Exhibit C

United States Patent No. 7,715,476

US007715476B2

(12) **United States Patent**
Edwards et al.

(10) **Patent No.:** **US 7,715,476 B2**
(45) **Date of Patent:** **May 11, 2010**

(54) **SYSTEM, METHOD AND ARTICLE OF MANUFACTURE FOR TRACKING A HEAD OF A CAMERA-GENERATED IMAGE OF A PERSON**

(76) Inventors: **Jeffrey L. Edwards**, 1072 Tanland Dr., #203, Palo Alto, CA (US) 94306; **Katerina H. Nguyen**, 3341 Alma St., Palo Alto, CA (US) 94306

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1206 days.

(21) Appl. No.: **11/112,433**

(22) Filed: **Apr. 21, 2005**

(65) **Prior Publication Data**

US 2005/0185054 A1   Aug. 25, 2005

Related U.S. Application Data

(63) Continuation of application No. 10/353,858, filed on Jan. 28, 2003, now Pat. No. 6,909,455, which is a continuation of application No. 09/364,859, filed on Jul. 30, 1999, now Pat. No. 6,545,706.

(51) **Int. Cl.**
H04N 7/18 (2006.01)
(52) **U.S. Cl.** **375/240.08**; 375/240.16
(58) **Field of Classification Search** ....
375/240.08–240.17
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,843,568 A	6/1989	Krueger et al.	
5,148,477 A	9/1992	Neely et al.	
5,384,912 A	1/1995	Ogrinc et al.	
5,454,043 A	9/1995	Freeman	
5,469,536 A	11/1995	Blank	
5,534,917 A	7/1996	MacDougall	
5,548,659 A	8/1996	Okamoto	
5,570,113 A	10/1996	Zetts	
5,581,276 A	12/1996	Cipolla et al.	
5,623,587 A	4/1997	Bulman	
5,631,697 A	5/1997	Nishimura et al.	
5,767,867 A	6/1998	Hu	
5,781,198 A	7/1998	Korn	
5,790,124 A	8/1998	Fischer et al.	

(Continued)

OTHER PUBLICATIONS

Crow, F. C., "Summed-Area Tables for Texture Mapping," Computer Graphics, vol. 18(3), 207-212, Jul. 1984.

(Continued)

Primary Examiner—Andy S Rao
(74) *Attorney, Agent, or Firm*—Workman Nydegger

(57) **ABSTRACT**

A system, method and article of manufacture are provided for tracking a head portion of a person image in video images. Upon receiving video images, a first head tracking operation is executed for generating a first confidence value. Such first confidence value is representative of a confidence that a head portion of a person image in the video images is correctly located. Also executed is a second head tracking operation for generating a second confidence value representative of a confidence that the head portion of the person image in the video images is correctly located. The first confidence value and the second confidence value are then outputted. Subsequently, the depiction of the head portion of the person image in the video images is based on the first confidence value and the second confidence value.

32 Claims, 15 Drawing Sheets
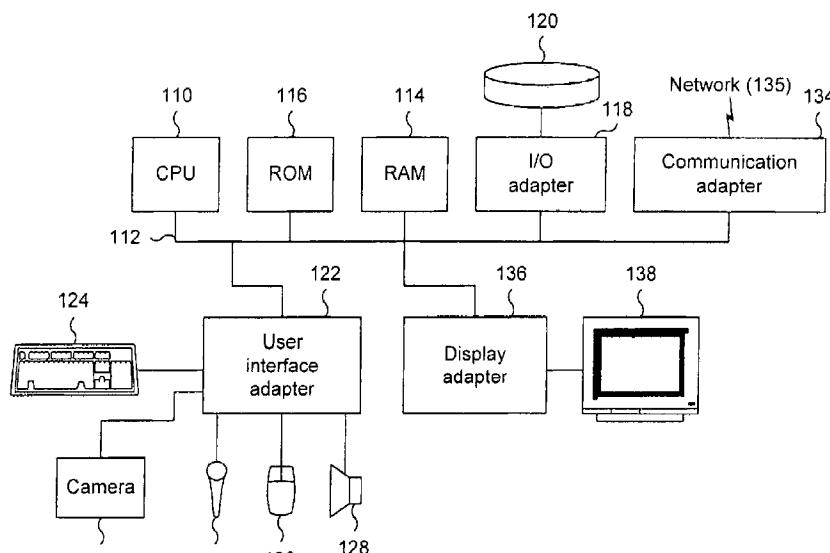
US 7,715,476 B2

Page 2

U.S. PATENT DOCUMENTS

5,802,220	A	9/1998	Black et al.
6,154,559	A	11/2000	Beardsley
6,301,370	B1	10/2001	Steffens et al.

