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(54) Title: A SYSTEM AND METHOD TO DETECT INTRUSION EVENT

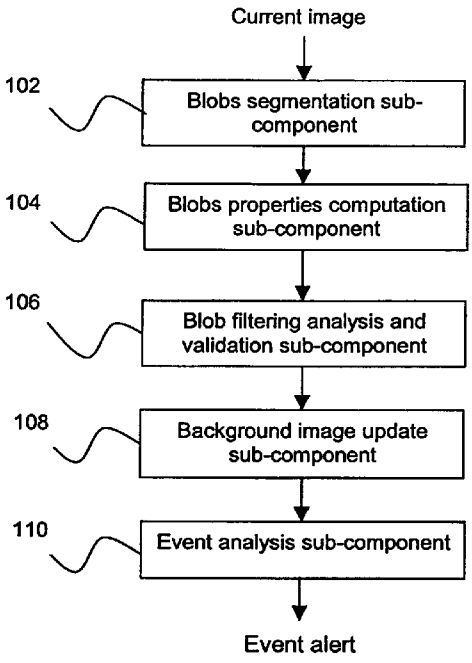

FIG. 1

(57) Abstract: The present invention provides a system and method for detecting intrusion event in region of interest. The system comprises at least one blob segmentation sub-component which processes current image and extracts motion pixels by subtracting current image from reference or background image; at least one blob properties computation sub¬ component which classifies motion pixels by applying morphology closing and filing holes to current motion map and labelling each of adjacent motion pixels; at least one blob filtering analysis and validation sub-component which validates intruder blobs using rule sets; at least one background model update sub-component which updates background image using combination of rules based on similarity value of detected blob and its surrounding; and at least one intrusion event analysis sub-component which triggers alert when event is detected and verified.

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A SYSTEM AND METHOD TO DETECT INTRUSION EVENT

FIELD OF INVENTION

The present invention relates to a system and method for detection of intrusion event within one or more predefined regions of interest (ROIs) while minimizing false alarm due to noise and reduction of misdetection.

BACKGROUND ART

Conventionally, video surveillance utilizes human operators to monitor multiple screens and to identify occurrence of any abnormal event in monitored area. Existing intrusion detection methods are based on motion detection technology, whereby existence of object within the scene is detected by frame differencing current image frame with reference image which is generated from series of history images.

Accuracy of existing intrusion detection methods has a high occurrence of false detection is present due to noise. There is also a low detection rate due to filtering of object of interest by noise removal and false detection due to ghost effect. Specifically, this area of intrusion detection refers to 'blob detection' where blobs are visual modules. The detection method is aimed at detecting points and/or regions in the image that are either brighter or darker than the surrounding area or ROI.

The present invention provides a system and method to detect intrusion event within one or more predefined regions-of-interest by validating noise removal analysis prior to actual removal, updating background image by considering object significance level, and including temporal analysis during event analysis based on a predefined sensitivity level for each region-of-interest in the scene.

The subject matter claimed herein is not limited to embodiments that solve any disadvantages or that operate only in environments such as those described above. Rather, this background is only provided to illustrate one exemplary technology area where some embodiments described herein may be practice.

SUMMARY OF INVENTION

The present invention provides a system (100) for detecting intrusion event in region of interest. The system comprising at least one blob segmentation sub-component (102), at least one blob properties computation sub-component (104), at least one blob filtering analysis and validation sub-component (106), at least one background model update sub-component (108) and at least one intrusion event analysis sub-component (110). The said blob segmentation sub-component (102) processes current image and extracts motion pixels by subtracting current image from reference or background image. The said blob properties computation sub-component (104) classifies motion pixels by applying morphology closing and filling holes to current motion map and labeling each of adjacent motion pixels. The said blob filtering analysis and validation sub-component (106) validates intruder blobs using combination of rules based on blob geometric properties, temporal properties and blob significancy based on similarity properties of blob with surrounding pixels. The said background model update sub-component (108) updates background image using combination of rules based on similarity value of detected blob and its surrounding by updating pixel in background image using predefined increment or decrement values if current pixel is background pixel and updating background pixel with current pixel intensity if current pixel belongs to motion blob and blob is non-significant while the said intrusion event analysis sub-component (110) triggers alert when event is detected and verified.

Further, the said blob properties computation sub-component (104) determines intruder blobs by determining similarity between blob and surrounding pixels in current image by calculating intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for current image, determining similarity between blob and surrounding pixels in background image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for background image and determining motion blob as non-siginificant if histogram intersection value of background image is larger than histogram intersection value of current image for more than predefined threshold value.

Preferably, the said blob filtering analysis and validation sub-component (106) calculates blob properties validates intruder blobs using rule set which combines information of calculated properties by considering blob as noise if blob status is new and blob is non-

significant, examining blob geometric properties against acceptable range of values if blob status is not new, considering blob as noise if blob property is out of predefined range and blob status is not split and blob lifespan is more than predefined threshold value else considering blob as intruder blob.

Another aspect of the present invention provides a method (700) for detecting intrusion event in region of interest. The method comprising the steps of processing current image and extracting motion pixels (702), classifying motion pixels (704), determining intruder blobs using combination of rules based on blob geometric properties, temporal properties and similarity properties of blob with surrounding pixels (706), updating background image using combination of rules based on similarity value of detected blob and its surrounding (708) and triggering alert when event is detected and verified (710).

Preferably, a method for determining intruder blobs, further comprises calculating blob properties (802) and validating intruder blobs using rule set which combines information of calculated properties (804).

