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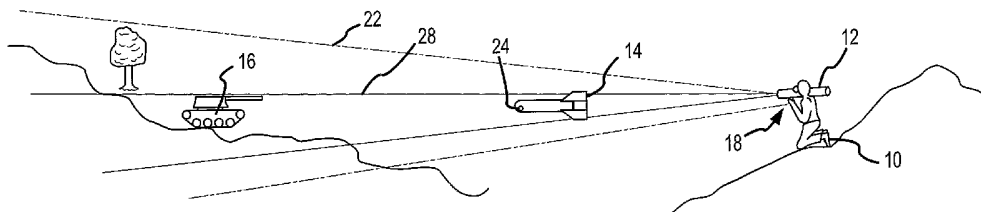
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ning of each regular issue of the PCT Gazette.

(54) Title: FLIR-TO-MISSILE BORESIGHT CORRELATION AND NON-UNIFORMITY COMPENSATION OF THE MIS-
SILE SEEKER



(57) Abstract: The present invention provides for simple and streamlined boresight correlation of FLIR-to-missile video. Boresight correlation (42) is performed with un-NUCed missile video (40), which allows boresight correlation and NUC (46) to be performed simultaneously thereby reducing the time required to acquire a target and fire the missile. The current approach uses the motion of the missile seeker for NUCing to produce spatial gradient filtering in the missile image by differencing images as the seeker moves. This compensates DC non-uniformities in the image. A FLIR image (44) is processed with a matching displace and subtract spatial filter constructed based on the tracked scene motion. The FLIR image is resampled to match the missile image resolution, and the two images are preprocessed and correlated using conventional methods. Improved NUC (46) is provided by cross-referencing multiple measurements of each area of the scene as viewed by different pixels in the imager. This approach is based on the simple yet novel premise that every pixel in the array that looks at the same thing should see the same thing. As a result, the NUC terms adapt to non-uniformities in the imager and not the scene.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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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 practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 02/067575 A (RAYTHEON COMPANY) 29 August 2002 (2002-08-29) page 3, line 24 - page 4, line 32 page 7, line 11 - page 8, line 14 page 9, line 8 - page 14, line 21 page 26, line 20 - page 36, line 9 figures 1-8	1,2,5-10
A	US 5 903 659 A (KILGORE ET AL) 11 May 1999 (1999-05-11) column 1, line 30 - line 58 column 2, line 41 - column 4, line 59 column 5, line 32 - column 6, line 14 figures 1-17 ----- -/--	1,2,5,7, 9

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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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 5 420 421 A (LINDGREN ET AL) 30 May 1995 (1995-05-30) column 2, line 39 - line 68 column 3, line 23 - column 6, line 56 figures 1,2 -----	1,2,5,7, 9
A	US 5 129 595 A (THIEDE ET AL) 14 July 1992 (1992-07-14) column 2, line 53 - column 3, line 30 column 3, line 51 - column 4, line 22 column 6, line 52 - column 8, line 11 figures 1,3-5 -----	1,2,5,7, 9
A	US 5 940 140 A (DADOURIAN ET AL) 17 August 1999 (1999-08-17) column 2, line 63 - column 3, line 14 column 3, line 31 - column 5, line 64 figures 1-3 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 02067575	A	29-08-2002	EP 1374567 A2	02-01-2004
US 5903659	A	11-05-1999	AT 203610 T	15-08-2001
			AU 705782 B2	03-06-1999
			AU 8756298 A	11-11-1998
			CA 2254143 A1	22-10-1998
			DE 69801201 D1	30-08-2001
			DE 69801201 T2	16-05-2002
			DK 909428 T3	24-09-2001
			EP 0909428 A2	21-04-1999
			IL 127240 A	01-12-2002
			JP 3417573 B2	16-06-2003
			JP 2001509996 T	24-07-2001
			KR 2000016752 A	25-03-2000
			NO 985898 A	15-02-1999
			NZ 332877 A	23-06-2000
			TR 9802636 T1	21-09-2001
			TW 517192 B	11-01-2003
			WO 9847102 A2	22-10-1998
US 5420421	A	30-05-1995	AU 656492 B2	02-02-1995
			AU 5220793 A	16-06-1994
			CA 2110368 A1	08-06-1994
			DE 69323531 D1	25-03-1999
			DE 69323531 T2	17-06-1999
			EP 0601534 A1	15-06-1994
			ES 2127779 T3	01-05-1999
			IL 107828 A	04-09-1996
			JP 2661865 B2	08-10-1997
			JP 6235663 A	23-08-1994
			NO 934422 A	08-06-1994
			TR 28036 A	11-12-1995
US 5129595	A	14-07-1992	NONE	
US 5940140	A	17-08-1999	CA 2265563 A1	19-03-1998
			EP 0937361 A1	25-08-1999
			JP 2001503574 T	13-03-2001
			WO 9811734 A1	19-03-1998