



US009503742B2

(12) **United States Patent**  
**Gutierrez Novelo**

(10) **Patent No.:** **US 9,503,742 B2**  
(45) **Date of Patent:** **Nov. 22, 2016**

(54) **SYSTEM AND METHOD FOR DECODING 3D STEREOSCOPIC DIGITAL VIDEO**

(75) Inventor: **Manuel Rafael Gutierrez Novelo**,  
Nueva Santa Maria (MX)

(73) Assignee: **TD Vision Corporation S.A. de C.V.**,  
Col. Nueva Santa Maria (MX)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 687 days.

(21) Appl. No.: **12/837,421**

(22) Filed: **Jul. 15, 2010**

(65) **Prior Publication Data**  
US 2010/0271462 A1 Oct. 28, 2010

**Related U.S. Application Data**  
(63) Continuation of application No. 11/510,262, filed on Aug. 25, 2006, which is a continuation of application No. PCT/MX2004/000012, filed on Feb. 27, 2004.

(51) **Int. Cl.**  
**H04N 7/12** (2006.01)  
**H04N 19/42** (2014.01)  
(Continued)

(52) **U.S. Cl.**  
CPC ..... **H04N 19/42** (2014.11); **H04N 19/30** (2014.11); **H04N 19/44** (2014.11); **H04N 19/593** (2014.11); **H04N 19/597** (2014.11); **H04N 19/61** (2014.11); **H04N 19/70** (2014.11)

(58) **Field of Classification Search**  
CPC ..... H04N 19/597  
USPC ..... 375/240.01, 240.14, 240.27, 240.23; 348/43, 46  
IPC ..... H04N 7/12  
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,579,413 A	11/1996	Bjontegaard
5,612,735 A	3/1997	Haskell et al.
5,619,256 A	4/1997	Haskell et al.
5,652,616 A	7/1997	Chen et al.

(Continued)

FOREIGN PATENT DOCUMENTS

CN	1450816 A	10/2003
EP	0639031	2/1995

(Continued)

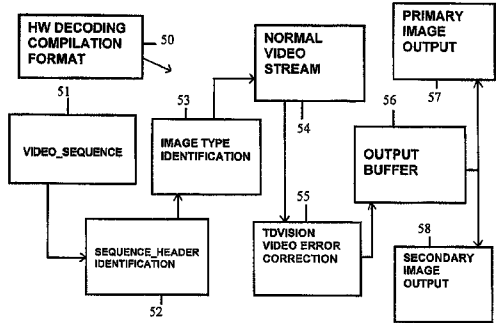
OTHER PUBLICATIONS

Tseng et al., "Compatible Video Coding of Stereoscopic Sequences Using MPEG-2's Scalability and Interlaced Structure," International Workshop on HDTV '94, Oct. 1994, Torino, Italy.  
(Continued)

*Primary Examiner* — Young Lee  
(74) *Attorney, Agent, or Firm* — Knobbe Martens Olson & Bear LLP

(57) **ABSTRACT**  
Described herein is a MPEG-2 compatible stereoscopic 3D-video image digital decoding method and system. In order to obtain 3D-images from a digital video stream, modifications are made to the current MPEG2 decoders, by means of software and hardware changes in different parts of the decoding process. Namely, the video\_sequence structures of the video data stream are modified via software to include the necessary flags at the bit level of the image type in the TDVision® technology. Modifications are also made in the decoding processes as well as in decoding the information via software and hardware, wherein a double output buffer is activated, a parallel and difference decoding selector is activated, the decompression process is executed, the corresponding output buffer is displayed; and the decoder is programmed via software to simultaneously receive and decode two independent program streams, each with an TDVision® stereoscopic identifier.

**1 Claim, 5 Drawing Sheets**



- (51) **Int. Cl.**  
*H04N 19/597* (2014.01)  
*H04N 19/30* (2014.01)  
*H04N 19/61* (2014.01)  
*H04N 19/593* (2014.01)  
*H04N 19/44* (2014.01)  
*H04N 19/70* (2014.01)