Further, a method for updating background image using combination of rules based on similarity value of detected blob and its surrounding, further comprises updating pixel in background image using predefined increment or decrement values if current pixel is background pixel (902) and updating background pixel with current pixel intensity if current pixel belongs to motion blob and blob is non-significant (904). A method for calculating blob properties further comprises calculating blob geometrical properties (1002), calculating blob temporal properties (1004) and calculating blob significancy based on similarity properties with surrounding pixels (1006). A method for determining intruder blobs further comprises determining similarity between blob and surrounding pixels in current image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for current image (1102), determining similarity between blob and surrounding pixels in background image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for background image (1104) and determining motion blob as non-significant if histogram intersection value of background image is larger than histogram intersection value of current image for more than predefined threshold value (1106).

Preferably, a method for validating intruder blobs using rule set which combines information of calculated properties further comprises considering blob as noise if blob status is new and blob is non-significant (1202), examining blob geometric properties against acceptable range of values if blob status is not new (1204), considering blob as noise if blob property is out of predefined range and blob status is not split and blob lifespan is more than predefined threshold value (1206), else considering blob as intruder blob (1208).

The present invention consists of features and a combination of parts hereinafter fully described and illustrated in the accompanying drawings, it being understood that various changes in the details may be made without departing from the scope of the invention or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS

To further clarify various aspects of some embodiments of the present invention, a more particular description of the invention will be rendered by references to specific embodiments thereof, which are illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail through the accompanying drawings in which:

Fig. 1 illustrates architecture of intrusion detection system of the present invention.

Fig. 2 illustrates blob segmentation sub-component.

Fig. 3 is a flowchart illustrating blob filtering analysis and validation sub-component.

Fig. 4 is a flowchart illustrating blob properties analysis.

Fig. 5 is a flowchart illustrating motion and non-motion histogram intersection computation.

Fig. 6 illustrates background updating rule.

Fig. 7 is a flowchart illustrating a method for detecting intrusion event in region of interest.

Fig. 8 is a flowchart illustrating a method for determining intruder blobs.

Fig. 9 is a flowchart illustrating a method for updating background image using combination of rules based on similarity value of detected blob and its surrounding.

Fig. 10 is a flowchart illustrating a method for calculating blob properties.

Fig. 11 is a flowchart illustrating a method for further determining intruder blob.

Fig. 12 is a flowchart illustrating a method for validating intruder blobs using rule set which combines information of calculated properties.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention provides a system and method for detection of intrusion event within one or more predefined regions of interest (ROIs) while minimizing false alarm due to noise and reduction of misdetection. Hereinafter, this specification will describe the present invention according to the preferred embodiments. It is to be understood that limiting the description to the preferred embodiments of the invention is merely to facilitate discussion of the present invention and it is envisioned without departing from the scope of the appended claims.

Reference is first being made to Fig 1. Fig. 1 illustrates general architecture of the present invention for intrusion event detection. The illustrated intrusion detection system (100) comprises at least one blob segmentation sub-component (102), at least one blob properties computation sub-component (104), at least one blob filtering analysis and validation sub-component (106), at least one background model update sub-component (108) and at least one intrusion event analysis sub-component (110). The said system comprises of inputs wherein the inputs includes at least one sensor device, at least one region of interest (ROI) map and at least one sensitivity level detection. Sensitivity level determines responsiveness of the system of the present invention by detecting intrusion event as well as to provide for consistency of the system in maintaining event alert.

Reference is now being made to Fig 2. As illustrated in Fig. 2, blob segmentation sub-component (102) processes current image and extracts motion pixels by subtracting current image from reference or background image. The difference of the image is thresholded to produce current motion map. Motion map is a binary map where pixels with zero values indicate background pixels whereas non-zero pixels are motion or foreground pixels.

Blob properties computation sub-component (104) classifies motion pixels by applying morphology closing and filling holes to current motion map. Resultant map is labeled using pixel connect algorithm whereby each group of connected motion pixels will be labeled with the same label to indicate pixels which belongs to the same group. A connected motion pixel is called motion blob.

The said blob properties computation sub-component (104) further determines blobs significancy by determining similarity between blob and surrounding pixels in current image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for current image, determining similarity between blob and surrounding pixels in background image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for background image and determining motion blob as non-significant if histogram intersection value of background image is larger than histogram intersection value of current image for more than predefined threshold value.

For each motion blob, its geometric properties such as blob area, orientation, compactness, projection, skewness etc. will be determined.

Reference is now being made to Fig. 3. Fig. 3 is a flowchart illustrating blob filtering analysis and validation sub-component (106). Blob filtering analysis and validation sub-component (106) validates intruder blobs using rule set which combines information of calculated properties based on blob geometrical properties, temporal properties and blob significancy based on similarity properties of blob with surrounding pixels. Blob filtering analysis and validation sub-component (106) validates intruder blobs using rule set which combines information of calculated properties by considering blob as noise if blob status is new and blob is non-significant, examining blob geometric properties against acceptable range of values if blob status is not new, considering blob as noise if blob property is out of predefined range and blob status is not split and blob lifespan is more than predefined threshold value else considering blob as intruder blob.

