

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
21 October 2004 (21.10.2004)

PCT

(10) International Publication Number  
WO 2004/090811 A3

(51) International Patent Classification<sup>7</sup>: G06T 1/00

AA Eindhoven (NL). VAN GESTEL, Henricus, A., W. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(21) International Application Number:  
PCT/IB2004/050385

(74) Agent: SCHMITZ, Herman, J., R.; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(22) International Filing Date: 2 April 2004 (02.04.2004)

(25) Filing Language: English

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NL, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(26) Publication Language: English

(30) Priority Data:  
03100982.2 11 April 2003 (11.04.2003) EP

(71) Applicant (for all designated States except US): KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

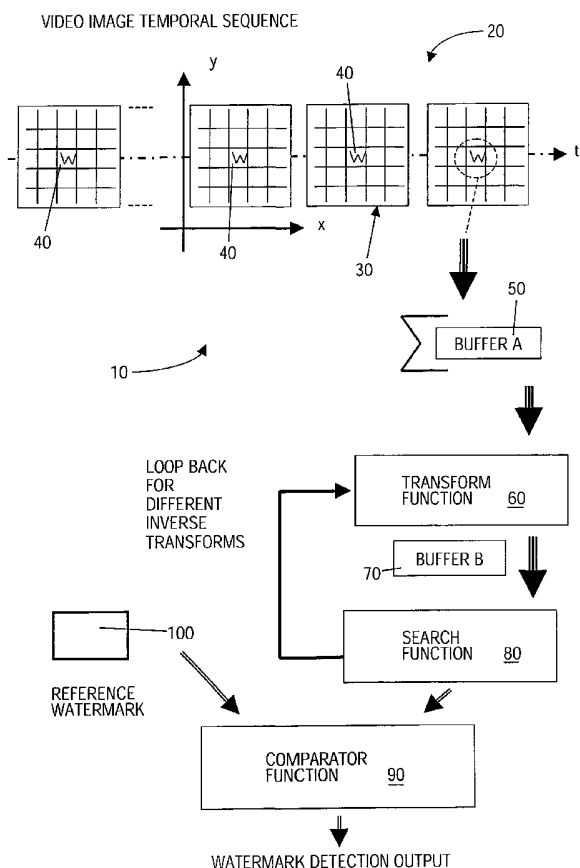
(72) Inventors; and

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),

(75) Inventors/Applicants (for US only): VAN VUGT, Henricus, A., G. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656

[Continued on next page]

(54) Title: METHOD OF DETECTING WATERMARKS



(57) Abstract: It is difficult to detect a watermark (40) in a video image sequence (20) if the image has been subjected (possibly by a hacker) to affine transforms such as scaling, rotation, flipping, etc. The transform carried out is generally unknown. Therefore, one or more inverse transforms (60) are performed to the image prior to detection (90) until a reliable decision can be made. The inverse transforms are performed with small stepsize variations of adequate parameters. In a preferred embodiment, an initial search for correlation is done between the inverse transformed image and a blurred version of the reference watermark, the blurred reference watermark being obtained by combining a number of e.g. rotated versions of the reference watermark. If some correlation has been found, the amount of blur and/or the stepsize is decreased. This requires fewer steps to detect the watermark.

WO 2004/090811 A3



Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

**Declaration under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD,

**Published:**

— with international search report

**(88) Date of publication of the international search report:**

20 January 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

**INTERNATIONAL SEARCH REPORT**

ional Application No  
IB2004/050385

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 G06T1/00

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 7 G06T H04N

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, INSPEC, COMPENDEX

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 408 082 B1 (RHOADS GEOFFREY B ET AL) 18 June 2002 (2002-06-18)  claims 1-10 column 1, line 60 - column 2, line 11 column 2, line 54 - line 62 column 3, line 44 - column 4, line 29 column 5, line 49 - column 6, line 62	1-3,6,7, 17-19, 21-23
Y	----- -/--	5,12-15

Further documents are listed in the continuation of box C.       Patent family members are listed in annex.

° Special categories of cited documents :

*A* document defining the general state of the art which is not considered to be of particular relevance	*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
*E* earlier document but published on or after the international filing date	*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
*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)	*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.
*O* document referring to an oral disclosure, use, exhibition or other means	*&* document member of the same patent family
*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  15 September 2004	Date of mailing of the international search report  13/10/2004
--	--

Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer  Deltorn, J-M
--	--

## INTERNATIONAL SEARCH REPORT

International Application No

IB2004/050385

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>PEREIRA S ET AL: "ROBUST TEMPLATE MATCHING FOR AFFINE RESISTANT IMAGE WATERMARKS" IEEE TRANSACTIONS ON IMAGE PROCESSING, IEEE INC. NEW YORK, US, vol. 9, no. 6, June 2000 (2000-06), pages 1123-1129, XP000951913 ISSN: 1057-7149 page 1125, section III - page 1127, left column, line 42</p>	1-4,6-8, 11,17, 21-23
Y	-----	5,12-15
Y	<p>LIN C.-Y. ET AL.: "rotation, scale and translation resilient watermarking for images" IEEE TRANSACTION ON IMAGE PROCESSING, vol. 10, no. 5, May 2001 (2001-05), pages 767-782, XP002296325 page 769, section II.A -page 770, left column, line 6</p>	1-3,6-8, 17,21-23
X	<p>HARTUNG F ET AL: "SPREAD SPECTRUM WATERMARKING: MALICIOUS ATTACKS AND COUNTERATTACKS" PROCEEDINGS OF THE SPIE, SPIE, BELLINGHAM, VA, US, vol. 3657, 25 January 1999 (1999-01-25), pages 147-158, XP000949145 ISSN: 0277-786X page 154, section 4.4 - page 156, line 1 page 150, section 3.2 - page 151, line 42</p>	1-3,6-8, 12-15, 17,21-23
Y	<p>GB 2 371 435 A (IBM) 24 July 2002 (2002-07-24) claims 8-10 page 4, line 20 - page 5, line 11 page 7, line 20 - page 9, line 3 page 9, line 21 - line 34</p>	1-3,6-8, 17,21-23
Y	<p>FRIDRICH J ET AL: "COMPARING ROBUSTNESS OF WATERMARKING TECHNIQUES" PROCEEDINGS OF THE SPIE, SPIE, BELLINGHAM, VA, US, vol. 3657, January 1999 (1999-01), pages 214-225, XP000961847 ISSN: 0277-786X page 215, section 2 - page 219, line 1</p>	12-15
	----- -/--	

