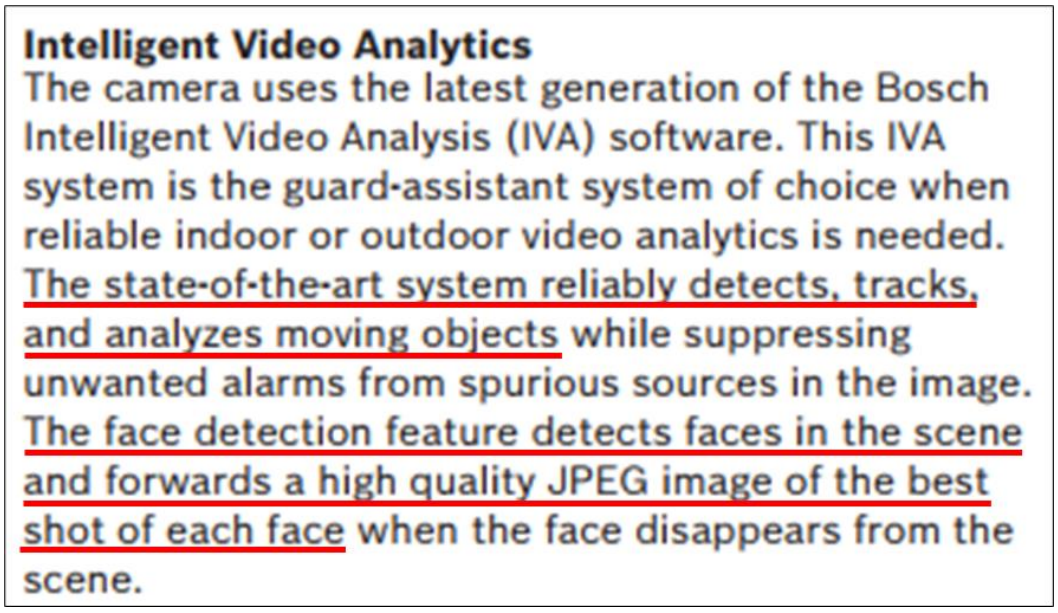


Source:
https://media.boschsecurity.com/fs/media/pb/media/partners_1/integration_tools_1/developer/bosch-metadata-and-iva-events.pdf

and Posting Face Snapshots Guide (Exhibit G).

229. The Accused Infringing Devices positioned the crop window such that the crop window was centered around the detected face and then cropped the image according to the crop window.

Source: Posting Face Snapshots Guide (Exhibit G).



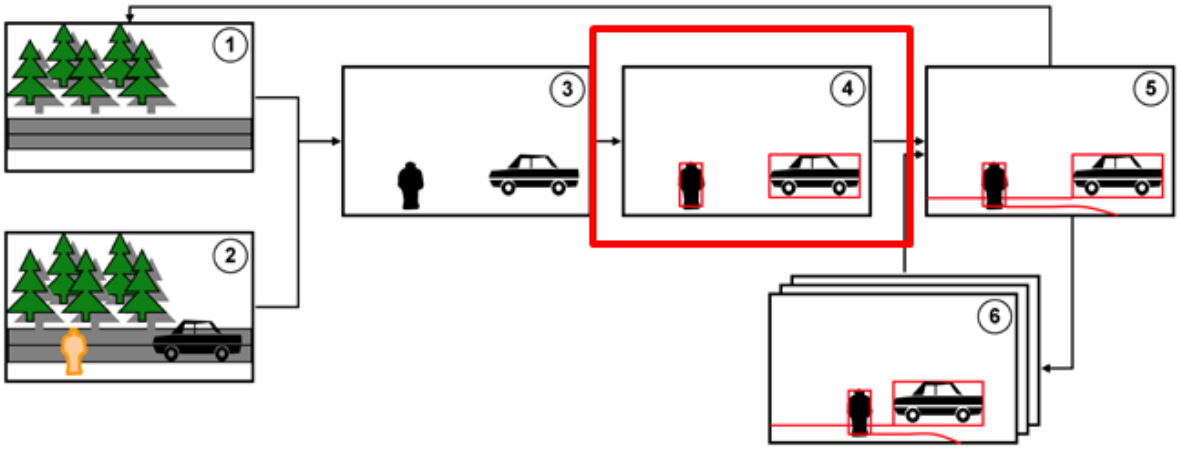
Intelligent Video Analytics
The camera uses the latest generation of the Bosch Intelligent Video Analysis (IVA) software. This IVA system is the guard-assistant system of choice when reliable indoor or outdoor video analytics is needed. The state-of-the-art system reliably detects, tracks, and analyzes moving objects while suppressing unwanted alarms from spurious sources in the image. The face detection feature detects faces in the scene and forwards a high quality JPEG image of the best shot of each face when the face disappears from the scene.

Source: http://resource.boschsecurity.com/documents/NBN_932_Data_sheet_enUS_16676724107.pdf

230. The Accused Infringing Devices clustered the regions of the image map into background and foreground classes including, for example, a person, head, car, face, bike, truck, and the like (i.e., "belief categories").

Background subtraction Intelligent Video Analytics and Essential Video Analytics

Intelligent Video Analytics and Essential Video Analytics use background subtraction technique to extract the image foreground from the background for further processing.



1	Background image	**2**	Current image
3	Foreground (background update)	**4**	Detected objects (background update)
5	Tracking (background update)	**6**	Tracks in previous frames (background update)

Source: VCA Software Manual (Exhibit F).

The *object_class_tag* number is **0x06**.

This tag contains information about the most probable class of the object.

certainty specifies the probability that the object is of the given class type. Thereby, a value of 255 encodes maximal certainty and 0 means completely uncertain.

class specifies the object's class. The following classes are defined:

Class	***value***
Person	*1*
Head	*2*
Car	*3*
Group of persons	*4*
Bike	*5*
Truck	*6*
Small object	*7*
Face	*8*

Table 21: Object classification

Source: https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/downloads_1/video_8/documents_1/boschvcd640-live.pdf?noScroll=true&TB_iframe=true&height=600&width=1015&content=[.cntWrapper

231. Bosch thus infringed at least claim 12 of the '506 Patent by making, using, testing, selling, offering for sale, importing and/or licensing the Accused Infringing Devices, and operating such that all steps of at least claim 12 were performed.

232. The users, customers, agents and/or other third parties (collectively, "third-party infringers") infringed, including under 35 U.S.C. § 271(a), at least claim 12 of the '506 Patent by using the Accused Infringing Devices.

233. Bosch had, since at least no later than February 20, 2018, known or been willfully blind to the fact that the third-party infringers' use of the Accused Infringing Devices directly infringed the '506 Patent.

234. Bosch's knowledge of the '506 Patent, which covered operating the Accused Infringing Devices in their intended manner such that all limitations of at least claim 12 of the '506 Patent were met, made it known to Bosch that the third-party infringers' use of the Accused Infringing Devices directly infringed the '506 Patent, or, at the very least, rendered Bosch willfully blind to such infringement.

235. Having known or been willfully blind to the fact that the third-party infringers' use of the Accused Infringing Devices in their intended manner such that all limitations of at least claim 12 of the '506 Patent were met directly infringed the '506 Patent, Bosch, upon information and belief, actively encouraged the third-party infringers to directly infringe the '506 Patent by making, using, testing, selling, offering for sale, importing and/or licensing said Accused Infringing Devices, and by, for example: marketing the Accused Infringing Devices to the third-party infringers; supporting and managing the third-party infringers' use of the Accused Infringing Devices; and providing technical assistance to the third-party infringers by, for example, publishing the following instructional

information directing third-party infringers how to make and use the Accused Infringing Devices to infringe claim 12 of the ’506 Patent:

- www.boschsecurity.com;
- https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/downloads_1/video_8/documents_1/boschvcd640-live.pdf?noScroll=true&TB_iframe=true&height=600&width=1015&content=[.cntWrapper;
- VCA Software Manual (Exhibit F);
- VCD Format Manual (Exhibit E);
- Posting Face Snapshots Guide (Exhibit G); and
- https://media.boschsecurity.com/fs/media/pb/media/partners_1/integration_tools_1/developer/bosch-metadata-and-iva-events.pdf.

236. Bosch induced the third-party infringers to infringe at least claim 12 of the ’506 Patent by directing or encouraging them to operate the Accused Infringing Devices which, alone or in combination with the third-party infringers’ devices,

satisfied all limitations of claim 12 of the ’506 Patent. For example, Bosch advertised and promoted the features of the Accused Infringing Devices and encouraged the third-party infringers to operate the Accused Infringing Devices in an infringing manner. Bosch further provided technical assistance as to how the Accused Infringing Devices should be used by the third-party infringers by, for example, publishing the following instructional information directing third-party infringers how to make and use the Accused Infringing Devices to infringe claim 12 of the ’506 Patent:

- www.boschsecurity.com;
- https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/downloads_1/video_8/documents_1/boschvcd640-live.pdf?noScroll=true&TB_iframe=true&height=600&width=1015&content=[.cntWrapper;
- VCA Software Manual (Exhibit F);
- VCD Format Manual (Exhibit E);
- Posting Face Snapshots Guide (Exhibit G); and

- https://media.boschsecurity.com/fs/media/pb/media/partners_1/integration_tools_1/developer/bosch-metadata-and-iva-events.pdf .

237. In response, the third-party infringers acquired and operated the Accused Infringing Devices such that all limitations of claim 12 of the ’506 Patent were practiced.