As illustrated in Fig. 3, process flow of blob filtering analysis and validation sub-component (106) comprises of current blobs properties analysis, blobs temporal analysis, blobs neighboring pixels analysis and validation of blobs. In current blobs properties analysis, probability that motion blob belongs to noise based on its properties is computed. User can select to invoke any of the filters, for example size filter, compact filter, or orientation filter, then the properties for each blob will be compared against each filters predetermined minimum and maximum acceptable range of values. Blob will be flagged as 'to be-removed' if any blob properties does not fall within the acceptable range. Prior to this step, all small motion blobs will be removed first. This entire step is

illustrated in Fig. 4.

In blobs temporal analysis, blob temporal properties are updated based on current-previous blob overlapping analysis. Each detected blob in current image frame will be compared against all of previous motion blobs and percentage of overlapping between current and previous blob will be calculated. If overlapping percentage is above a certain threshold value, the corresponding blobs are considered as related and vice versa. From the overlapping analysis, temporal properties of each detected blob in current image frame will be updated. These properties include blob lifespan, blob's average and standard deviation area, centroid etc.

In blobs neighboring pixels analysis, all motion and non-motion pixels are enclosed within blob bounding box which will be analyzed using histogram intersection in order to determine if motion blob is an actual object or a 'ghost' of object. Thereafter, blobs are validated to be removed and object map is updated.

Reference is now made to Fig 5. Fig. 5 is a flowchart illustrating motion and non-motion histogram intersection computation of background model update sub-component (108). Color histogram of background pixels and foreground pixels will be computed as illustrated in FIG. 5. In this sub-component, background or reference image will be updated. Updating image is crucial as gradual background changes in the scene will be gradually updated as part of background. To eliminate updating static object-of-interest as background and mistakenly detect 'ghost' of the object-of-interest as a valid object, background updating step will be taken into consideration as the current object significance level which have been computed in previous sub-component. The said background model update sub-component updates background image using combination of rules based on similarity value of detected blob and its surrounding by updating pixel in background image using predefined increment or decrement values if current pixel is background pixel and updating background pixel with current pixel intensity if current pixel belongs to motion blob and blob is non-significant.

Rules to update the said background is illustrated in Fig. 6. For each image pixels, if pixel is background, then update pixel. If pixel is foreground and non-significant then update pixel. Otherwise, pixels will not be updated.

After all steps above completed, the final object map will contain only possible human blobs. Then these blobs will be analyzed by event analysis sub-component. The said intrusion event analysis sub-component triggers alert when event is detected and verified. First each of these blobs reference points will be examined whether they fall within the predefined ROI or not. Only blobs which reference points fall within ROI will be considered.

Reference is now being made to Fig. 7. Fig. 7 is a flowchart illustrating a method for detecting intrusion event in region of interest. As illustrated in Fig. 7, a method (700) for detecting intrusion event in region of interest, comprising the steps of processing current image and extracting motion pixels (702), classifying motion pixels (704) by applying morphology closing and filing holes to current motion map and labeling each of adjacent motion pixels, determining intruder blobs using combination of rules based on blob geometric properties, temporal properties and similarity properties of blob with surrounding pixels (706), updating background image using combination of rules based on similarity value of detected blob and its surrounding (708) and triggering alert when event is detected and verified (710).

Reference is now being made to Figs. 8, 9, and 10 respectively. Fig. 8 is a flowchart illustrating a method for determining intruder blobs while Fig. 9 is a flowchart illustrating a method for updating background image using combination of rules based on similarity value of detected blob and its surrounding and Fig. 10 is a flowchart illustrating a method for calculating blob properties. As illustrated in Fig. 8, blob properties is first calculated to determine intruder blobs (802) and thereafter intruder blobs is validated using rule set which combines information of calculated properties (804). As illustrated in Fig. 10, the method for computing blob properties further comprises calculating blob geometrical properties (1002), calculating blob temporal properties (1004) and calculating blob significancy based on similarity properties with surrounding pixels (1006). Blob geometrical properties include area, orientation and compactness while blob temporal properties include blob lifespan and blob status. As illustrated in Fig. 9, background image is updated by updating pixel in background image using predefined increment or decrement values if current pixel is background pixel (902) and background image is

updated with current pixel intensity if current pixel belongs to motion blob and blob is non-significant (904).

Reference is now being made to Fig. 11. Fig. 11 provides further steps for determining intruder blobs by determining similarity between blob and surrounding pixels in current image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for current image (1102). Thereafter, similarity between blob and surrounding pixels in background image is determined by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for background image (1104). Subsequently, motion blob is determined as non-significant if histogram intersection value of background image is larger than histogram intersection value of current image for more than predefined threshold value (1106).

Reference is now being made to Fig. 12. Fig. 12 a flowchart illustrating a method for validating intruder blobs using rule set which combines information of calculated properties. As illustrated in Fig. 12, intruder blobs are validated using rule set which combines information of calculated properties. Blob is considered as noise if blob status is new (1202) and blob is non-significant while blob geometric properties are examined against acceptable range of values if blob status is not new (1204). Thereafter, blob is considered as noise if blob property is out of predefined range and blob status is not split and blob lifespan is more than predefined threshold value (1206); else blob is considered as intruder blob (1208).

Alert is triggered when event is detected and verified wherein only blobs which reference points fall within ROI will be considered. The said intrusion event analysis sub-component (110) triggers alert when event is detected and verified.

The approach of the present invention provides a system and method to detect intrusion event within one or more predefined regions-of-interest by validating noise removal analysis prior to actual removal, updating background image by considering object significance level, and including temporal analysis during event analysis based on a predefined sensitivity level for each region-of-interest in the scene.

The present invention may be embodied in other specific forms without departing from its essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore indicated by the appended claims rather than by the foregoing description. All changes, which come within the meaning and range of equivalency of the claims, are to be embraced within their scope.

