

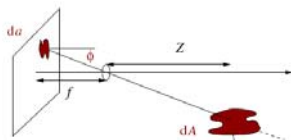
ACTIVE ZOOM CONTROL

Toni Linares, Neil Robertson & John Hannah

Pedestrian detection and tracking is needed in a large variety of scenarios like airports, train stations, universities (etc.) and usually is the first step needed for later actions and analysis. For example, once we have detected and tracked a pedestrian we may want to estimate their behaviour and depending on their behaviour, focus more on one pedestrian than on another. Little work has been done in the past on behaviour recognition and in particular active zoom control. This is because the theory of active zooming is not developed and computationally time consuming tasks are needed i.e. the techniques involved in this area are not currently real-time.

Motivation

This project is motivated by the need to develop the theory of active zoom control for multiple cameras. We are inspired by the work of Tordoff & Murray for single-camera reactive zoom control but this has limitations in the active scheme with many cameras.



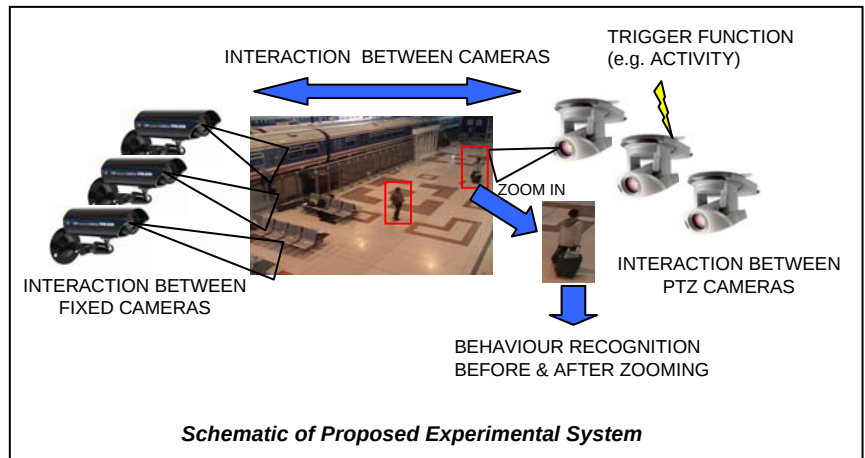
$$\rho = \frac{da \cos \phi}{dA \cos \Phi}$$

$$\frac{da \cos \phi}{(f / \cos \phi)^2} = \frac{dA \cos \Phi}{(Z / \cos \phi)^2}$$

$$\frac{f}{Z} = \text{constant}$$

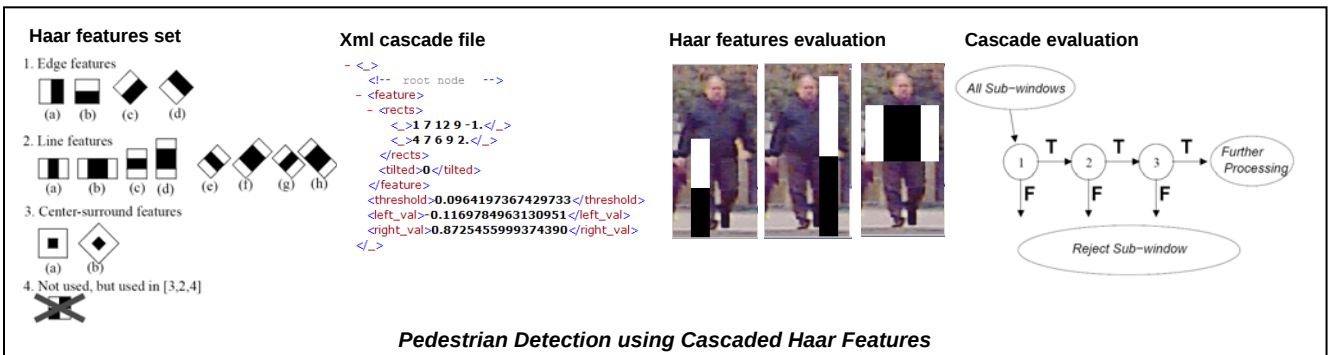
The Goal

To focus development we aim to develop a prototype security system able to detect pedestrians in a given scene and capable of paying more attention to some pedestrians to extract more information (e.g. if unusual behaviour is observed). A set of fixed cameras will be mounted to observe the scene and detect pedestrians present in it. PTZ cameras will be used to focus on a particular pedestrian to extract more useful information for behaviour recognition, identification etc.



Current Work

Several tests have been done to understand the strengths and weaknesses of different techniques involved in these areas. Special attention has been paid to Viola & Jones Haar features detection technique. We are also exploring size-preservation via mean-shift.



Future Work

- o Develop a reliable pedestrian detection which handles occlusion and different projections of a person. (V-J does not.)
- o Handle the problem of tracking with multiple cameras. (Tordoff & Murray used single camera.)
- o Develop a method to make cameras interact between them (both PTZ and fixed).
- o Develop a zooming strategy e.g. a cost function or Markov Decision Process?
- o Find a stable method to zoom in / out smoothly, involving control theory and hardware.