238. Bosch specifically intended to induce, and did induce, the third-party infringers to infringe at least claim 12 of the ’506 Patent, and Bosch knew of or was willfully blind to such infringement. Bosch advised, encouraged, and/or aided the third-party infringers to engage in direct infringement, including through its encouragement, advice, and assistance to the third-party infringers to use the Accused Infringing Devices.

239. Based on, among other things, the foregoing facts, Bosch induced infringement under 35 U.S.C. § 271(b) of at least claim 12 of the ’506 Patent.

240. Bosch sold, provided and/or licensed to the third-party infringers Accused Infringing Devices especially made and adapted—and specifically intended by Bosch—to be used as components and material parts of the inventions covered by the ’506 Patent. For example, Bosch cameras with IVA software which the third-party infringers used in a manner such that all limitations of at least claim

12 of the ’506 Patent were met, and without which the third-party infringers would have been unable to use and avail themselves of the Accused Infringing Devices in their intended manner.

241. Upon information and belief, Bosch also knew that the Accused Infringing Devices operated in a manner that satisfied all limitations of at least claim 12 of the ’506 Patent.

242. The IVA, subject matter detection and cropping technology in the Accused Infringing Devices was specially made and adapted to infringe at least claim 12 of the ’506 Patent. Upon information and belief, the IVA, subject matter detection and cropping technology in the Accused Infringing Devices was not a staple article or commodity of commerce, and, because the functionality was designed to work with the Accused Infringing Devices solely in a manner that is covered by the ’506 Patent, it did not have a substantial non-infringing use. At least by no later than February 20, 2018, based on the foregoing facts, Bosch knew of or was willfully blind to the fact that such functionality was especially made and adapted for—and was in fact used in—the Accused Infringing Devices in a manner that is covered by the ’506 Patent.

243. Based on, among other things, the foregoing facts, Bosch has contributorily infringed at least claim 12 of the ’506 Patent under 35 U.S.C. § 271(c).

244. Bosch's acts of infringement of the '506 Patent were willful and intentional under the standard of *Halo Elecs., Inc. v. Pulse Elecs., Inc.*, 136 S. Ct. 1923 (2016). Since at least February 20, 2018, Bosch willfully infringed the '506 Patent by refusing to take a license. Instead of taking a license to the '506 Patent, Bosch made the business decision to "efficiently infringe" the '506 Patent. In doing so, Bosch willfully infringed the '506 Patent.

245. Bosch's acts of direct and indirect infringement caused damage to MPV and MPV is entitled to recover from Defendants the damages sustained by Plaintiff as a result of Defendants' infringing acts in an amount subject to proof at trial, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court, pursuant to 35 U.S.C. § 284.

COUNT III –INFRINGEMENT OF THE '507 PATENT

246. Plaintiff realleges and incorporates by reference the allegations set forth above, as if set forth verbatim herein.

247. MPV owns by assignment the entire right, title, and interest in the '507 patent.

248. The '507 Patent was issued by the United States Patent and Trademark Office on November 25, 2003 and is titled "Automatically Producing an Image of a Portion of a Photographic Image."

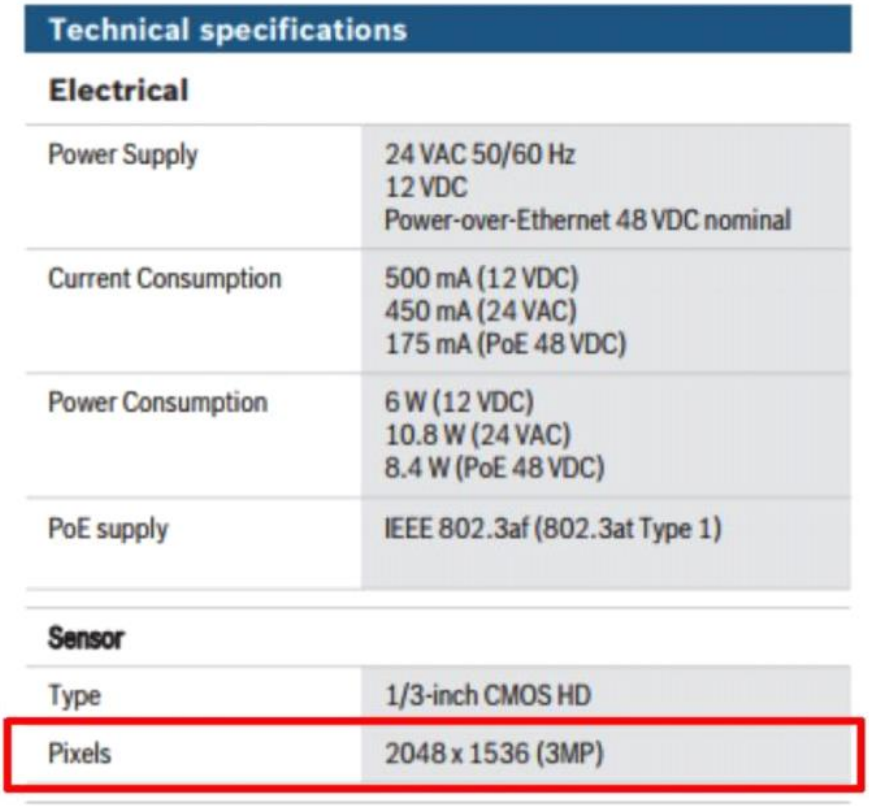
249. Upon information and belief, Bosch has directly infringed at least claim 3 of the ’507 Patent by making, using, testing, selling, offering for sale, importing and/or licensing in the United States without authority devices such as Bosch security cameras (e.g., Dinion 1080p) and related Intelligent Video Analysis (IVA) software that practice a method of producing an image of at least a portion of a digital image (collectively the “Accused Infringing Devices” or “Accused Infringing Products”) in an exemplary manner as described below.

250. The Accused Infringing Devices practice a method of producing an image of at least a portion of a digital image.

Source: http://resource.boschsecurity.com/documents/NBN_932_Data_sheet_enUS_16676724107.pdf

Source: Posting Face Snapshots Guide (Exhibit G).

251. The Accused Infringing Devices provide digital images having pixels. Bosch Security Cameras provide a digital image having pixels



Technical specifications	
Electrical	
Power Supply	24 VAC 50/60 Hz 12 VDC Power-over-Ethernet 48 VDC nominal
Current Consumption	500 mA (12 VDC) 450 mA (24 VAC) 175 mA (PoE 48 VDC)
Power Consumption	6 W (12 VDC) 10.8 W (24 VAC) 8.4 W (PoE 48 VDC)
PoE supply	IEEE 802.3af (802.3at Type 1)
Sensor	
Type	1/3-inch CMOS HD
Pixels	2048 x 1536 (3MP)

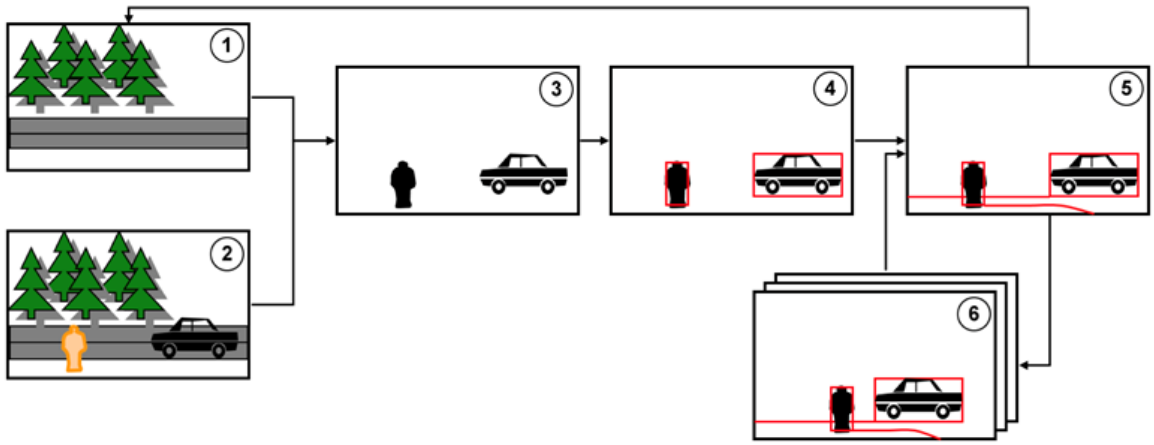
Source: http://resource.boschsecurity.com/documents/NBN_932_Data_sheet_enUS_16676724107.pdf

252. The Accused Infringing Devices compute a belief map of the digital image by using the pixels of the digital image to determine a series of features and using such features to assign a probability of a location of a main subject of the digital

image in the belief map. The Accused Infringing Devices compute an image map (i.e., "belief map") of the digital image by using the pixels to determine a foreground object map and a background map of an image, the image map comprising tracked confidence, image confidence, and classification score features (i.e., "a series of features"), and using the features to detect a foreground object/background at the location wherein a foreground object having, for example, highest probability and score features indicating that a face, a person, a car, and the like has been detected (i.e., "assign a probability of a location of a main subject of the digital image in the belief map").

Background subtraction Intelligent Video Analytics and Essential Video Analytics

Intelligent Video Analytics and Essential Video Analytics use background subtraction technique to extract the image foreground from the background for further processing.