CLAIMS

1. A system (100) for detecting intrusion event in region of interest, comprising:
   at least one blob segmentation sub-component (102);
   at least one blob properties computation sub-component (104);
   at least one blob filtering analysis and validation sub-component (106);
   at least one background model update sub-component (108); and
   at least one intrusion event analysis sub-component (110).

2. A system (100) according to Claim 1, comprises of inputs to the system, the said inputs includes at least one sensor device; at least one region of interest (ROI) map; and at least one sensitivity level detection.

3. A system (100) according to Claim 1, wherein the said blob segmentation sub-component (102) processes current image and extracts motion pixels by subtracting current image from reference or background image.

4. A system (100) according to Claim 1, wherein the said blob properties computation sub-component (104) classifies motion pixels by applying morphology closing and filing holes to current motion map and labeling each of adjacent motion pixels.

5. A system (100) according to Claim 1, wherein the said blob filtering analysis and validation sub-component (106) validates intruder blobs using combination of rules based on blob geometric properties, temporal properties and blob significancy based on similarity properties of blob with surrounding pixels.

6. A system (100) according to Claim 1, wherein the said background model update sub-component (108) updates background image using combination of rules based on similarity value of detected blob and its surrounding by updating pixel in background image using predefined increment or decrement values if current pixel is background pixel and updating background pixel with current pixel intensity if current pixel belongs to motion blob and blob is non-

significant.

7. A system (100) according to Claim 1, wherein the said intrusion event analysis sub-component (110) triggers alert when event is detected and verified.

8. A system (100) according to Claim 1 and Claim 4 wherein the said blob properties computation sub-component (104) calculates blobs significancy by:

determining similarity between blob and surrounding pixels in current image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for current image; and

determining similarity between blob and surrounding pixels in background image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for background image;

determining motion blob as non-significant if histogram intersection value of background image is larger than histogram intersection value of current image for more than predefined threshold value.

9. A system (100) according to Claim 1 and Claim 4, wherein the said blob filtering analysis and validation sub-component (106) validates intruder blobs using rule set which combines information of calculated properties by:

considering blob as noise if blob status is new and blob is non-significant;

examining blob geometric properties against acceptable range of values if blob status is not new;

considering blob as noise if blob property is out of predefined range and blob status is not split and blob lifespan is more than predefined threshold value; else

considering blob as intruder blob.

10. A method (700) for detecting intrusion event in region of interest, comprising the steps of:

processing current image and extracting motion pixels (702);

classifying motion pixels (704);

determining intruder blobs using combination of rules based on blob geometric properties, temporal properties and similarity properties of blob with surrounding pixels (706);

updating background image using combination of rules based on similarity value of detected blob and its surrounding (708); and

triggering alert when event is detected and verified (710).

11. A method according to Claim 10, wherein classifying motion pixels further comprises applying morphology closing and filing holes to current motion map and labeling each of adjacent motion pixels.

12. A method according to Claim 10, wherein determining intruder blobs further comprises:

calculating blob properties (802); and

validating intruder blobs using rule set which combines information of calculated properties (804).

13. A method according to Claim 10, wherein updating background image using combination of rules based on similarity value of detected blob and its surrounding, further comprising:

updating pixel in background image using predefined increment or decrement values if current pixel is background pixel (902); and

updating background pixel with current pixel intensity if current pixel belongs to motion blob and blob is non-significant (904).

14. A method according to Claim 12, wherein calculating blob properties further comprises:

calculating blob geometrical properties (1002);

calculating blob temporal properties (1004); and

calculating blob significancy based on similarity properties with surrounding pixels (1006).

15. A method according to Claim 10, wherein determining intruder blobs, further comprises:

determining similarity between blob and surrounding pixels in current image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for current image (1102);

determining similarity between blob and surrounding pixels in background image by calculating histogram intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for background image (1104);

determining motion blob as non-significant if histogram intersection value of background image is larger than histogram intersection value of current image for more than predefined threshold value (1106).

16. A method according to Claim 12, wherein validating intruder blobs using rule set which combines information of calculated properties further comprising:

considering blob as noise if blob status is new and blob is non-significant (1202);

examining blob geometric properties against acceptable range of values if blob status is not new (1204);

considering blob as noise if blob property is out of predefined range and blob status is not split and blob lifespan is more than predefined threshold value (1206); else

considering blob as intruder blob (1208).