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,815,601	A	9/1998	Katata et al.
5,886,736	A	3/1999	Chen
5,963,257	A	10/1999	Katata et al.
5,978,515	A	11/1999	Katata et al.
6,043,838	A	3/2000	Chen
6,055,012	A	4/2000	Haskell et al.
6,072,831	A	6/2000	Chen
6,097,759	A	8/2000	Murakami et al.
6,144,701	A	11/2000	Chiang et al.
6,148,109	A	11/2000	Boon et al.
6,151,362	A	11/2000	Wang
6,292,588	B1	9/2001	Shen et al.
6,345,123	B1	2/2002	Boon
6,370,193	B1	4/2002	Lee
6,370,276	B2	4/2002	Boon
6,377,625	B1	4/2002	Kim
6,456,432	B1	9/2002	Lazzaro et al.
6,633,676	B1	10/2003	Kleihorst et al.
6,636,644	B1	10/2003	Itokawa
6,658,056	B1	12/2003	Duruoz et al.
6,661,914	B2	12/2003	Dufour
6,665,445	B1	12/2003	Boon
6,678,331	B1	1/2004	Moutin et al.
6,678,424	B1	1/2004	Ferguson
7,136,415	B2	11/2006	Yun et al.
7,277,121	B2	10/2007	Mashitani et al.
7,636,088	B2	12/2009	Nomura et al.
2002/0009137	A1	1/2002	Nelson et al.
2003/0048354	A1	3/2003	Takemoto et al.
2003/0095177	A1	5/2003	Yun et al.
2003/0190079	A1	10/2003	Penain et al.
2003/0202592	A1	10/2003	Sohn et al.
2004/0008893	A1	1/2004	Itoi et al.
2004/0027452	A1	2/2004	Yun et al.
2004/0101043	A1	5/2004	Flack et al.
2004/0120396	A1	6/2004	Yun et al.
2004/0252186	A1	12/2004	Mashitani et al.
2006/0133493	A1	6/2006	Cho et al.
2007/0041442	A1	2/2007	Novelo
2010/0039499	A1	2/2010	Nomura et al.
2010/0271463	A1	10/2010	Novelo

FOREIGN PATENT DOCUMENTS

JP	07-240943	9/1995
JP	07-296185	11/1995
JP	09-139957	5/1997
JP	09-237353	9/1997
JP	11-069346	3/1999
JP	11-113026	4/1999
JP	11-509998	8/1999
JP	2000-020757	1/2000
JP	2001054140	2/2001
JP	2002-519792	7/2002
JP	2003-319419	11/2003
KR	1997-0060973	8/1997
WO	WO 9817068	4/1998
WO	WO 03/092304	11/2003

OTHER PUBLICATIONS

Harman, "Home Based 3D Entertainment—An Overview," Pro-

Gotoh, H. "Gotoh Hiroshige's Monthly Report," DOS/V Power Report, Japan, Impress Corporation, Jul. 1, 2003, vol. 13, No. 7, pp. 125-126.  
 Nakasu, MPEG-2 Video Encoding Schemes and Their Features, Academic Literature, Etc. 2007-51282-007, Jun. 1, 2010, pp. 2-6.  
 Nakasu, E. "Comprehensible MPEG2 and MPEG2 image coding system and feature," Video a, Dec. 1, 1992, Shasin-kogyo Publisher, vol. 15, No. 12, pp. 34-38.  
 Notice of Reasons for Rejection for Japanese Patent Application No. P2005-512205 dated Jun. 22, 2010 by Japanese Patent Office.  
 Notice of Reasons for Rejection for Japanese Patent Application No. P2007-500701 dated Jun. 1, 2010 by Japanese Patent Office.  
 Notice of Reasons for Rejection for Japanese Patent Application No. P2007-500700 dated Jun. 1, 2010 by Japanese Patent Office.  
 Notice of Request for Submission of Argument for Korean Patent Application No. 10-2006-7020051 dated Jul. 13, 2010.  
 Notice of Request for Submission of Argument for Korean Patent Application No. 10-2006-7020050 dated Jul. 13, 2010.  
 Office Action for Canadian Patent Application No. 2,557,534 dated Feb. 21, 2011 by Canadian Intellectual Property Office.  
 Examination Report for European Patent Application No. 04715594.0 dated Oct. 18, 2010 by European Patent Office.  
 Examination Report for European Patent Application No. 04715595.7 dated Oct. 18, 2010 by European Patent Office.  
 First Office Action for Chinese Patent Application No. 200480042753.3 dated Aug. 8, 2008 by State Intellectual Property Office of P.R.C.  
 Second Office Action for Chinese Patent Application No. 200480042753.3 dated Mar. 20, 2009 by State Intellectual Property Office of P.R.C.  
 Third Office Action for Chinese Patent Application No. 200480042753.3 dated Feb. 24, 2010 by State Intellectual Property Office of P.R.C.  
 First Office Action for Chinese Patent Application No. 2004800425881 dated Jun. 13, 2008 by State Intellectual Property Office of P.R.C.  
 Second Office Action for Chinese Patent Application No. 2004800425881 dated May 8, 2009 by State Intellectual Property Office of P.R.C.  
 Third Office Action for Chinese Patent Application No. 2004800425881 dated Mar. 18, 2010 by State Intellectual Property Office of P.R.C.  
 First Office Action for Chinese Patent Application No. 201010227674.7 dated Jul. 20, 2011 by State Intellectual Property Office of P.R.C.  
 First Office Action for Chinese Patent Application No. 201010221966.X dated Jun. 23, 2011 by State Intellectual Property Office of P.R.C.  
 Notice of Reasons for Rejection for Japanese Patent Application No. P2007-500701 dated Jan. 5, 2010 by Japanese Patent Office.  
 Notice of Reasons for Rejection for Japanese Patent Application No. P2007-500700 dated Jan. 12, 2010 by Japanese Patent Office.  
 Final Rejection for Japanese Patent Application No. P2001-500701 dated Dec. 21, 2010 by Japanese Patent Office.  
 Final Rejection for Japanese Patent Application No. P2001-500700 dated Dec. 21, 2010 by Japanese Patent Office.  
 Notice of Final Rejection for Korean Patent Application No. 10-2006-7020051 dated May 24, 2011.  
 Notice of Final Rejection for Korean Patent Application No. 10-2006-7020050 dated May 23, 2011.  
 Notice of Request for Submission of Argument for Korean Patent Application No. 10-2011-7022035 dated Dec. 15, 2011.  
 Notice of Request for Submission of Argument for Korean Patent Application No. 10-2011-7022011 dated Dec. 14, 2011.  
 Chien, et al., Efficient Stereo Video Coding System For Immersive Teleconference With Two-Stage Hybrid Disparity Estimation Algorithm, DSP/IC Design Lab, Graduate Institute of Electronics Engineering and Department of Electrical Engineering, National Taiwan University 1, Sec. 4, Roosevelt Rd., Taipei, Taiwan, 2003.  
 Jiang, et al., A Hybrid Scheme for Low Bit-Rate Coding of Stereo

