

Crowd behaviour analysis for conflict forecasting in urban parades

Title: Crowd behaviour analysis for conflict forecasting in urban parades

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Location: University of Haute Alsace, Mulhouse, France

Duration: 36 months

Context:

This PhD position is part of a joint French–German research project on future security in urban areas, funded by the French National Research Agency (ANR) and the German Federal Ministry of Education and Research (BMBF), from 2017 to 2020. This project is entitled “Organized Pedestrian Movement in Public Spaces: Preparation and Crisis Management of Urban Parades and Demonstration Marches with High Conflict Potential” (OPMoPS). The main outcome of this project will be a decision support tool based on mathematics, computer science and sociological research, which will help the forces of civil security (FCS) to prepare and control urban parades and demonstration marches (UPM), to detect risk situations, and to react to possible threats to individuals and civil security fast and efficiently.

Description:

Public area monitoring with drones and cameras is of particular value in case of UPM. Such a system can help the FCS as an intelligence service. For example, it can be used to detect and locate faster agitation behaviors in the crowd for rioters in order to react in a suitable way as soon as possible.

The aim of this PhD thesis is to create new methods for crowd behaviour analysis based on innovative data mining techniques. The developed methods will rely on large amount of temporal data extracted from videos recorded by drones and cameras. Temporal data will be obtained from existing state-of-the-art computer vision approaches [1,2] which will be implemented by the PhD candidate. These data will be composed of sequences of events and time-series (e.g. trajectories) representing the behaviors of the crowd during the demonstrations. The PhD thesis will be composed of two parts: 1) analysis of the data extracted from videos for offline analysis 2) development of a real-time detection system to monitor on-going events. Both tools will be integrated into a decision support system used to support forces of civil security.

The MIPS laboratory has a strong experience in sequences and time-series analysis [3,4,5]. The developed methods will extend and rely on these existing work.

References:

1. Rodriguez, Mikel, et al. "Data-driven crowd analysis in videos." *Computer vision (ICCV), 2011 IEEE international conference on*. IEEE, 2011.
2. Allain, Pierre, Nicolas Courty, and Thomas Corpetti. "AGORASET: a dataset for crowd video analysis." 1st ICPR International Workshop on Pattern Recognition and Crowd Analysis. 2012.
3. Petitjean F, Forestier G, Webb G, Nicholson A, Chen Y and Keogh E (2014), Dynamic Time Warping Averaging of Time Series allows Faster and more Accurate Classification In IEEE International Conference on Data Mining.
4. Forestier G, Petitjean F, Riffaud L and Jannin P (2015), Optimal sub-sequence matching for the automatic prediction of surgical tasks, In AIME 15th Conference on Artificial Intelligence in Medicine.
5. Petitjean F, Weber J, Efficient Satellite Image Time Series Analysis Under Time Warping, IEEE Geoscience Remote Sensing Letters, Vol. 11, No. 6, 2014.

Prerequisites:

- The candidate must have a Master or equivalent in computer science or applied mathematics.
- The candidate must have good knowledge in data mining, an experience in computer vision would be appreciated.
- Programming language: Java
- The candidate must be fluent in English

Application:

Send by email a resume, a cover letter, a transcript containing all your grades obtained during your Master studies, 1-2 recommendation letters.