17. A method according to Claim 14, wherein blob geometrical properties includes area, orientation and compactness.

18. A method according to Claim 14, wherein blob temporal properties includes blob lifespan and blob status.

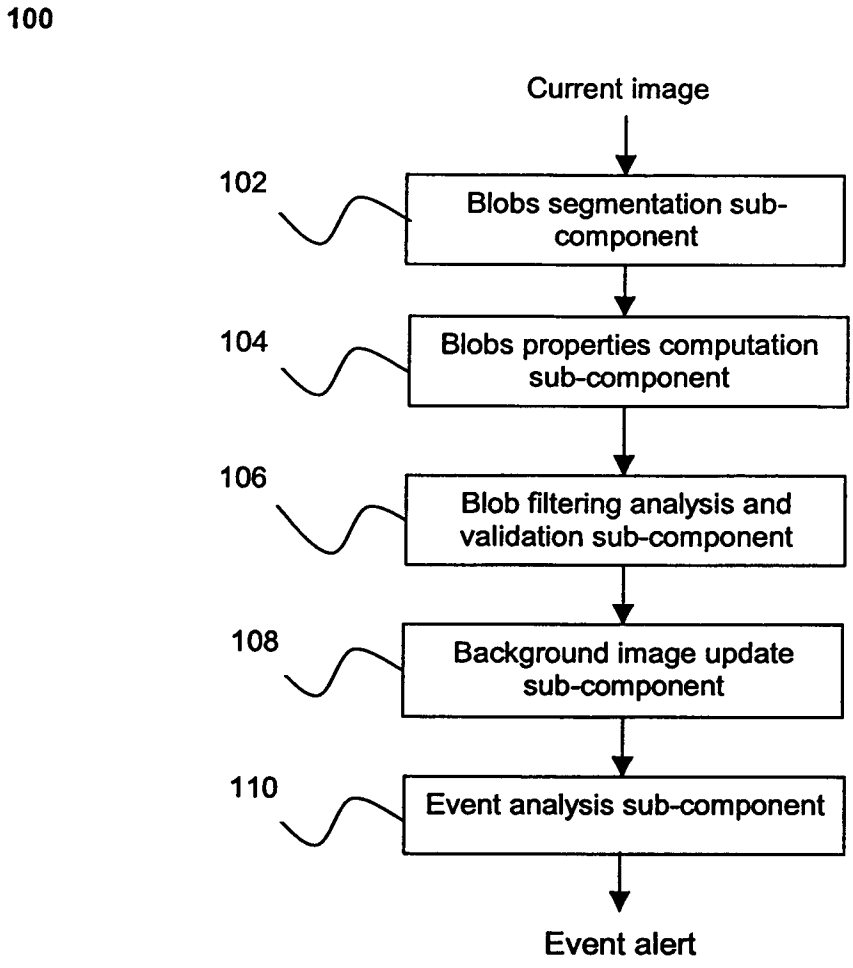
100
Current image
102
Blobs segmentation sub-component
104
Blobs properties computation sub-component
106
Blob filtering analysis and validation sub-component
108
Background image update sub-component
110
Event analysis sub-component
Event alert

FIG. 1

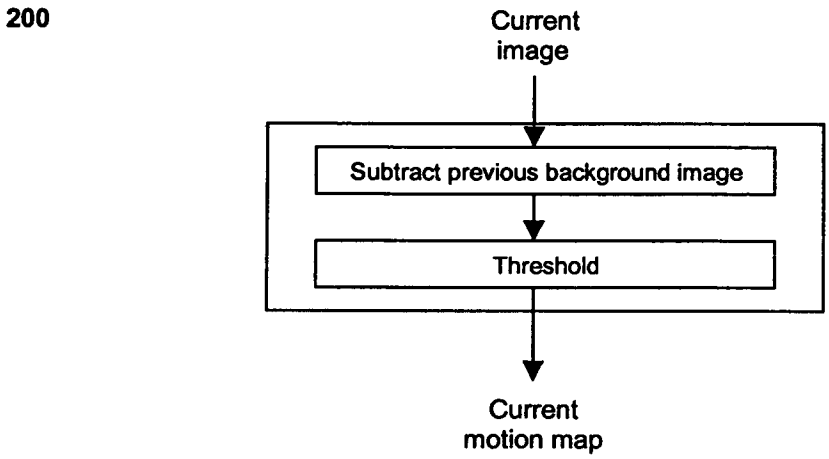
200
Current image
Subtract previous background image
Threshold
Current motion map