(56)

**References Cited**

## OTHER PUBLICATIONS

Naito, 3D-HDTV Digital Coding Scheme Conforming To Mpeg-2 With Full Use Of Disparity Compensation, Electronics and Communications in Japan, Part 1, vol. 85, No. 2, 2002, Translated from Denshi Joho Tsushin Gakkai Ronbunshi, vol. J83-B, No. 5, May 2000, pp. 739-747.

Olm, Encoding and Reconstruction of Multiview Video Objects, IEEE Signal Processing Magazine, May 1999, vol. 16, pp. 47-54.

Perkins, Data Compression of Steropairs, IEEE Transactions on communications, vol. 40, No. 4, Apr. 1992.

Puri, et al., Basics of Stereoscopic Video, New Compression Results with MPEG-2 and a Proposal for MPEG-4, Signal Processing: Image Communication 10, 1997, pp. 201-234.

Schertz, Source Coding of Stereoscopic Television Pictures, Institut für Rundfunktechnik, FXG, 1992, 462-464.

Seferidis, et al., Improved Disparity Estimation in Stereoscopic Television, IEEE Xplore, vol. 29, No. 9, 1993.

Sethuraman, et al., A Multiresolution Framework For Stereoscopic Image Sequence Compression, Proc. of ICIP-95, vol. II, pp. 361-365, IEEE Computer Society Press, 1994.

Siegel, et al., Compression and Interpolation of 3D-Stereoscopic and Multi-View Video, The Rototics Institute, Carnegie Mellon University, Pittsburgh, PA 15213, SAE vol. 3012, 1997, 227-238.

Tengecharoen, et al., Stereo Image Compression by Quadrant Vector Quantization, Faculty of Engineering, and Research Center for Communications and Information Technology (ReCCIT), King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand, 2003.

Yan, et al., Stereo Video Coding Based on Frame Estimation and Interpolation, IEEE Transactions on Broadcasting, vol. 49, No. 1, Mar. 2003, pp. 14-21.

Zhu, Fast Disparity Estimation Algorithms for Stereo Video Coding Based on MPEG-2, Bulletin of Science and technology, vol. 19, No. 1, Jan. 31, 2003.

