(54) Title: SYSTEM FOR COLLISION PREDICTION AND TRAFFIC VIOLATION DETECTION

(57) Abstract: The invention refers to a system for monitoring, analyzing and reporting incidences of traffic violations at a predetermined area in real-time, prospectively or retrospectively. Specifically, the invention refers to a system and method of monitoring, analyzing, predicting and reporting or warning the incidence of a past or imminent traffic violation by acquiring a moving object within a predetermined boundary, assigning a path to the moving object and based on a plurality of thresholds, determining the likelihood of a traffic violation type and occurrence.
(88) Date of publication of the international search report:
11 My 2013
INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB12/55640

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) : G01S 13/58; G06G 01/01, 01/07, 01/07 (2013.01)
USPC : 340/906, 933, 935, 936, 937; 342/109

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)

IPC(8): G01S 13/00, 13/08, 13/58; G06G 01/01, 01/07, 01/07 (2013.01)
USPC: 340/906, 933, 935, 936, 937; 342/104, 106, 107, 109, 114, 115, 179

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)


C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 6,970,102 B2 (CIOLLI, R) November 29, 2005; Figures 3, 4, 5, 6, 9, Abstract, Column 4, Lines 9-15, Column 4, Lines 64-66, Column 5, Lines 12-17, Column 6, Lines 30-34, Column 7, Lines 34-37, Column 10, Lines 7-13, Column 10, Lines 48-56, Column 11, Lines 6-11, Column 11, Lines 30-34, Column 12, Lines 27-33, Claims 1, 32</td>
<td>1, 4/1, 5/4/1, 6, 7/1, 8/1, 9, 10/9, 11/10/9, 12/10/9, 13, 14, 16 and 18</td>
</tr>
<tr>
<td>Y</td>
<td>US 2010/0080163 A1 (KRISHNAMOORTHI, R et al.) April 1, 2010; Paragraphs [0082], [0146] and [271],</td>
<td>17</td>
</tr>
<tr>
<td>Y</td>
<td>US 7,418,346 B2 (BREED, DS et al.) August 26, 2008; Figures 5 and 26, Abstract and Column 15, Lines 17-26</td>
<td>19-21</td>
</tr>
<tr>
<td>A</td>
<td>US 5,995,190 A (DAVIS, CA et al.) August 10, 1999; entire document</td>
<td>1, 4-21</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:
  "A" document defining the general state of the art which is not considered to be of particular relevance
  "E" earlier application or patent but published on or after the international filing date
  "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  "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

† 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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
11 April 2013 (11.04.2013)

Date of mailing of the international search report
2 3 APR 2013

Name and mailing address of the ISA/US
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INTERNATIONAL SEARCH REPORT

PCT/IB12/55640

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. □ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Group i: Claims 1 and 4-21; Group ii: Claims 2, 4, 5, 7, 8 and 10-12; Group iii: Claims 3-5, 7, 8 and 10-12

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group i: Claims 1 and 4-21 are directed toward a method of detecting a traffic violation, the method comprising the steps of: a. using a video source, obtaining a reference frame of a defined monitored area; b. defining region boundaries within the monitored area; c. optionally defining time span values for each region; d. acquiring one or more moving objects within the defined area; e. associating the acquired object with a previously acquired or a new trajectory; f. Detecting a violation wherein, if the acquired or new trajectory crosses the predetermined region boundaries in a specific sequence and the trajectory crosses each region during the optionally defined time span a threshold has been violated and a traffic violation has occurred.

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. □ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. □ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: Claims 1 and 4-21

Remark on Protest

- □ The additional search fees were accompanied by the applicant’s protest and, where applicable, the payment of a protest fee.

- □ The additional search fees were accompanied by the applicant’s protest but the applicable protest fee was not paid within the time limit specified in the invitation.

- □ No protest accompanied the payment of additional search fees.

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-Continued from Box No. III: Observations where unity of invention is lacking-

Group II: Claims 2, 4, 5, 7, 8 and 10-12 are directed toward a method of predicting a collision between two or more moving objects, the method comprising the steps of: a. using a video source, obtaining a reference frame of a defined monitored area; b. based on a predetermined criteria, defining a plurality of parameters within the defined area such as at what distance from the predicted collision should affected parties be notified; c. acquiring a plurality of moving objects within the defined area; d. associating each acquired object with a previously acquired or a new trajectory in real time; e. analyzing the acquired or new trajectories of the moving objects, whereby if two or more trajectories intersect and both objects will arrive at the intersection point within a predetermined time, a threshold has been violated and a collision is likely to occur.

Group III: Claims 3-5, 7, 8 and 10-12 are directed toward a method for analyzing a traffic violation associated with failure to give a right of way within a predetermined area, or dangerous driving, the method comprising the steps of: a. using a video source, obtaining a reference frame of a defined monitored area; b. based on a predetermined criteria, defining a plurality of parameters within the defined area such as a plurality of regions where each region's precedence over all other regions is defined; c. acquiring a plurality of moving objects within the defined area; d. associating each acquired object with a previously acquired or a new trajectory in real time; e. analyzing the acquired or new trajectories of the moving objects, whereby based on the predetermined parameters if two or more trajectories converge within a predetermined time, and one of the moving objects shows a sudden change in trajectory prior to the intersection point, and it can be determined based on region precedence that the object had precedence a threshold has been violated and a failure to give right of way has occurred.

The common technical feature shared by Groups I, II and III are a method of detecting a traffic violation, the method comprising the steps of: a. using a video source, obtaining a reference frame of a defined monitored area; b. defining region boundaries within the monitored area; c. optionally defining time span values for each region; d. acquiring one or more moving objects within the defined area; e. associating the acquired object with a previously acquired or a new trajectory. However, this common feature is previously disclosed by US 2010/0128127 A1 (Ciolli). Ciolli discloses a method of detecting a traffic violation (traffic violation detection, title), the method comprising the steps of: a. using a video source (camera 20 and 30, figure 1, abstract), obtaining a reference frame of a defined monitored area (monitoring a region under surveillance 31 and 33, figure 1, abstract); b. defining region boundaries within the monitored area (monitoring a region under surveillance 31 and 33, figure 1, abstract); c. optionally defining time span values for each region (supplying independently sourced and verifiable time, date and location of a violation, abstract); d. acquiring one or more moving objects within the defined area (detecting vehicle presence and movement, abstract).

Since the common technical feature is previously disclosed by the Ciolli reference, this common feature is not special and so Groups I, II and III lack unity.