FIG. 2

300

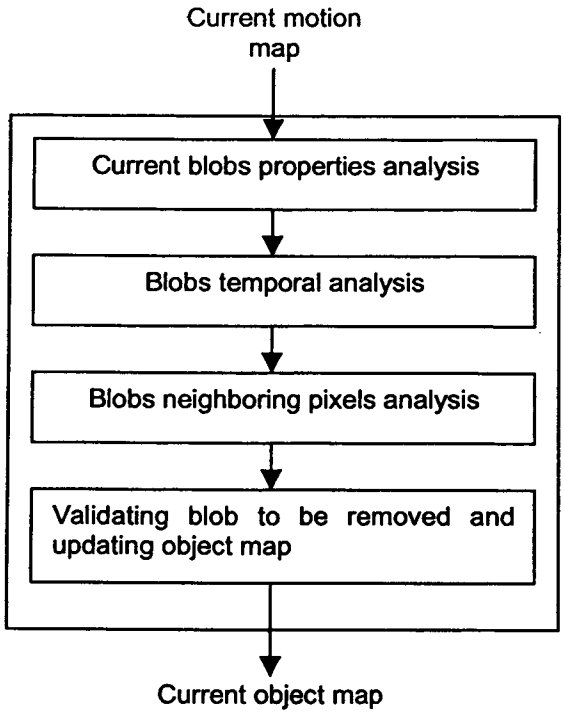

FIG. 3

400

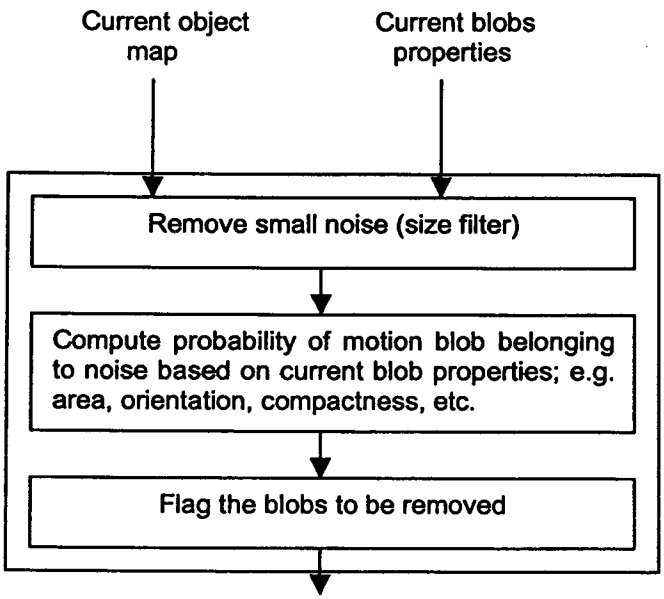

FIG. 4

500

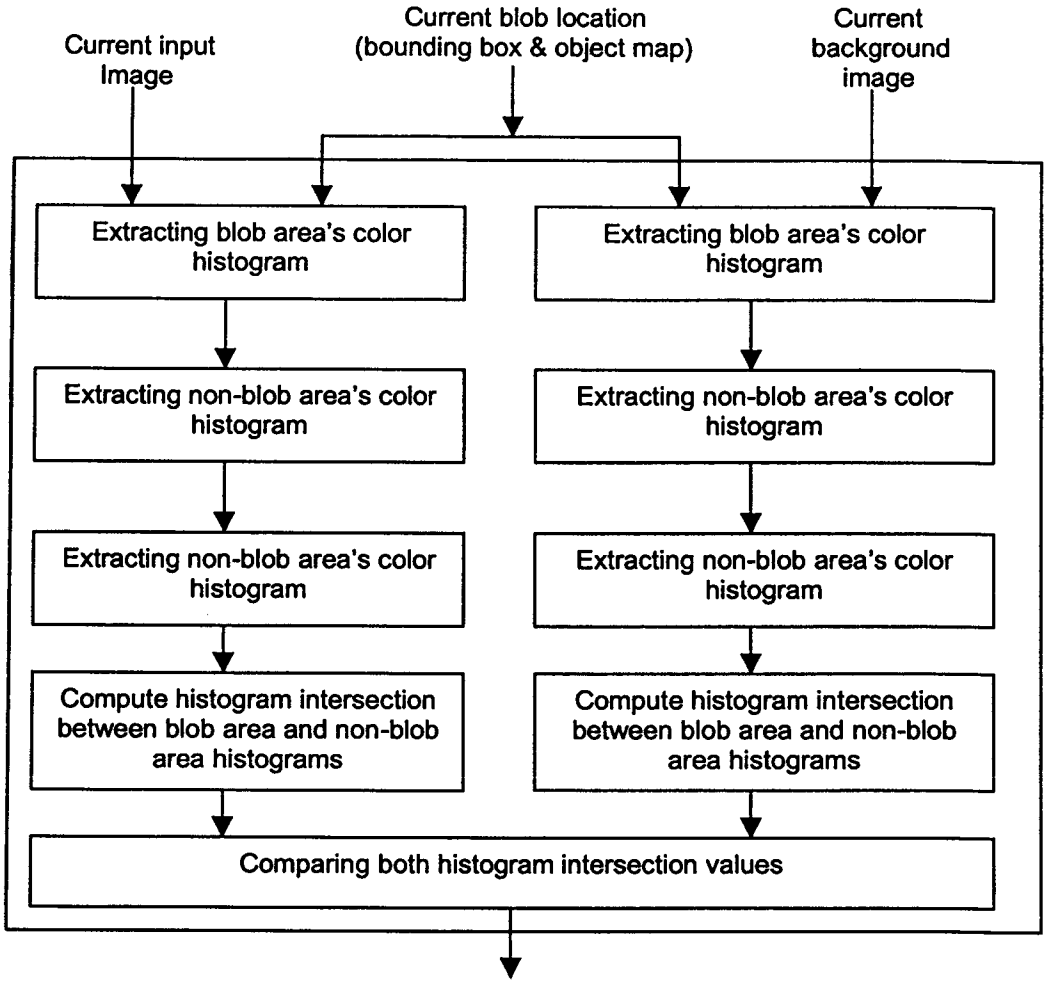

FIG. 5

600

```
For each image pixels,
  If pixel is background
        Update the pixel
  Else if pixel is foreground  && significance==0
        Update the pixel
  End if
End for
```