1	Background image	**2**	Current image
3	Foreground (background update)	**4**	Detected objects (background update)
5	Tracking (background update)	**6**	Tracks in previous frames (background update)

Source: VCA Software Manual (Exhibit F).

The *face_object_properties_tag* number is **0x003E**.

With this tag the properties of a detected face in a video frame can be described.

face_object_id specifies the unique ID of the face. IVA starts face object IDs with 1 and does not use 0, even after a range overflow.

alarm_flag specifies whether this face object has triggered an alarm.

assigned_object_flag specifies whether this face is assigned to an object.

bounding_box_ul_x, **bounding_box_ul_y**, **bounding_box_lr_x** and **bounding_box_lr_y** define the bounding box of the face object with the coordinates of the upper left and lower right corner.

tracked_confidence specifies how sure it is that this face is correctly identified as a face. The range of the value is 0...32768, which corresponds to a confidence between 0 and 1. This confidence is determined by an update of the **image_confidence** during face tracking.

image_confidence specifies how sure it is that this face is correctly identified as a face. The range of the value is 0...32768, which corresponds to a confidence between 0 and 1. This confidence is determined inside an image only without consideration of the temporal history.

classification_score specifies the current classification score of the face. It corresponds to the quality of the best detection in the face detection.

Source: VCD Format Manual (Exhibit E).

Intelligent Video Analytics

The camera uses the latest generation of the Bosch Intelligent Video Analysis (IVA) software. This IVA system is the guard-assistant system of choice when reliable indoor or outdoor video analytics is needed. The state-of-the-art system reliably detects, tracks, and analyzes moving objects while suppressing unwanted alarms from spurious sources in the image. The face detection feature detects faces in the scene and forwards a high quality JPEG image of the best shot of each face when the face disappears from the scene.

Source: http://resource.boschsecurity.com/documents/NBN_932_Data_sheet_enUS_16676724107.pdf

Image information

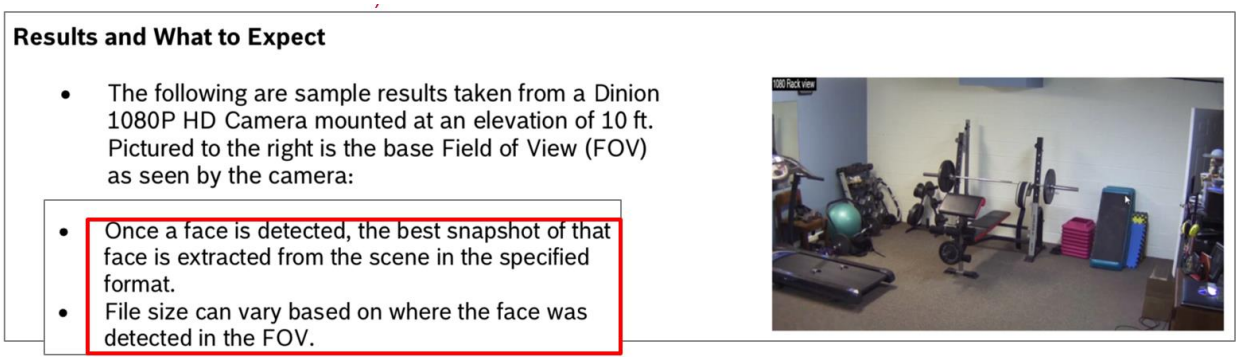
Depending on the configuration of Intelligent Video Analytics and Essential Video Analytics, additional overlays in the image, for example object outlines, can provide more information. These object outlines are displayed in real time and are always synchronized exactly with the moving object. During life view, the metadata arrive one frame after the respective camera image, and thus the outlines do not always exactly surround the object.

	Indicates that an object is detected as person.
	Indicates that an object is detected as car.
	Indicates that an object is detected as truck.
	Indicates that an object is detected as bike.

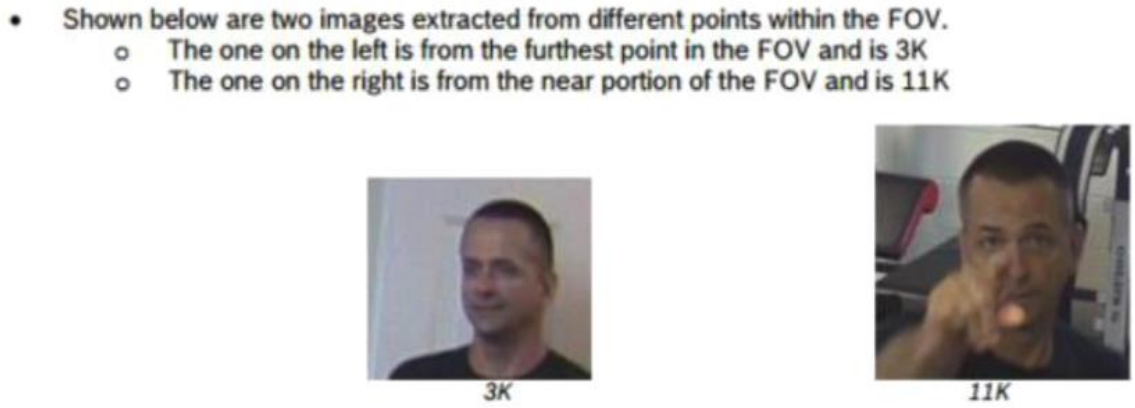
Source: VCA Software Manual (Exhibit F).

253. The Accused Infringing Devices determine a crop window having a shape factor and a zoom factor, the shape and zoom factors determining a size of the crop window. The Accused Infringing Devices crop the digital image to include a portion of the image of high subject content in response to the belief map and the crop window. The Accused Infringing Devices determine an extraction window ("crop window") having a shape factor and a zoom factor that determine a size of the extraction window and crop the digital image to include the best

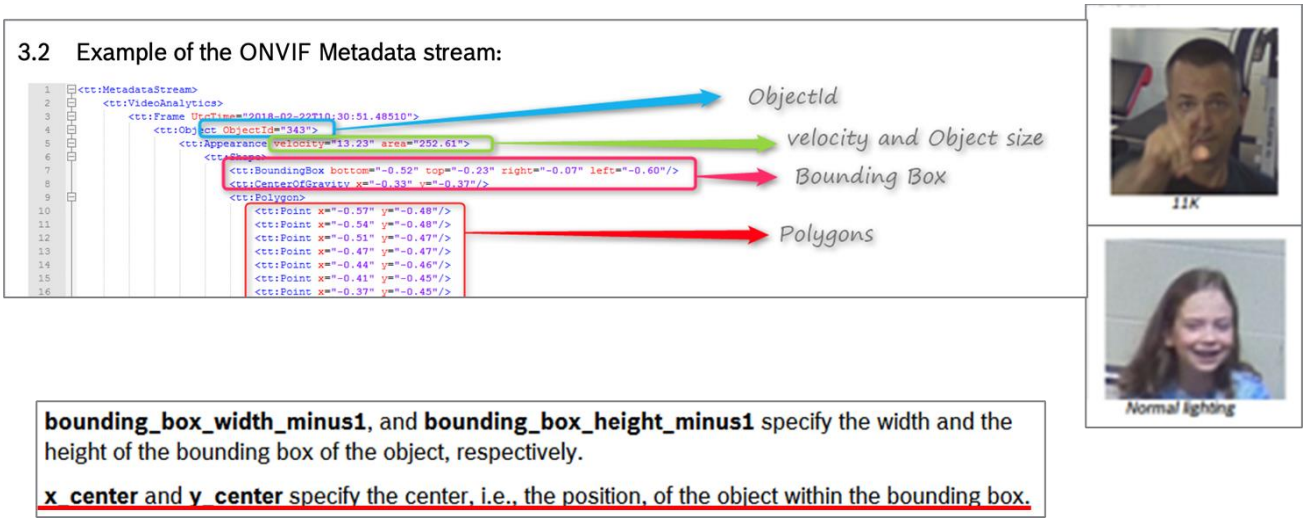
snapshot of, for example, a face ("a portion of the image of high subject content") in response to the image map ("belief map") and the extraction window.



Source: Posting Face Snapshots Guide (Exhibit G).



Source: Posting Face Snapshots Guide (Exhibit G).



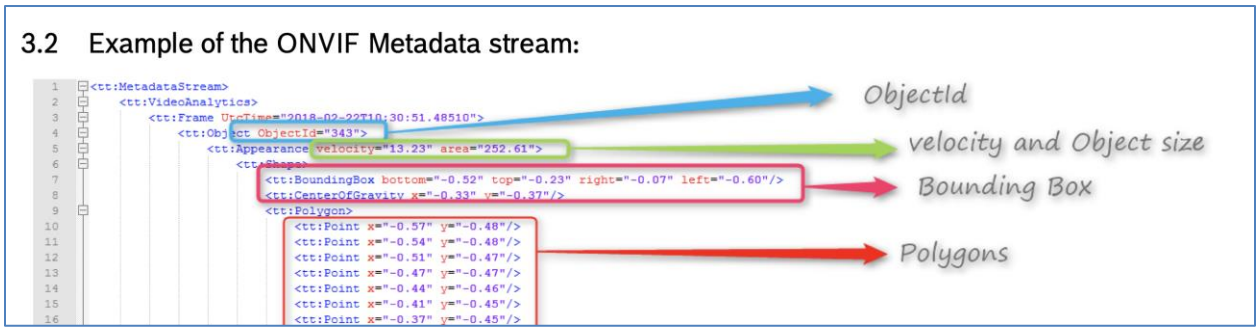
Source: https://media.boschsecurity.com/fs/media/pb/media/partners_1/integration_tools_1/developer/bosch-metadata-and-iva-events.pdf and Posting Face Snapshots Guide (Exhibit G).