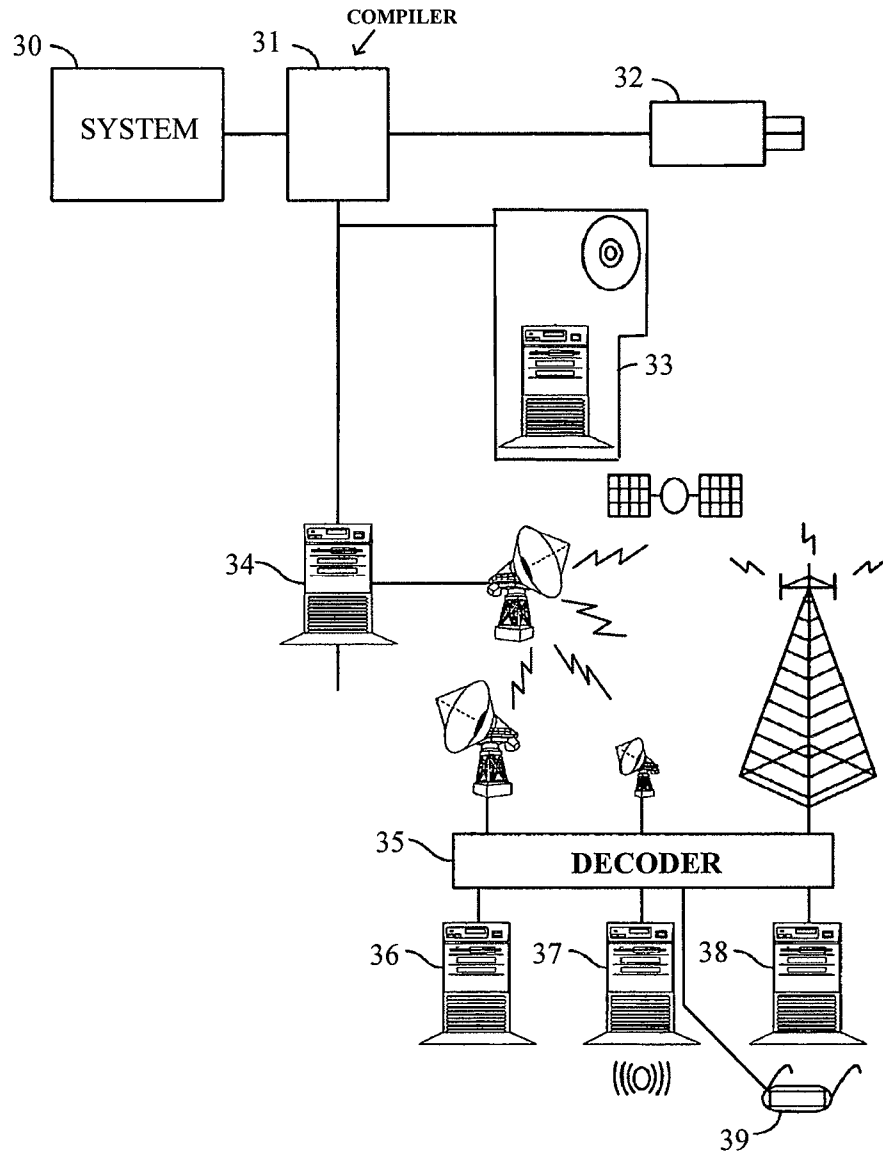


FIG. 1

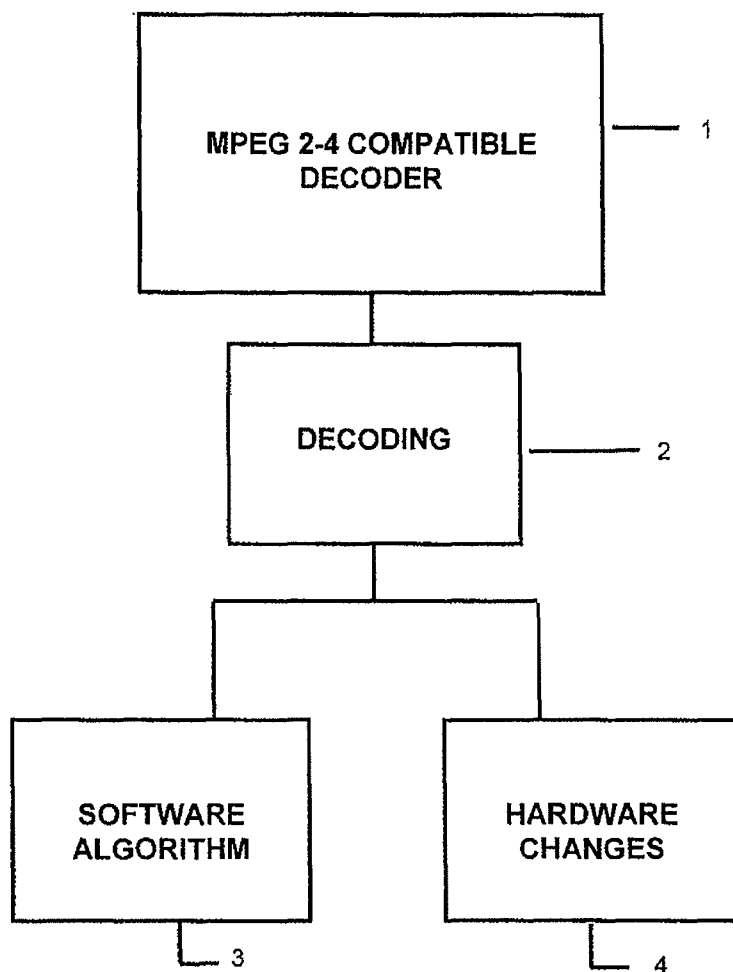


Fig. 2

# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.