FIG. 6

700

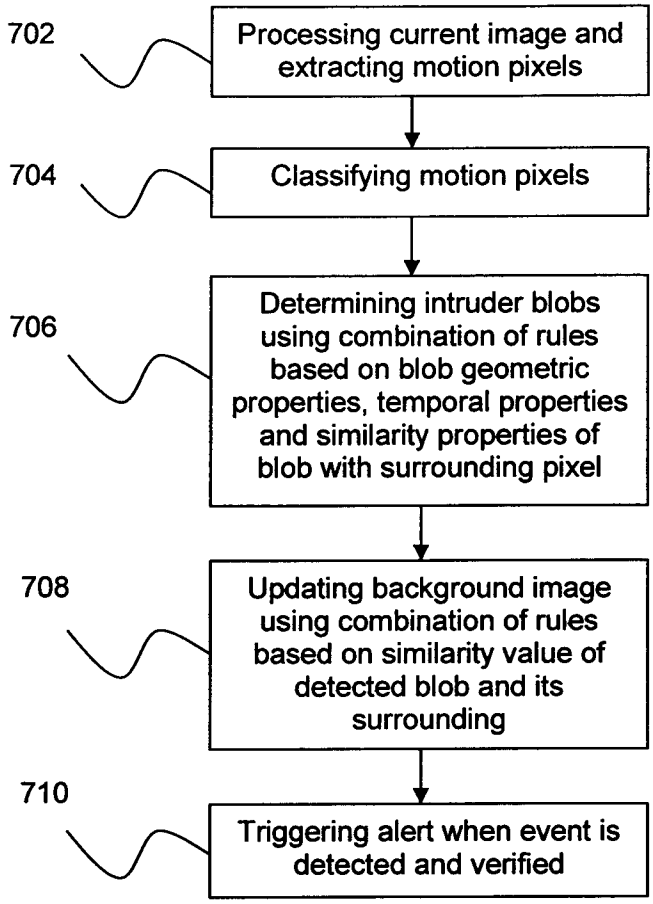

FIG. 7

800

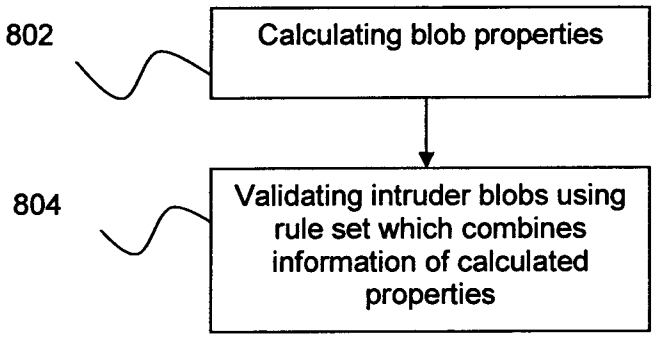

FIG. 8

900

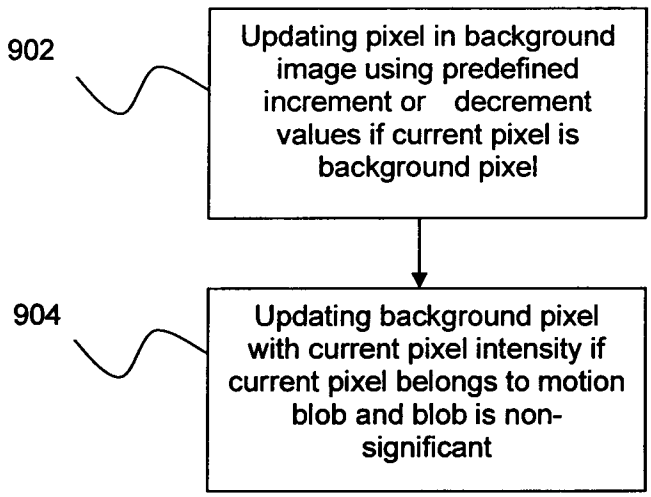

FIG. 9

1000

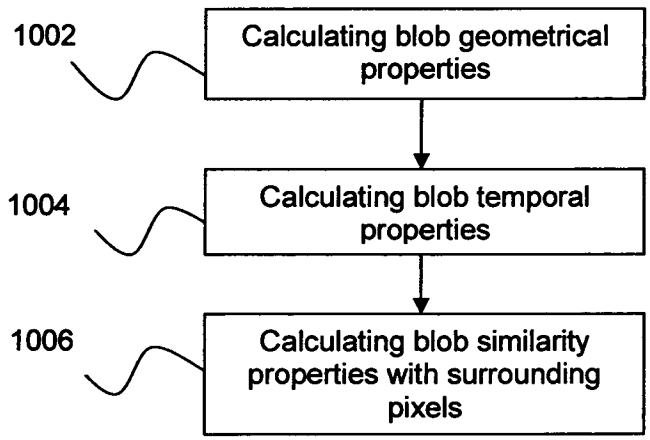

FIG. 10

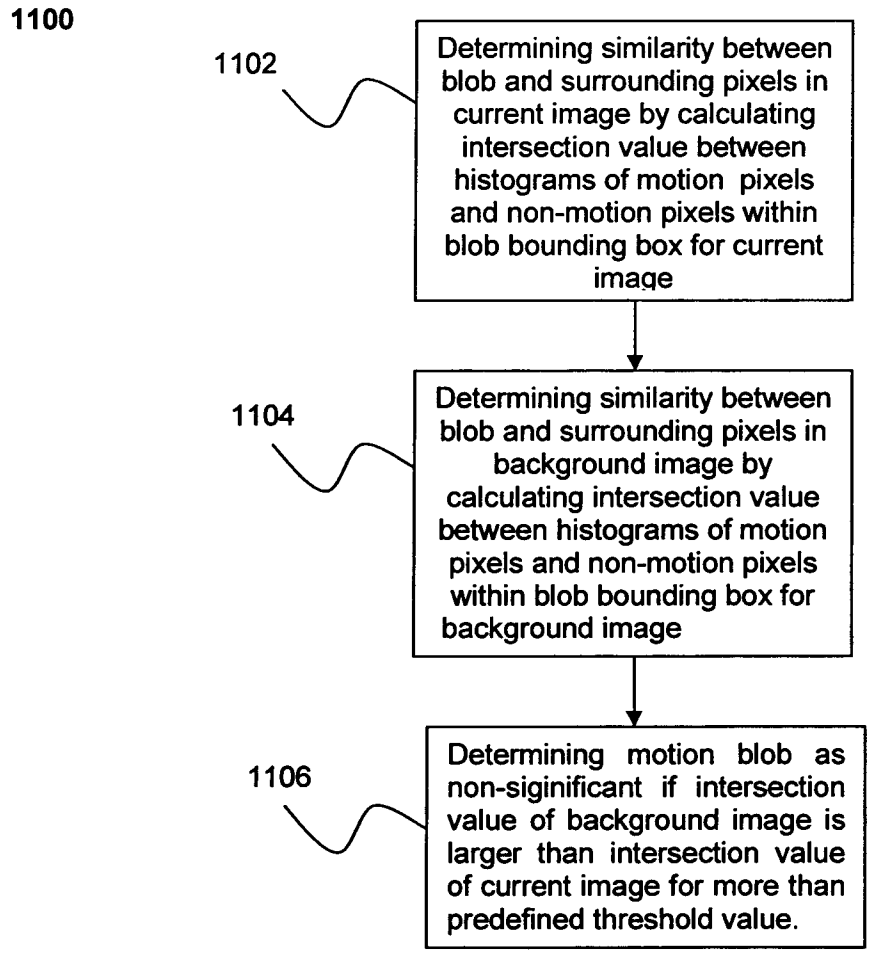
1100
1102
Determining similarity between blob and surrounding pixels in current image by calculating intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for current image
1104
Determining similarity between blob and surrounding pixels in background image by calculating intersection value between histograms of motion pixels and non-motion pixels within blob bounding box for background image
1106
Determining motion blob as non-siginificant if intersection value of background image is larger than intersection value of current image for more than predefined threshold value.

