Probabilistic Group-Level Motion Analysis and Scenario Recognition

Ming-Ching Chang, Nils Krahnstoever, Weina Ge

Computer Vision Lab, GE Global Research Center, Niskayuna NY, USA

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Goal: Continuous automated video-based behavior recognition in locations such as parks, schools, prison yards, public venues where continuous law enforcement presence is desirable but inflexible.

Specifically addressing issues involving groups and crowds.

Behaviors being detected by our system:
- group forming and dispersion
- running (fast) individuals
- loitering individuals or groups
- approaching / chasing / meeting
- flanking
- agitation / aggression / fighting
- customized behaviors and scenarios

Prior Capabilities
- GE’s multi-camera, multi-object surveillance tracking system
- Motion analysis, discrete group analysis
- Activity detection, social network analysis
- Active control for PTZ camera network
- Biometrics at a distance

Simulated scenarios. Data enacted by Lake Erie Correctional Officers.

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Probabilistic Evidence & Reasoning

Resource Description

Evidence Storage

Modular Reasoning

Probabilistic Group-Level Event Recognition

Probabilistic Evidence & Reasoning

- Group forming and dispersion
- Running (fast) individuals
- Loitering individuals or groups
- Approaching / chasing / meeting
- Flanking
- Agitation / aggression / fighting
- Customized behaviors and scenarios

Probabilistic Soft Group Analysis
- Pairwise grouping
- Path-based connectivity

Scenario Recognition for Individuals

- Walking or Drag-drop to connect
- Moving Towards Each Other

• Group forming and dispersion • Running (fast) individuals • Loitering individuals or groups • Approaching / chasing / meeting • Flanking • Agitation / aggression / fighting • Customized behaviors and scenarios

Scenario Modeling GUI

Allows user to easily define new scenarios using a bank of event inference modules

System Deployment & Validation

- Independent system evaluation in progress conducted by ManTech (www.mantech.com) on behalf of NIJ
- System deployed to local police department to process video feeds and control PTZ cameras for real-life applications

Conclusions

- Robust multi-camera, multi-object surveillance tracking system as the backbone
- Probabilistic representation and inference for tracking evidence and group activities
- Modular inference enables explanation of decision making for alerts
- User-friendly GUI allows law enforcement practitioners to quickly design new events and scenarios
- Integrated face capture in PTZ views
- Ongoing system deployment and validation on real-world law enforcement sites