## INTERNATIONAL SEARCH REPORT

onal Application No  
IB2004/050385

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>CHEN, Y-K.; HOLLIMAN, M.; DEBES, E.; ZHELTOV, S.; KNYAZEV, A.; BRATANOV, S.; BELENOV, R.; SANTOS: "Media Applications on Hyper-Threading Technology" INTEL TECHNOLOGY JOURNAL., February 2002 (2002-02), XP002296402 page 4, left-column, line 4 - page 5, left-column, line 11</p>	5
A	<p>WO 99/36876 A (DIGIMARC CORP) 22 July 1999 (1999-07-22) Abstract page 4, line 1 - line 14 page 5, line 14 - line 23 claims 1,6,11</p>	18,19
A	<p>KIM H.-S., BAEK Y. AND LEE H.-K.: "rotation-, scale-, and translation-invariant image watermark using higer order spectra" OPTICAL ENGINEERING, vol. 42, no. 2, February 2003 (2003-02), pages 340-349, XP002296403 page 342, section 3.1 page 347, section 5.1</p>	1-3,6-8, 17,21-23

## INTERNATIONAL SEARCH REPORT

Information on patent family members

onal Application No

IB2004/050385

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6408082	B1	18-06-2002	US 6122403 A	19-09-2000
			US 5862260 A	19-01-1999
			US 5822436 A	13-10-1998
			US 2003039377 A1	27-02-2003
			US 2004001608 A1	01-01-2004
			US 6424725 B1	23-07-2002
			US 2002090113 A1	11-07-2002
			US 2002164049 A1	07-11-2002
			US 2002186886 A1	12-12-2002
			US 2002186887 A1	12-12-2002
			US 2003033530 A1	13-02-2003
			US 2003091189 A1	15-05-2003
			US 2003053653 A1	20-03-2003
			US 2003102660 A1	05-06-2003
			US 2003086585 A1	08-05-2003
			US 2003142847 A1	31-07-2003
			US 2003128861 A1	10-07-2003
			US 2003103645 A1	05-06-2003
			US 2004022444 A1	05-02-2004
			US 2003133592 A1	17-07-2003
			US 2004057581 A1	25-03-2004
			US 2003050961 A1	13-03-2003
			US 2003231785 A1	18-12-2003
			US 2004005093 A1	08-01-2004
			US 2003228031 A1	11-12-2003
			US 2003219144 A1	27-11-2003
			US 6700990 B1	02-03-2004
			US 6307949 B1	23-10-2001
			US 6381341 B1	30-04-2002
			US 6614914 B1	02-09-2003
			US 6611607 B1	26-08-2003
			US 6567533 B1	20-05-2003
			US 2004037449 A1	26-02-2004
			US 2004153649 A1	05-08-2004
			US 6647128 B1	11-11-2003
			US 2004128514 A1	01-07-2004
			US 2001019618 A1	06-09-2001
			US 2001016051 A1	23-08-2001
			US 2002009208 A1	24-01-2002
			US 2002006212 A1	17-01-2002
			US 2002021824 A1	21-02-2002
			US 2002067844 A1	06-06-2002
			US 2002118831 A1	29-08-2002
			US 2002090112 A1	11-07-2002
			US 2002080997 A1	27-06-2002
			AU 3008697 A	05-12-1997
			EP 1019868 A2	19-07-2000
			WO 9743736 A1	20-11-1997
			US 2002188841 A1	12-12-2002
			US 6229924 B1	08-05-2001
GB 2371435	A	24-07-2002	GB 2335816 A , B	29-09-1999
			JP 3490332 B2	26-01-2004
			JP 11341452 A	10-12-1999
			TW 409214 B	21-10-2000
			US 6785398 B1	31-08-2004
WO 9936876	A	22-07-1999	AU 747372 B2	16-05-2002

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

IB2004/050385

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9936876	A	AU 2463499 A	02-08-1999
		BR 9907105 A	30-04-2002
		CA 2318564 A1	22-07-1999
		EP 1050005 A2	08-11-2000
		JP 2003529225 T	30-09-2003
		US 2002061121 A1	23-05-2002
		US 2002064298 A1	30-05-2002
		WO 9936876 A2	22-07-1999
		US 2002159615 A1	31-10-2002
		US 2002176600 A1	28-11-2002
		US 2002172397 A1	21-11-2002
		US 2002181735 A1	05-12-2002
		US 2003035565 A1	20-02-2003
		US 2003128861 A1	10-07-2003
		US 6427020 B1	30-07-2002
		US 2003231785 A1	18-12-2003
		US 6636615 B1	21-10-2003
		US 6574350 B1	03-06-2003
		US 6332031 B1	18-12-2001

---