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(54) **INTRUDER DETECTION THROUGH TRAJECTORY ANALYSIS IN MONITORING AND SURVEILLANCE SYSTEMS**

(75) Inventors: **Srinivas Gutta**, Buchanan; **Tomas Brodsky**, Croton-on-Hudson, both of NY (US)

(73) Assignee: **Koninklijke Philips Electronics N.V.**, Eindhoven (NL)

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(56) **References Cited**

U.S. PATENT DOCUMENTS

4,249,207	A	*	2/1981	Harman et al.	348/152
5,657,076	A		8/1997	Tapp	348/154
5,831,669	A		11/1998	Adrain	348/143
5,982,418	A		11/1999	Ely	348/153
6,069,653	A		5/2000	Hudson	348/143
6,069,655	A		5/2000	Seeley et al.	348/154

FOREIGN PATENT DOCUMENTS

GB	2223614	A	4/1990
GB	2343945	A	5/2000
JP	11-328405		11/1999

OTHER PUBLICATIONS

Rowley, H.A., et al., "Human Face Detection in Visual Scenes", advances in Neural Information Processing Systems 8, Proceedings of the 1995 Conference, pp. 875-881, 1996.

Rowley, H.A., et al., "Rotation Invariant Neural Network-Based Face Detection", Proceedings, 1988 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, pp. 38-44, 1998.

Raja, Y., et al., "Segmentation and Tracking Using Colour Mixture Models", Computer Vision —ACCV '98, Third Asian Conference on Computer Vision, Hong Kong, China, Jan. 1998, Proceedings, vol. 1.

Lee, C.H., et al., "Automatic Human Face Location In A Complex Background Using Motion And Color Information", Pattern Recognition, vol. 29, No. 11, pp. 1887-1889, 1996.

Gutta, S., et al., "Face Surveillance", Sixth International Conference on Computer Vision, The Institute of Electrical and Electronics Engineers, Inc., pp. 646-651.

Stauffer, C., "Automatic hierarchical classification using time-based co-occurrences", IEEE Computer Society Technical Committee on Pattern Analysis and Machine Intelligence, vol. 2, pp. 333-339.

Grimson, W.E.L., et al., "Using adaptive tracking to classify and monitor activities in a site", Proceedings 1988, IEEE Computer Society Conference on Computer Vision and Pattern Recognition, pp. 22-29, 1998.

* cited by examiner

Primary Examiner—Thomas Mullen

(74) *Attorney, Agent, or Firm*—Gregory L. Thorne

(57) **ABSTRACT**

A security monitoring system including one or more cameras for monitoring a path of an individual, a recorder for recording the monitoring of the individual, trajectory analyzer for computing a trajectory of the path of the individual from the recorded monitoring, comparator for comparing the trajectory against known trajectories, and an alarm system for transmitting an alarm signal if the trajectory does not match one of the known trajectories. Further, the system may include a database for storing image data for each authorized individual of the structure and a recognition system for comparing images of the individual from the one or more cameras with the stored image data in the database. The alarm system transmits the alarm signal if the trajectory does not match one of the known trajectories and the individual is an authorized individual or if the individual is not an authorized individual.

17 Claims, 2 Drawing Sheets