FIG. 11

1200

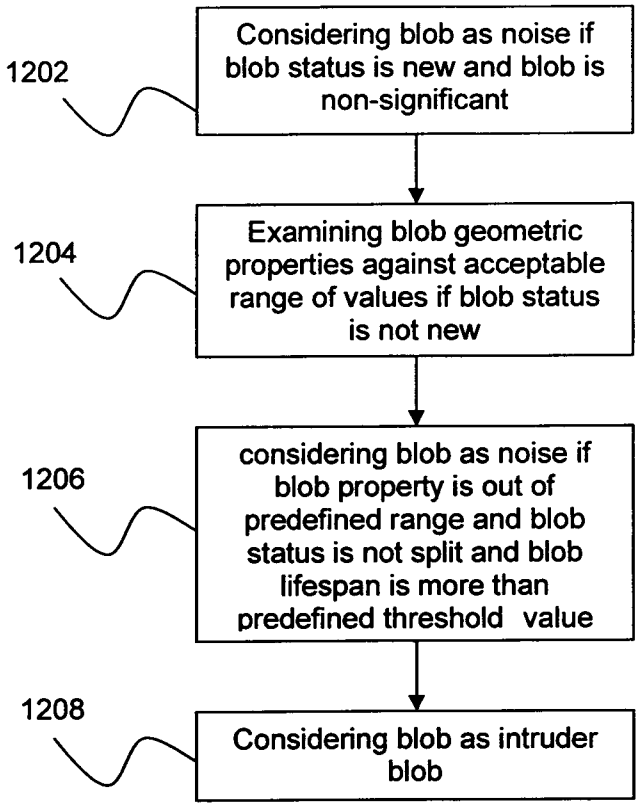
1202
Considering blob as noise if blob status is new and blob is non-significant
1204
Examining blob geometric properties against acceptable range of values if blob status is not new
1206
considering blob as noise if blob property is out of predefined range and blob status is not split and blob lifespan is more than predefined threshold value
1208
Considering blob as intruder blob

FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2011/000164

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

G06K 9/46 (2006.01) ***G06T 7/20*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI, EPODOC, Google Patent, Patent Lens, Espacenet, Google with keywords (blob, motion pixel, object tracking, intrusion detection, region of interest, segmentation, background model) and the like terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2010/124062 A1 (CERNIUM CORPORATION) 28 October 2010 abstract, pars. [1005-1008, 1013, 1016, 1038, 1042-1043, 1056, 1058-1061, 1071-1072]	1-3, 5-7, 9-10, 12-14, 16-18
X	US 2008/0166045 A1 (XU et al.) 10 July 2008 abstract, pars. [0004-0005, 0019, 0039, 0041, 0048-0050, 0074-0075, 0083-0086, 0098], fig. 1, table 1	1-3, 5-8, 10, 12-15, 17-18
X	US 2008/0219573 A1 (LU) 11 September 2008 abstract, pars. [0025, 0027-0030, 0036-0040, 0053, 0055], fig. 1	1-5, 7-8, 10-12, 14-15
A	US 2006/0140481 A1 (KIM et al.) 29 June 2006 whole document	

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search	Date of mailing of the international search report
27 September 2011	04/10/2011
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer **YING LI** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : (02) 6283 2802

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2011/000164

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005/0100192 A1 (FUJIMURA et al.) 12 May 2005 whole document	
A	TANG, S. L. et al., 'Hybrid Blob and Particle Filter Tracking Approach for Robust Object Tracking', International Conference on Computational Science, ICCS 2010, Procedia Computer Science, Vol. 1, May 2010, Pages 2549-2557. whole document	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/MY2011/000164

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	2010124062	US	2010290710				
US	2008166045	CN	101142593	EP	1859410	JP	2008533892
		WO	2006097680				
US	2008219573	US	7995800				
US	2006140481	KR	20060064504	US	7688999		
US	2005100192	EP	1671216	JP	2007508624	US	7366325
		WO	2005036371				

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX