Crowd detection and behaviour analysis from Multi-camera Surveillance video

1. Abstract of the proposal

The importance of video-based monitoring systems is growing, causing computer vision to become more and more popular. With the increase in human population, it is necessary to monitor crowds, whether in a public setting or an industrial setting. The main aim of the project is to analyse the crowd from multiple surveillance cctv video. The application of crowd analysis lends itself to a new application domain, such as the automatic detection of chaotic acts in crowds and the localization of abnormal zones in scenes. Monitoring people's behaviour is highly beneficial due to the ubiquitous presence of multiple cameras in surveillance systems. The multiple views of the scene allow for the management of occlusions and failures that may affect any sensor. The tracking of objects from multiple cameras is considered as the first step in designing intelligent surveillance applications. A framework for crowd detection, zonal counting, tracking of people and behaviour analysis of crowd from multi-camera surveillance video is presented in this paper.

2. Objectives

Yolo-v4 for detecting people from video and Deep-SORT algorithm for tracking people. For detecting a person from multiple cameras, we need that type of videos. We will assume that there is a primary camera and do initial processing based on this video. Rest of the camera footage will be used to get different angle of the person and give them ID.

3. Expected Outcomes

The warning should be given when there is a number of people greater than the threshold. Movement of people in the video is analysed and if it is greater than threshold the crowd has abnormal behaviour.

4. Literature Survey/Related Works

[1] "Video crowd detection and abnormal behavior model detection based on machine learning method." -Xie, Shaoci, Xiaohong Zhang, and Jing Cai

- Method for modelling crowd video dynamics by adopting a two-stream convolutional architecture which incorporates spatial and temporal networks
- Motion flow field is obtained from the video through dense optical flow
- Trained and evaluated on a benchmark crowd video dataset

[2] "Multi-feature-based crowd video modeling for visual event detection." - Ullah, Habib, et al

- Machine learning-based IDS video crowd and its behavior anomaly detection model
- The experiment mainly includes three aspects: optical flow extraction, optical flow to geospatial mapping, and spatial analysis of optical flow.

5. Proposed Solution

Proposed methods include person detection, tracking of people in the video, zonal counting and crowd behaviour analysis based on the movement of person

Person detection

- Read video frame by frame
- Load model Yolo-v4 model
- Detect persons in each frame
- Draw bounding box for all persons

Tracking Person

- Track person using Deep-SORT algorithm
- Give unique id for each person
- Save each person image in a folder with their ID
- Detect People in other cameras
- Find match from primary video image
- Give person id in footage

Zonal counting

- Divide Screen into Zones
- Map person id to Zone
- Calculate number of people in each frame if number of person in a zone greater than threshold crowd alert will be shown

Crowd behaviour analysis

- Get movement each person from tracking
- If the movement is greater than threshold in a zone it will be considered as abnormal behavior

6. References

[1] Xie, Shaoci, Xiaohong Zhang, and Jing Cai. "Video crowd detection and abnormal behavior model detection based on machine learning method." *Neural Computing and Applications* 31.1 (2019): 175-184.

[2] Ullah, Habib, et al. "Multi-feature-based crowd video modeling for visual event detection." *Multimedia Systems* 27.4 (2021): 589-597.