254. The Accused Infringing Devices select an initial position of the crop window at a location which includes a center of mass. The Accused Infringing Devices select an initial position of the crop window which includes a center of gravity ("center of mass") of, for example, the detected face.

Table 29: Syntax of object shape polygon

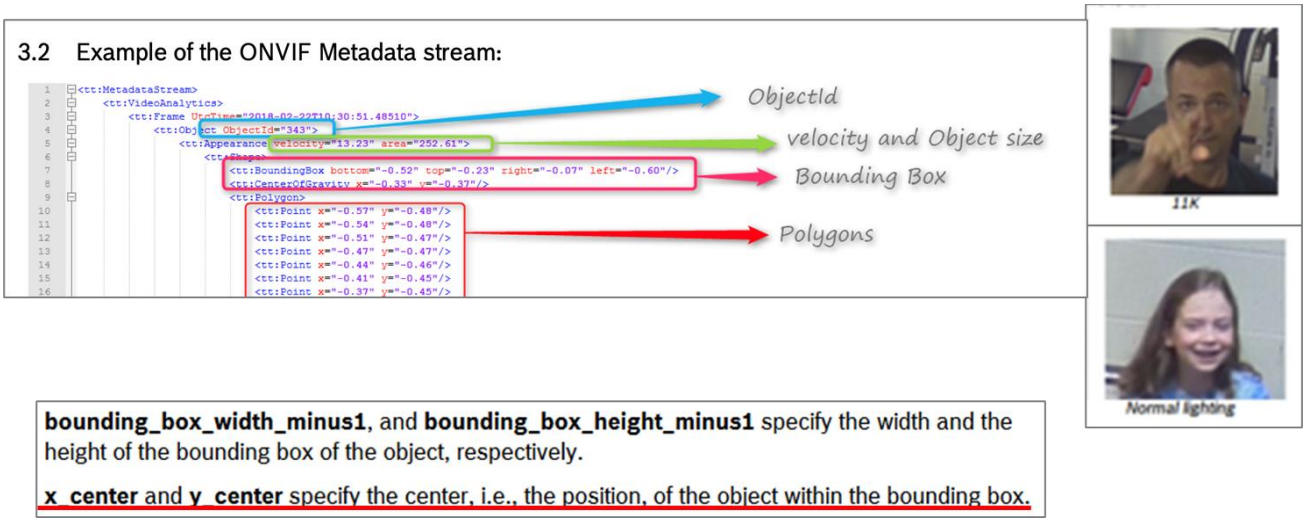
This object shape description is based on a polygon instead of a chain for the object contour. The polygon is not constrained to the image area.

Source: https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/downloads_1/video_8/documents_1/boschvcd640-live.pdf?noScroll=true&TB_iframe=true&height=600&width=1015&content=[.cntWrapper]



Source: https://media.boschsecurity.com/fs/media/pb/media/partners_1/integration_tools_1/developer/bosch-metadata-and-iva-events.pdf and Posting Face Snapshots Guide (Exhibit G).

255. The Accused Infringing Devices use belief values corresponding to the crop window to select the position of the crop window to include a portion of the image of high subject content in response to the belief map and crop the digital image according to the position of the crop window. The Accused Infringing Devices use confidence values (i.e., "belief values") corresponding to the extraction window to select the position of the extraction window to be centered around the bounding box that is centered around the center of gravity of the detected face (i.e., "include a portion of the high subject content in response to the belief map"). The Accused Infringing Devices then extract the face from the image (i.e., "cropping the digital image") according to the position of the extraction window.



Source:
https://media.boschsecurity.com/fs/media/pb/media/partners_1/integration_tools_1/developer/bosch-metadata-and-iva-events.pdf and
https://web.archive.org/web/20170517131045/http://st-tpp.resource.bosch.com:80/media/technology_partner_programm/10_public/iva/posting_face_snapshots_setup_and_guidelines_ver_1_7_18_13.pdf

256. Bosch has thus infringed at least claim 3 of the ’507 Patent by making, using, testing, selling, offering for sale, importing and/or licensing the Accused Infringing Devices, and operating such that all steps of at least claim 3 are performed.

257. The users, customers, agents and/or other third parties (collectively, “third-party infringers”) infringe, including under 35 U.S.C. § 271(a), at least claim 3 of the ’507 Patent by using the Accused Infringing Devices.

258. Bosch has, since at least no later than February 20, 2018, known or been willfully blind to the fact that the third-party infringers' use of the Accused Infringing Devices directly infringes the '507 Patent.

259. Bosch's knowledge of the '507 Patent, which covers operating the Accused Infringing Devices in their intended manner such that all limitations of at least claim 3 of the '507 Patent are met, made it known to Bosch that the third-party infringers' use of the Accused Infringing Devices would directly infringe the '507 Patent, or, at the very least, render Bosch willfully blind to such infringement,

260. Having known or been willfully blind to the fact that the third-party infringers' use of the Accused Infringing Devices in their intended manner such that all limitations of at least claim 3 of the '507 Patent are met would directly infringe the '507 Patent, Bosch, upon information and belief, actively encouraged the third-party infringers to directly infringe the '507 Patent by making, using, testing, selling, offering for sale, importing and/or licensing said Accused Infringing Devices, and by, for example: marketing the Accused Infringing Devices to the third-party infringers; supporting and managing the third-party infringers' continued use of the Accused Infringing Devices; and providing technical assistance to the third-party infringers during their continued use of the

Accused Infringing Devices by, for example, publishing the following instructional information directing third-party infringers how to make and use the Accused Infringing Devices to infringe claim 3 of the ’507 Patent:

- www.boschsecurity.com;
- https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/downloads_1/video_8/documents_1/boschvcd640-live.pdf?noScroll=true&TB_iframe=true&height=600&width=1015&content=[.cntWrapper;
- VCA Software Manual (Exhibit F);
- VCD Format Manual (Exhibit E);
- https://web.archive.org/web/20170517131045/http://st-tpp.resource.bosch.com:80/media/technology_partner_programm/10_public/iva/posting_face_snapshots_setup_and_guidelines_ver_1_7_18_13.pdf ; and
- https://media.boschsecurity.com/fs/media/pb/media/partners_1/integration_tools_1/developer/bosch-metadata-and-iva-events.pdf .

261. Bosch induced the third-party infringers to infringe at least claim 3 of the ’507 Patent by directing or encouraging them to operate the Accused Infringing Devices which, alone or in combination with the third-party infringers’ devices, satisfy all limitations of claim 3 of the ’507 Patent. For example, Bosch advertised and promoted the features of the Accused Infringing Devices and encouraged the third-party infringers to operate the Accused Infringing Devices in an infringing manner. Bosch further provided technical assistance as to how the Accused Infringing Devices should be used by the third-party infringers by, for example, publishing the following instructional information directing third-party infringers how to make and use the Accused Infringing Devices to infringe claim 3 of the ’507 Patent:

- www.boschsecurity.com;
- https://st-tpp.resource.bosch.com/media/technology_partner_programm/10_public/downloads_1/video_8/documents_1/boschvcd640-live.pdf?noScroll=true&TB_iframe=true&height=600&width=1015&content=[.cntWrapper;
- VCA Software Manual (Exhibit F);

- VCD Format Manual (Exhibit E);

- https://web.archive.org/web/20170517131045/http://st-tpp.resource.bosch.com:80/media/technology_partner_programm/10_public/iva/posting_face_snapshots_setup_and_guidelines_ver_1_7_18_13.pdf ; and

- https://media.boschsecurity.com/fs/media/pb/media/partners_1/integration_tools_1/developer/bosch-metadata-and-iva-events.pdf .

262. In response, the third-party infringers acquired and operated the Accused Infringing Devices such that all limitations of claim 3 of the ’507 Patent are practiced.

263. Bosch has specifically intended to induce, and has induced, the third-party infringers to infringe at least claim 3 of the ’507 Patent, and Bosch has known of or been willfully blind to such infringement. Bosch has advised, encouraged, and/or aided the third-party infringers to engage in direct infringement, including through its encouragement, advice, and assistance to the third-party infringers to use the Accused Infringing Devices.

264. Based on, among other things, the foregoing facts, Bosch has induced, and continues to induce, infringement under 35 U.S.C. § 271(b) of at least claim 3 of the ’507 Patent.

265. Bosch sold, provided and/or licensed to the third-party infringers Accused Infringing Devices that are especially made and adapted—and specifically intended by Bosch—to be used as components and material parts of the inventions covered by the ’507 Patent. For example, Bosch cameras with IVA software which the third-party infringers use in a manner such that all limitations of at least claim 3 of the ’507 Patent are met, and without which the third-party infringers would be unable to use and avail themselves of the Accused Infringing Devices in their intended manner.

266. Upon information and belief, Bosch also knew that the Accused Infringing Devices operate in a manner that satisfies all limitations of at least claim 3 of the ’507 Patent.

267. The IVA, subject matter detection and cropping technology in the Accused Infringing Devices is specially made and adapted to infringe at least claim 3 of the ’507 Patent. Upon information and belief, the IVA, subject matter detection and cropping technology in the Accused Infringing Devices is not a staple article or commodity of commerce, and, because the functionality is designed to work

with the Accused Infringing Devices solely in a manner that is covered by the '507 Patent, it does not have a substantial non-infringing use. At least by no later than February 20, 2018, based on the foregoing facts, Bosch has known or been willfully blind to the fact that such functionality is especially made and adapted for—and is in fact used in—the Accused Infringing Devices in a manner that is covered by the '507 Patent.

