



US007127081B1

(12) **United States Patent**
Erdem

(10) **Patent No.:** **US 7,127,081 B1**
(45) **Date of Patent:** **Oct. 24, 2006**

(54) **METHOD FOR TRACKING MOTION OF A FACE**

OTHER PUBLICATIONS

(75) Inventor: **A. Tanju Erdem**, Rochester, NY (US)

Tomasi, Carlo, et al., "Shape and Motion From Image Streams Under Orthography :A Factorization Method", *International Journal of Computer Vision*, vol. 9, No. 2, pp. 137-154, (1992).

(73) Assignee: **Momentum Bilgisayar, Yazilim, Danismanlik, Ticaret, A.S.**

(Continued)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 423 days.

Primary Examiner—Kanjibhai Patel
Assistant Examiner—Seyed Azarian

(74) *Attorney, Agent, or Firm*—Hiscock & Barclay, LLP; Thomas R. FitzGerald, Esq.

(21) Appl. No.: **09/689,565**

(57) **ABSTRACT**

(22) Filed: **Oct. 12, 2000**

(51) **Int. Cl.**
G06K 9/00 (2006.01)

(52) **U.S. Cl.** **382/103; 382/285; 348/169**

(58) **Field of Classification Search** 382/103, 382/100, 107, 115, 116, 117, 118, 209, 203, 382/276, 291, 106, 154, 162, 168, 189, 236, 382/243, 255, 274, 285, 287, 295, 305; 345/622, 345/630, 156, 419, 420, 474; 340/945, 326, 340/946, 981, 309.7, 14.07; 600/424; 348/94, 348/169

A method for tracking the motion of a person's face for the purpose of animating a 3-D face model of the same or another person is disclosed. The 3-D face model carries both the geometry (shape) and the texture (color) characteristics of the person's face. The shape of the face model is represented via a 3-D triangular mesh (geometry mesh), while the texture of the face model is represented via a 2-D composite image (texture image). Both the global motion and the local motion of the person's face are tracked. Global motion of the face involves the rotation and the translation of the face in 3-D. Local motion of the face involves the 3-D motion of the lips, eyebrows, etc., caused by speech and facial expressions. The 2-D positions of salient features of the person's face and/or markers placed on the person's face are automatically tracked in a time-sequence of 2-D images of the face. Global and local motion of the face are separately calculated using the tracked 2-D positions of the salient features or markers. Global motion is represented in a 2-D image by rotation and position vectors while local motion is represented by an action vector that specifies the amount of facial actions such as smiling-mouth, raised-eyebrows, etc.

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,975,960	A	12/1990	Petajan
5,280,530	A	1/1994	Trew et al.
5,744,953	A	4/1998	Hansen
5,774,591	A	6/1998	Black et al.
5,802,220	A	9/1998	Black et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP 0 926 628 A 6/1999

(Continued)

44 Claims, 12 Drawing Sheets

