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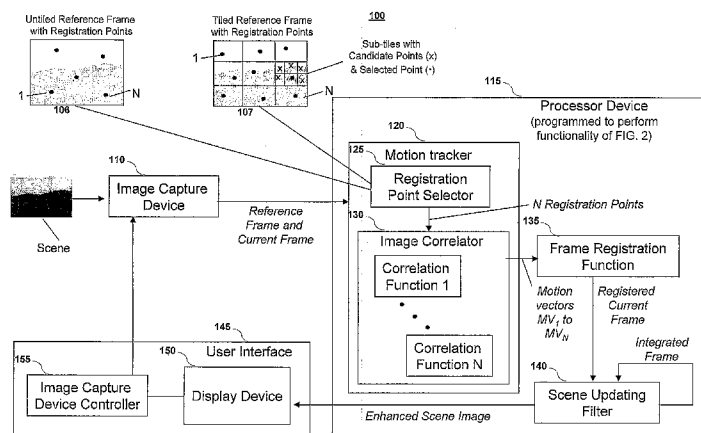
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[Continued on next page]

(54) Title: CONTINUOUS EXTENDED RANGE IMAGE PROCESSING



(57) Abstract: Methods and systems for image processing are provided. A method for processing images of a scene includes receiving image data of a reference and a current frame; generating N motion vectors that describe motion of the image data within the scene by computing a correlation function on the reference and current frames at each of N registration points; registering the current frame based on the N motion vectors to produce a registered current frame; and updating the image data of the scene based on the registered current frame. Optionally, registered frames may be oversampled. Techniques for generating the N motion vectors according to roll, zoom, shift and optical flow calculations, updating the image data of the scene according to switched and intermediate integration approaches, re-introducing smoothed motion into the image data of the scene, re-initializing the process, and processing images of a scene and a moving target within the scene are provided.

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**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US06/17688

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC: **G06K 9/00( 2006.01),9/40( 2006.01),9/32( 2006.01),9/36( 2006.01),9/46( 2006.01)**

USPC: 382/103,275,294,243,190

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)  
U.S. : 382/103,275,294, 243,190

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)  
Please See Continuation Sheet

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 20020159651 A1 (TENER et al) 31, October, 2002 (31.10.2002), see citations in form 237.	35-37, 62-64, and 97-99 ----- 1-3, 7-9, 11-12, 19-21, 27-34, 38-39, 40, 41, 43, 44, 46, 52, 58-61, 65-67, 71-74, 76, 83-86, 93-99, 100
X	US 20040136567 A1 (BILLINGHURST et al) 15 July 2004 (15.07.2004), see citation in form 237.	1-3, 7-9, 12, 19-20, 27-28, 33-34, 40, 41, 43, and 44

Further documents are listed in the continuation of Box C.  See patent family annex.

Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search: 14 August 2007 (14.08.2007)      Date of mailing of the international search report: 21 SEP 2007

Name and mailing address of the ISA/US: Mail Stop PCT, Attn: ISA/US, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450, Facsimile No. (571) 273-3201  
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**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/US06/17688

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,218,637 A (BALDING) 16 November 1965 (16.11.1965) see citations in form 237.	38-39 and 100
Y	WEI, Y. et al. A novel zoom invariant video object tracking algorithm (ZIVOTA), IEEE CCECE 2003, 4-7 May 2003, vol. 2, pages 1191-1194, see citations in form 237.	1-3, 7-9, 11-12, 19-21, 27-34, 40, 41, 43, 44, 46, 52, 58-61, 65-67, 71-74, 76, 83-86, 93-99
Y	US 5,923,786 A (MURAYAMA) 13 JULY 1999 (13.07.1999), SEE CITATIONS IN FORM 237.	7-9, 11-12, 73-74, 76

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US06/17688

## 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:  
Please See Continuation Sheet

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 any 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.: 1-3,7-12,19-21,26-41,43-46,52,57-67,71-76,83-86 and 92-100
  
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.:

- 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.

## BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

Group IA, Claims 7-12, 43-46, 71-76, 1-3, 19-21, 27-28, 33-34, 40-41, 52, 58, 65-67, 83-86, 93, drawn to Figs. 1 and 6A for tracking a target with n registration points without re-initialization and with generating n motion vectors based on RZS.

Group IB, Claims 4-6, 13-18, 42, 47-51, 68-70, 77-82, 1-3, 19-21, 27-28, 33-34, 40-41, 52, 58, 65-67, 83-86, 93, drawn to Figs. 1 and 7A for tracking a target with n registration points without re-initialization and with generating n motion vectors based on optical flow calculation.

Group IC, Claims 22-23, 53-54, 87-88, 1-3, 19-21, 27-28, 33-34, 40-41, 52, 58, 65-67, 83-86, 93, drawn to Figs. 1 and 9A for tracking a target with n registration points without re-initialization and with updating based on switch-based approach.

Group ID, Claims 24-25, 55-56, 89-91, 1-3, 19-21, 27-28, 33-34, 40-41, 52, 58, 65-67, 83-86, 93, drawn to Figs. 1 and 10A for tracking a target with n registration points without re-initialization and with updating based on intermediate integration approach.

Group II, claim(s) 26, 29-32, 57, 59-61, 92, 94-96, drawn to Fig. 11 for re-introduction of smoothed motion and re-initialization in general tracking.

Group III, claim(s) 35-39, 62-64, 97-100, drawn to Figs. 12 A and B for general tracking a moving target and simultaneously displaying updated scene and a target.

The inventions listed as Groups IA, IB, IC, ID, II, and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

As shown above, each of Groups IA, IB, IC, ID, II, and III has its own "special technical features", listed below, that define a contribution which each of the inventions, considered as a whole, may make over the prior art:

Group IA: tracking a target with n registration points with generating n motion vectors based on RZS,

Group IB: tracking a target with n registration points with generating n motion vectors based on optical flow calculation,

Group IC: tracking a target with n registration points with updating based on switch-based approach,

Group ID: tracking a target with n registration points with updating based on intermediate integration approach,

Group II: re-introduction of smoothed motion and re-initialization,

Group III: simultaneously displaying updated scene and a target.

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US06/17688

Continuation of B. FIELDS SEARCHED Item 3:

EAST, IEEE Explore (motion vector, displacement, optical flow, tracking target, tracking object, feature points, registration points)