268. Based on, among other things, the foregoing facts, Bosch has contributorily infringed at least claim 3 of the '507 Patent under 35 U.S.C. § 271(c).

269. Bosch's acts of infringement of the '507 Patent have been willful and intentional under the standard of *Halo Elecs., Inc. v. Pulse Elecs., Inc.*, 136 S. Ct. 1923 (2016). Since at least February 20, 2018, Bosch has willfully infringed the '506 Patent by refusing to take a license and continuing the foregoing infringement. Instead of taking a license to the '507 Patent, Bosch made the business decision to "efficiently infringe" the '507 Patent. In doing so, Bosch willfully infringes the '507 Patent.

270. Bosch's acts of direct and indirect infringement have caused damage to MPV and MPV is entitled to recover from Defendants the damages sustained by Plaintiff as a result of Defendants' infringing acts in an amount subject to proof

at trial, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court, pursuant to 35 U.S.C. § 284.

COUNT IV –INFRINGEMENT OF THE '461 PATENT

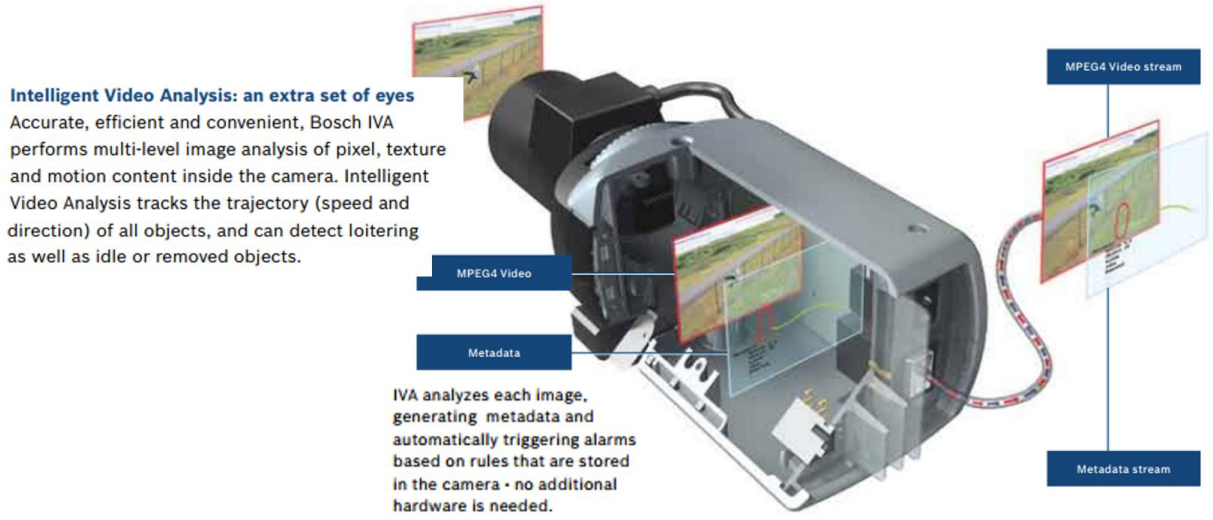
271. Plaintiff realleges and incorporates by reference the allegations set forth above, as if set forth verbatim herein.

272. MPV owns by assignment the entire right, title, and interest in the '461 patent.

273. The '461 Patent was issued by the United States Patent and Trademark Office on April 25, 2006 and is titled "Method for Detecting Objects in Digital Images."

274. Upon information and belief, Bosch has directly infringed at least claim 3 of the '461 Patent by making, using, testing, selling, offering for sale, importing and/or licensing in the United States without authority IP security cameras with Intelligent Video Analytics (IVA) that perform a method for detecting objects in a digital image (collectively the "Accused Infringing Devices") in an exemplary manner as described below.

275. The Accused Infringing Devices perform a method for detecting objects in a digital image.



Source: Focus Your Attention IVA Brochure (Exhibit H).

276. The Focus Your Attention IVA Brochure was published by Bosch.

277. The Focus Your Attention IVA Brochure relates to the Accused Infringing Devices and their use of the Bosch Intelligent Video Analysis ("IVA") software and algorithms described in the VCA Software Manual.

278. The VCA Software Manual relates to the Accused Infringing Devices as it describes the VCA process used by the Accused Infringing Devices to automatically analyze video images to alarm on predefined events like the detection of moving objects in the monitored area or tampering with the camera.

279. The VCA algorithms provided in the Accused Infringing Devices are described in the VCA Software Manual.

280. The VCA algorithms provided in the Accused Infringing Devices include, among others, Intelligent Video Analytics, Intelligent Video Analytics Flow, and Essential Video Analytics.

281. The VCA Software Manual describes the metadata created and collected through the Bosch VCA algorithms in the Accused Infringing devices, and such metadata includes object position and trajectory, object shape (bounding box and outline), and various object properties.

282. The Accused Infringing Devices included and used the Intelligent Video Analytics software and algorithms described in the VCA Software Manual.

283. The Accused Infringing Devices generate a motion detection map ("first segmentation map") of the digital image according to movement of individual image blocks ("a non-object specific criterion").

Intelligent Video Analysis: an extra set of eyes

Accurate, efficient and convenient, Bosch IVA performs multi-level image analysis of pixel, texture and motion content inside the camera. Intelligent Video Analysis tracks the trajectory (speed and

Capturing details in metadata

IVA captures data on everything that happens within the active areas of each monitored scene. Content analysis information, in the form of metadata, is generated and stored with the video images. The metadata contains details on all objects within, entering or leaving the monitored areas. And the analysis doesn't stop with live scenes,

Bosch IVA can also provide event recognition during playback of recorded video. The recorded metadata, comprised of simple text strings describing specific image details, is much smaller and easier to search through than the recorded video images. By searching the metadata with smart search facilities like those provided with an Internet search engine, IVA quickly takes you to the relevant

Source: Focus Your Attention IVA Brochure (Exhibit H)

Image information

Notice!

The Intelligent Video Analytics Flow functionality differs from the Intelligent Video Analytics object recognition. The Intelligent Video Analytics Flow functionality detects an optical flow formed by the movement of individual blocks. Intelligent Video Analytics Flow does not use a camera calibration.

Traffic monitoring:
- Enforce no-parking zones
- Wrong-way detection
- Monitor road side for broken cars
- Traffic counts

The block-tracking map in polar coordinates provides the results of the IVA Flow analysis algorithm block tracking in polar coordinates (direction and velocity). It shows in each block the information about the estimated block motion.

Source: VCA Software Manual (Exhibit F); https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf; and VCD Format Manual (Exhibit E).

284. The motion detection map generated by the Accused Infringing Devices includes at least the Motion map referenced in section 4.3.8 of the VCD Format Manual Exhibit E, which signals in which area of the image (divided into cells) motion has been detected.

4.3.8 Motion map

motion map( ) {	**Descriptor**
bits_for_cell_changed	u(1)
number_of_nibbles_minus1	u(3)
v = 4 * (number_of_nibbles_minus1 + 1)	
cells_x	u(v)
cells_y	u(v)
cell_step_x	u(v)
cell_step_y	u(v)
cell_start_x	u(v)
cell_start_y	u(v)
if (bits_for_cell_changed)	
byte_aligned()	
for (y = 0; y < cells_y; y++)	
for (x = 0; x < cells_x; x++)	
cell_changed[y][x]	u(v)
byte_aligned()	
}	

Table 11: Syntax of motion map

Source: VCD Format Manual (Exhibit)E.

285. The motion detection map generated by the Accused Infringing Devices, using Intelligent Video Analytics Flow, includes basic motion detection of cells in a grid with velocity and direction and is used for counter flow detection in crowds as described in the VCA Software Manual in, among other places, Section 2 System Overview.

286. The motion detection map generated by the Accused Infringing Devices, using Motion+, includes basic change detection of cells including the amount of change, as described in the VCA Software Manual in, among other places, Section 2 System Overview.

2 System overview

General information about video content analysis (VCA)

Video content analysis is the process of automatically analyzing video images to alarm on predefined events like the detection of moving objects in the monitored area or tampering with the camera. It can also be used to gather statistics about the detected objects.