OTHER PUBLICATIONS

Huang, Chu-Lin, Wu, Ming-Shan, "A Model-based Complex Background Gesture Recognition System," IEEE International Conference on Systems, Man and Cybernetics, vol. 1 pp. 93-98, Oct. 1996.

Aggarwal, J. K., Cai, Q. "Human Motion Analysis: A Review," IEEE Nonrigid and Articulated Motion Workshop Proceedings, 90-102, (1997).

Cortes, C., Vapnik, V., "Support-Vector Networks," Machine Learning, vol. 20, pp. 273-297, (1995).

GMD Digital Media Lab: The Virtual Studio; http://viswiz.gmd.de/DML/vst/vst.html.

Swain, M. J., Ballard, D. H., "Indexing Via Color Histograms," Third International Conference on Computer Vision, pp. 390-393, Dec. 1990.

Review: Game Boy Camera, Jul. 15, 1998, http://www.gameweek.com/reviews/july15/gbc.html.

Barbie PhotoDesigner w/Digital Camera, Box, http://www.actioncd.com/ktkt0126.asp.

Figure 1

Video images

200

Background
subtraction
head tracker

202

Free form
head tracker

Mediator   204

Figure 2

DOCKET ALARM
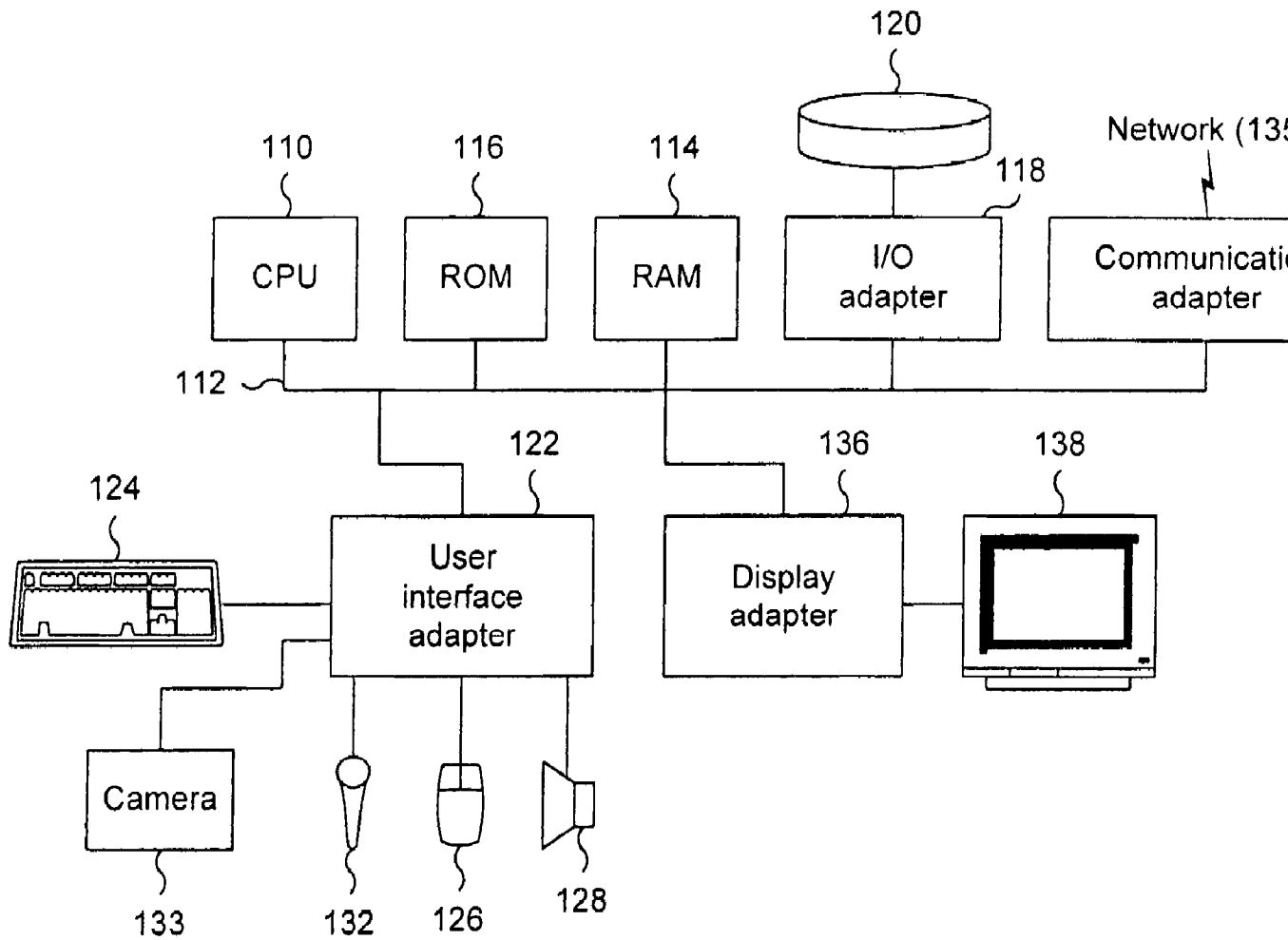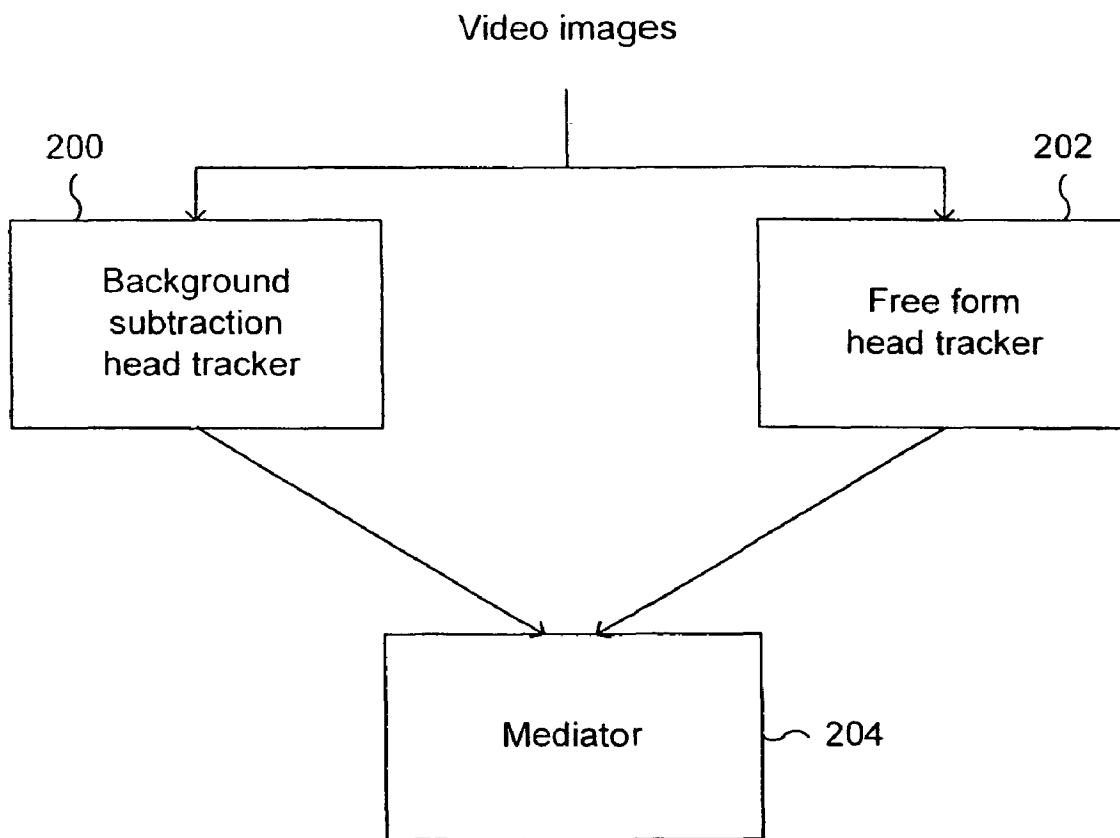
Explore Litigation Insights

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.