Depending on the camera type the following VCA algorithm are available in Bosch cameras:

- Intelligent Video Analytics:
  Mission-critical, long-distance intrusion detection in extreme weather conditions. Detection and tracking of moving objects.
  (see *Intelligent Video Analytics, page 10*)
- Intelligent Video Analytics Flow:
  Basic motion detection of cells in a grid with velocity and direction. Used for counter flow detection in crowds.
  (see *Intelligent Video Analytics, page 10*)
- Essential Video Analytics:
  Reliable video analytics for small and medium businesses, large retail stores, commercial buildings, and warehouses. Detection and tracking of moving objects.
  (see *Essential Video Analytics, page 11*)
- MOTION+:
  Basic change detection of cells in a grid. Can be used to trigger recordings.
  (see *MOTION+, page 19*)
- Tamper detection:
  Detects camera occlusion, turning away from the monitored scene, extreme lighting conditions and basic idle / removed object detection.
  (see *Tamper detection, page 20*)

Metadata

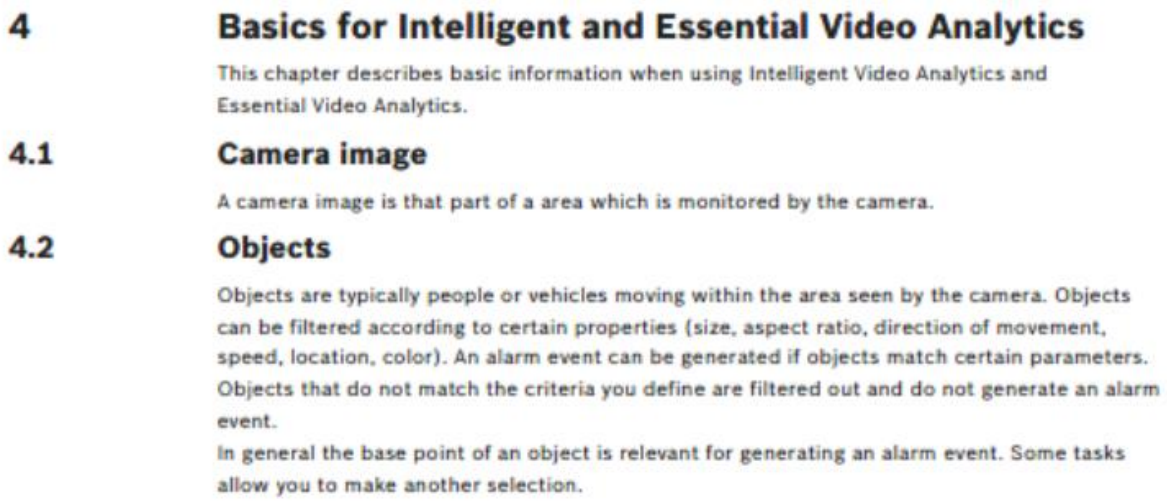
Metadata are the collected information from video content analysis algorithms. For Essential Video Analytics and Intelligent Video Analytics this includes all information about detected and tracked objects in the monitored area as follows:

- Alarm and counting events
- Object position and trajectory
  - In the image (2D)
  - Geolocation / ground plane coordinates (3D)
- Object shape
  - Bounding box
  - Outline
- Object properties
  - Object classification (**Upright persons**, **Cars**, **Trucks**, **Bikes**)
  - Object size (in the image and in reality)
  - Object speed and orientation
  - Object color histogram
  - Object ID

For MOTION+, the amount of change for each cell in the MOTION+ grid is included in the metadata. For Intelligent Video Analytics Flow, the metadata describe the computed motion direction.

Source: VCA Software Manual (Exhibit F).

287. The Accused Infringing Devices generate an object outline map (i.e., "a second segmentation map") of the digital image according to size, aspect ratio, direction of movement, speed, location, color, and the like of an object (i.e., "a object specific criterion").



4 Basics for Intelligent and Essential Video Analytics

This chapter describes basic information when using Intelligent Video Analytics and Essential Video Analytics.

4.1 Camera image

A camera image is that part of a area which is monitored by the camera.

4.2 Objects

Objects are typically people or vehicles moving within the area seen by the camera. Objects can be filtered according to certain properties (size, aspect ratio, direction of movement, speed, location, color). An alarm event can be generated if objects match certain parameters. Objects that do not match the criteria you define are filtered out and do not generate an alarm event.

In general the base point of an object is relevant for generating an alarm event. Some tasks allow you to make another selection.

Source: VCA Software Manual (Exhibit F).

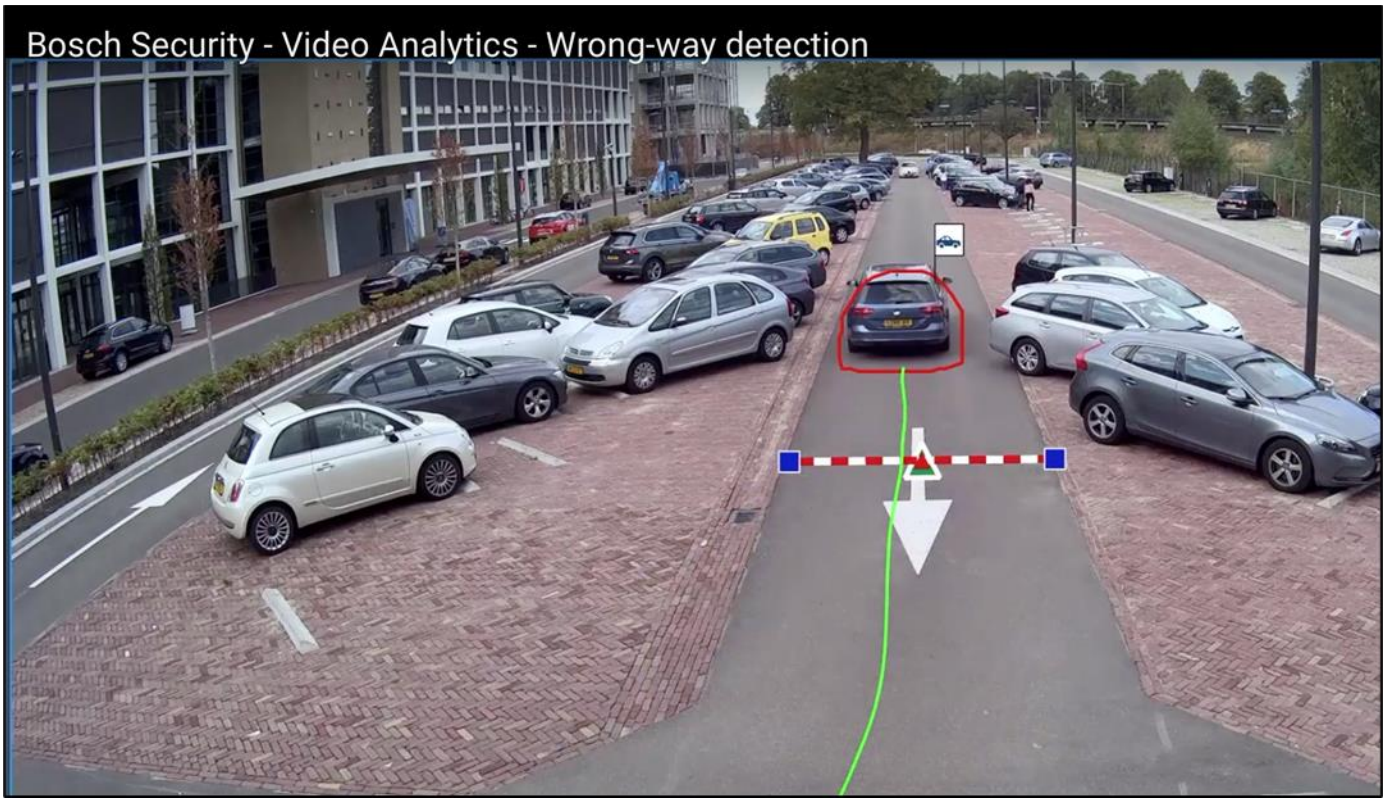
Image information

Depending on the configuration of Intelligent Video Analytics and Essential Video Analytics, additional overlays in the image, for example object outlines, can provide more information. These object outlines are displayed in real time and are always synchronized exactly with the moving object. During life view, the metadata arrive one frame after the respective camera image, and thus the outlines do not always exactly surround the object.

	Indicates that an object is detected as person.	
	Indicates that an object is detected as car.	
	Indicates that an object is detected as truck.	
	Indicates that an object is detected as bike.	

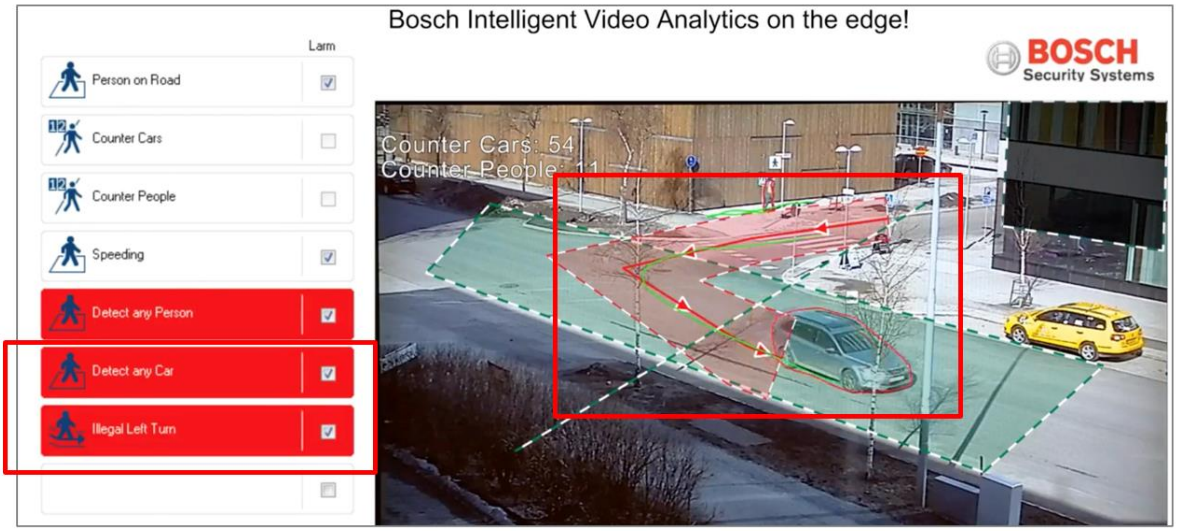
Source: VCA Software Manual (Exhibit F) and https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf.

288. The Accused Infringing Devices detect objects in the digital image using both the motion detection map ("first segmentation map") and the object outline map ("second segmentation map"). For example, a car in motion in the wrong direction is detected using both the motion detection map and the object outline map.



Source : https://www.youtube.com/watch?v=nTOKFhM0Fik

289. The Accused Infringing Devices detect objects in the digital image using both the motion detection map ("first segmentation map") and the object outline map ("second segmentation map"). For example, a car in motion while making an illegal left turn is detected using both the motion detection map and the object outline map.

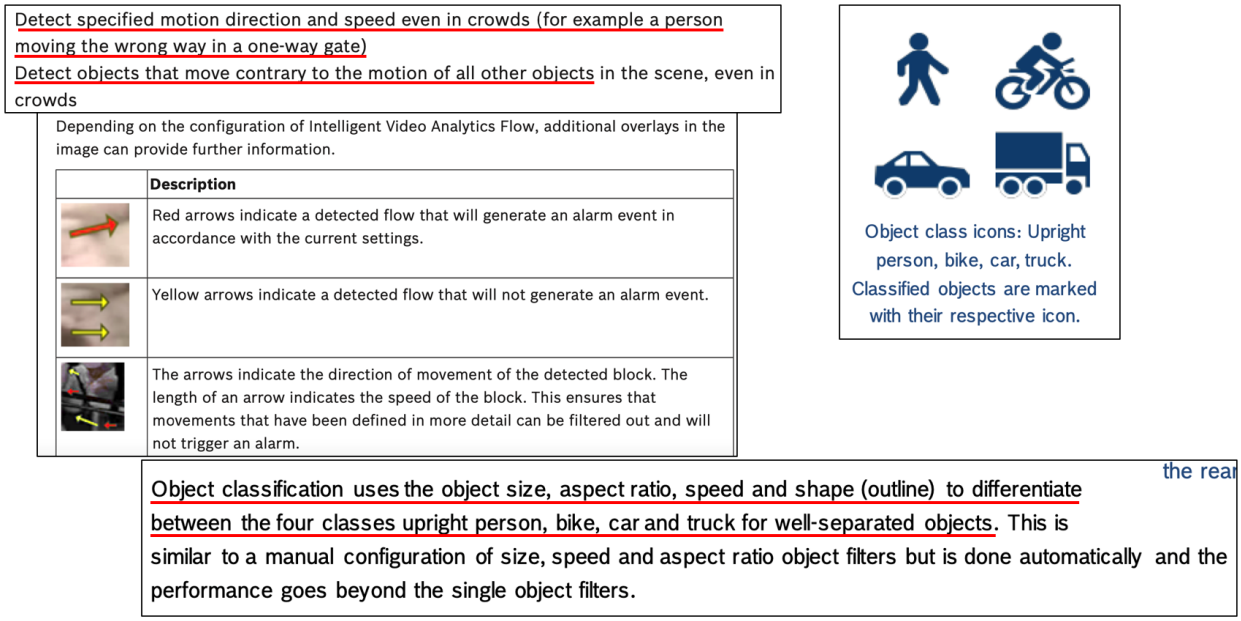


Source: https://www.youtube.com/watch?v=0FafvOfs0Vc

290. The Accused Infringing Devices detect persons, cars, etc. (i.e., "objects") using pattern matching in the first and second segmentation maps.

291. By way of example, the Accused Infringing Devices detect objects in the motion detection map ("first segmentation map") using flow matching (i.e., "pattern matching") wherein the Accused Infringing Devices detect specified motion direction and speed even in crowds (for example a person moving the wrong way in a one-way gate) and detecting objects that move contrary to the motion of all other objects. The Accused Infringing Devices detect objects in the object outline map ("second segmentation map"). The Accused Infringing Devices merge the detected objects to trigger an alarm. The merging of the detected objects is shown by at least the triggering of alarms for, by way of

example, objects moving in a particular direction, with a particular speed, contrary to the motion of other objects, and/or traversing a route. This demonstrates a merger of the objects detected in the first segmentation map, which have a motion associated with them, and the objects detected in the second segmentation map, which have a classification (type of object) associated with them. Similarly, the display of an object class icon alongside an object that is, when seen in the video images, moving, further indicates a merger of the objects detected in the respective maps.



Detect specified motion direction and speed even in crowds (for example a person moving the wrong way in a one-way gate)
Detect objects that move contrary to the motion of all other objects in the scene, even in crowds

Depending on the configuration of Intelligent Video Analytics Flow, additional overlays in the image can provide further information.

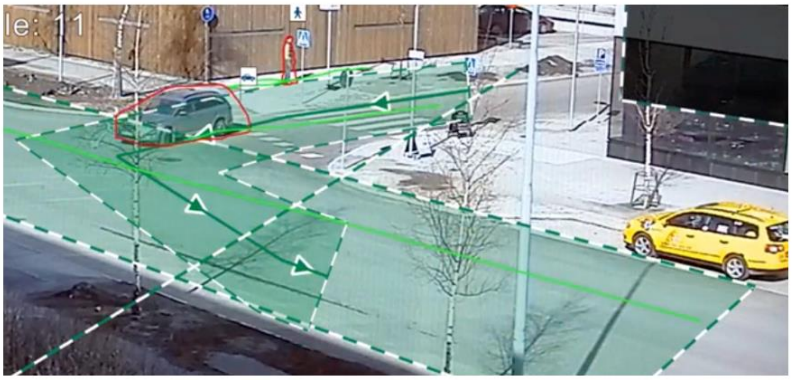
	Description
	Red arrows indicate a detected flow that will generate an alarm event in accordance with the current settings.
	Yellow arrows indicate a detected flow that will not generate an alarm event.
	The arrows indicate the direction of movement of the detected block. The length of an arrow indicates the speed of the block. This ensures that movements that have been defined in more detail can be filtered out and will not trigger an alarm.

Object class icons: Upright person, bike, car, truck. Classified objects are marked with their respective icon.

Object classification uses the object size, aspect ratio, speed and shape (outline) to differentiate between the four classes upright person, bike, car and truck for well-separated objects. This is similar to a manual configuration of size, speed and aspect ratio object filters but is done automatically and the performance goes beyond the single object filters.

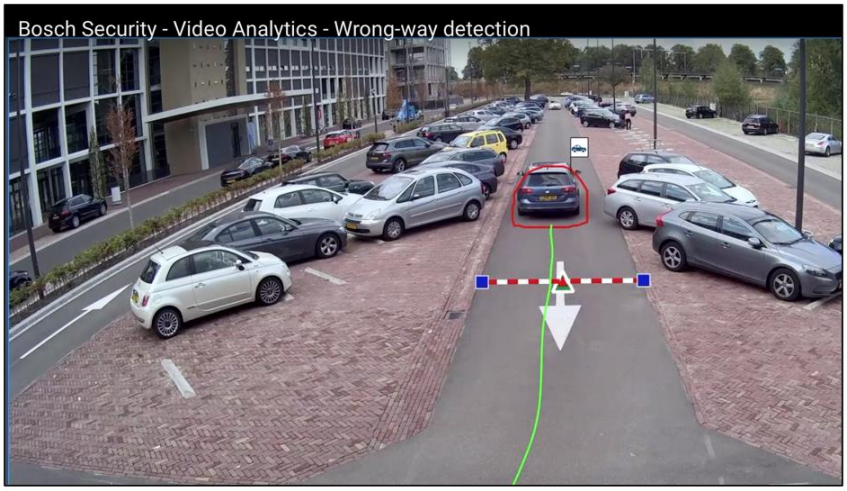
Source: http://resource.boschsecurity.com/documents/TN_VCA_object_classi_WhitePaper_enUS_23112661771.pdf and https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf; and VCA Software Manual (Exhibit F).

4. In the **Direction** list, select the direction an object must move to trigger an alarm.
Forward: Triggers an alarm if an object follows the arrows of the route displayed in the camera image..
Backward: Triggers an alarm if an object moves in the opposite direction of the arrows.
Any: Triggers an alarm independently of the direction.



Source: https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf; VCA Software Manual (Exhibit F); and https://www.youtube.com/watch?v=0FafvOfs0Vc

Filter by Object Class page
Limit the object classes that trigger an alarm.
- Select the desired check boxes (**Upright persons**, **Bikes**, **Cars**, **Trucks**).

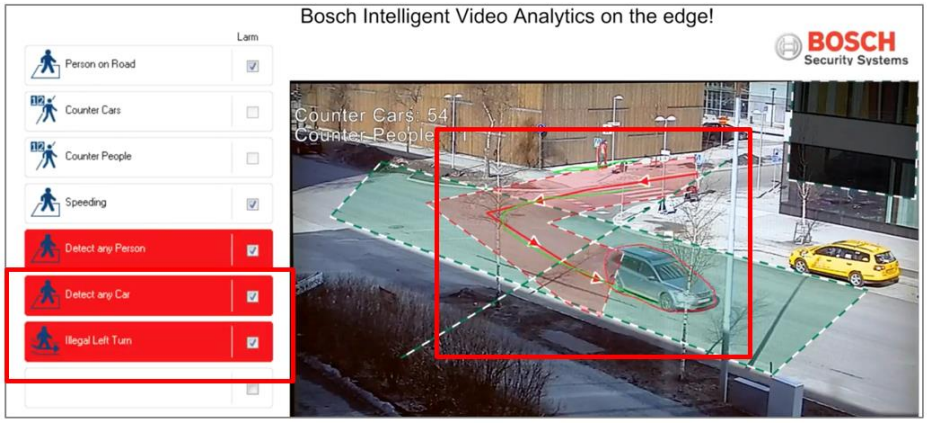


Source:
https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf; VCA Software Manual (Exhibit F); and
https://www.youtube.com/watch?v=nTOKFhM0Fik

Filter by Object Class page

Limit the object classes that trigger an alarm.

- Select the desired check boxes (**Upright persons**, **Bikes**, **Cars**, **Trucks**).



Source:
https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf; VCA Software Manual (Exhibit F); and
https://www.youtube.com/watch?v=0FafvOfs0Vc

4 Basics for Intelligent and Essential Video Analytics

This chapter describes basic information when using Intelligent Video Analytics and Essential Video Analytics.

4.1 Camera image

A camera image is that part of a area which is monitored by the camera.

4.2 Objects

Objects are typically people or vehicles moving within the area seen by the camera. Objects can be filtered according to certain properties (size, aspect ratio, direction of movement, speed, location, color). An alarm event can be generated if objects match certain parameters. Objects that do not match the criteria you define are filtered out and do not generate an alarm event.
In general the base point of an object is relevant for generating an alarm event. Some tasks allow you to make another selection.

Source: VCA Software Manual (Exhibit F).

Image information

Depending on the configuration of Intelligent Video Analytics and Essential Video Analytics, additional overlays in the image, for example object outlines, can provide more information. These object outlines are displayed in real time and are always synchronized exactly with the moving object. During life view, the metadata arrive one frame after the respective camera image, and thus the outlines do not always exactly surround the object.

	Indicates that an object is detected as person.	
	Indicates that an object is detected as car.	
	Indicates that an object is detected as truck.	
	Indicates that an object is detected as bike.	

Source: VCA Software Manual (Exhibit F) and https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf;

292. Bosch has thus infringed at least claim 3 of the ’461 Patent by making, using, testing, selling, offering for sale, importing and/or licensing the Accused

Infringing Devices, and operating such that all steps of at least claim 3 are performed.

293. The users, customers, agents and/or other third parties (collectively, "third-party infringers") infringe, including under 35 U.S.C. § 271(a), at least claim 3 of the '461 Patent by using the Accused Infringing Devices.

294. Bosch has, since at least no later than February 20, 2018, known or been willfully blind to the fact that the third-party infringers' use of the Accused Infringing Devices directly infringed the '461 Patent.

295. Bosch's knowledge of the '461 Patent, which covers operating the Accused Infringing Devices in their intended manner such that all limitations of at least claim 3 of the '461 Patent are met, made it known to Bosch that the third-party infringers' use of the Accused Infringing Devices would directly infringe the '461 Patent, or, at the very least, render Bosch willfully blind to such infringement.

296. Having known or been willfully blind to the fact that the third-party infringers' use of the Accused Infringing Devices in their intended manner such that all limitations of at least claim 3 of the '461 Patent are met would directly infringe the '461 Patent, Bosch, upon information and belief, actively encouraged the third-party infringers to directly infringe the '461 Patent by making, using,

testing, selling, offering for sale, importing and/or licensing said Accused Infringing Devices, and by, for example: marketing the Accused Infringing Devices to the third-party infringers; supporting and managing the third-party infringers' continued use of the Accused Infringing Devices; and providing technical assistance to the third-party infringers by, for example, publishing the following instructional information directing third-party infringers how to make and use the Accused Infringing Devices to infringe claim 3 of the '461 Patent:

- Focus Your Attention IVA Brochure (Exhibit H);
- https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf;
- VCD Format Manual (Exhibit E);
- https://www.youtube.com/watch?v=nTOKFhM0Fik
- https://www.youtube.com/watch?v=0FafvOfs0Vc
- http://resource.boschsecurity.com/documents/TN_VCA_object_classi_WhitePaper_enUS_23112661771.pdf

297. Bosch induced the third-party infringers to infringe at least claim 3 of the '461 Patent by directing or encouraging them to operate the Accused Infringing Devices which, alone or in combination with the third-party infringers' devices, satisfy all limitations of claim 3 of the '461 Patent. For example, Bosch

advertised and promoted the features of the Accused Infringing Devices and encouraged the third-party infringers to operate the Accused Infringing Devices in an infringing manner. Bosch further provided technical assistance as to how the Accused Infringing Devices should be used by the third-party infringers:

- Focus Your Attention IVA Brochure (Exhibit H);
- https://resource.boschsecurity.com/documents/VCA_Operation_Manual_enUS_23098106251.pdf;
- VCD Format Manual (Exhibit E);
- https://www.youtube.com/watch?v=nTOKFhM0Fik
- https://www.youtube.com/watch?v=0FafvOfs0Vc

298. http://resource.boschsecurity.com/documents/TN_VCA_object_classi_WhitePaper_enUS_23112661771.pdf

299. In response, the third-party infringers acquired and operated the Accused Infringing Devices such that all limitations of claim 3 of the ’461 Patent are practiced.

300. Based on, among other things, the foregoing facts, Bosch has induced, and continues to induce, infringement under 35 U.S.C. § 271(b) of at least claim 3 of the ’461 Patent.

301. Bosch sold, provided and/or licensed to the third-party infringers Accused Infringing Devices that are especially made and adapted—and specifically intended by Bosch—to be used as components and material parts of the inventions covered by the ’461 Patent. For example, Bosch IP security cameras with IVA software which the third-party infringers use in a manner such that all limitations of at least claim 3 of the ’461 Patent are met, and without which the third-party infringers would be unable to use and avail themselves of the Accused Infringing Devices in their intended manner.

302. Upon information and belief, Bosch also knew that the Accused Infringing Devices operate in a manner that satisfies all limitations of at least claim 3 of the ’461 Patent.

303. The IVA object detection technology in the Accused Infringing Devices is specially made and adapted to infringe at least claim 3 of the ’461 Patent. Upon information and belief, the IVA objects detection technology in the Accused Infringing Devices is not a staple article or commodity of commerce, and, because the functionality is designed to work with the Accused Infringing Devices solely in a manner that is covered by the ’461 Patent, it does not have a substantial non-infringing use. At least by no later than February 20, 2018, based on the foregoing facts, Bosch has known or been willfully blind to the fact that

such functionality is especially made and adapted for—and is in fact used in—the Accused Infringing Devices in a manner that is covered by the '461 Patent.

304. Based on, among other things, the foregoing facts, Bosch has and continues to contributorily infringe at least claim 3 of the '461 Patent under 35 U.S.C. § 271(c).

305. Bosch's acts of infringement of the '461 Patent have been willful and intentional under the standard of *Halo Elecs., Inc. v. Pulse Elecs., Inc.*, 136 S. Ct. 1923 (2016). Since at least February 20, 2018, Bosch has willfully infringed the '461 Patent by refusing to take a license and continuing the foregoing infringement. Instead of taking a license to the '461 patent, Bosch made the business decision to "efficiently infringe" the '461 Patent. In doing so, Bosch willfully infringes the '461 Patent.

306. Bosch's acts of direct and indirect infringement have caused damage to MPV and MPV is entitled to recover from Defendants the damages sustained by Plaintiff as a result of Defendants' infringing acts in an amount subject to proof at trial, which, by law, cannot be less than a reasonable royalty, together with interest and costs as fixed by this Court, pursuant to 35 U.S.C. § 284.

JURY DEMAND

307. Plaintiff hereby demands a trial by jury of all issues so triable pursuant to Fed. R. Civ. P. 38.

PRAYER FOR RELIEF

Plaintiff respectfully requests that the Court find in its favor and against Defendants, and that the Court grant Plaintiff the following relief:

A. Enter judgment that Defendants have infringed the Asserted Patents, either literally and/or under the doctrine of equivalents;

B. Enter judgment that Defendants have induced infringement of the Asserted Patents;

C. Enter judgment that Defendants have contributed to the infringement of the Asserted Patents;

D. Enter judgment that one or more claims of the ’317 Patent have been willfully infringed, either literally and/or under the doctrine of equivalents, by Defendants;

E. Enter judgment that one or more claims of the ’506 Patent have been willfully infringed, either literally and/or under the doctrine of equivalents, by Defendants;

F. Enter judgment that one or more claims of the ’507 Patent have been willfully infringed, either literally and/or under the doctrine of equivalents, by Defendants;

G. Enter judgment that one or more claims of the ’461 Patent have been willfully infringed, either literally and/or under the doctrine of equivalents, by Defendants;

H. Enter judgment awarding MPV damages adequate to compensate it for Defendants’ past infringement of the ’317 Patent and the ’506 Patent and for past infringement and any continuing or future infringement of the ’507 Patent and the ’461 Patent, including pre-judgment and post-judgment interest costs and disbursements as justified under 35 U.S.C. § 284 and an accounting;

I. That this Court declare this to be an exceptional case and award Plaintiff its reasonable attorneys’ fees and expenses in accordance with 35 U.S.C. § 285; and

J. Any further relief that this Court deems just and proper.

Dated: July 10, 2020

STAMOULIS & WEINBLATT LLC

/s/ Stamatios Stamoulis

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