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Crowd Counting Through Head Detection

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Abstract

When large numbers of people gather at a specific place or location for a specific purpose, it is defined as Mass Gathering. It is important to understand the event variables that might affect the health of people present during such mass gatherings. Crowd density is one of the most important variables to be considered during mass gatherings. Crowd density is defined as the number of people per unit area. The uncontrolled crowd density might lead to injury or illness, depending on the number of people. Hence it is important to keep track of the number of people present in a given area.

Devices used to count the total number of people in a given location are known as people counters. This type of system plays a vital role in recording the total number of visitors. Different types of sensors can be used for this purpose. Video cameras are one of the most accurate and reliable sensors that can be used for crowd calculation.

A significant drawback of video cameras is that they are heavy and expensive as compared to other potential sensors, and that they often require complex calibration in order to obtain usable results. A further undesirable aspect of high-resolution cameras is that they can compromise the privacy of the individuals who are being counted. Together, these factors have led us to the conclusion that there is value in creating crowd counting solutions that can use low-resolution cameras that are small, cheap, and sufficiently low-resolution that they represent no realistic risk to the privacy of the people being counted, even if the performance does not match the best results of the existing state of the art.

The primary goal of this study is to attempt to measure crowd density (people per area). As this is a complex challenge, we are concentrating on first step of it for now: counting people in a specific example context. Generalising the findings to measuring crowd density in general, while an admirable goal, is beyond the scope of this thesis. Within this study, we aim to make a prototype on MATLAB for the real time counting of people by using a video processing technique that is designed to be robust enough that it can work with low-resolution cameras, and simple enough that it can operate in real-time using small low-cost embedded processors. Thus, this study focuses on identifying and prototyping a suitable

computationally affordable and feasible solution, rather than advancing the state of the art in image processing through the generation of novel image processing algorithms, per se.

The method explored in this study uses neural network based regression analysis, and does not require any calibration of the camera. The image is obtained from a streaming camera in real time. Different experiments were conducted and the results proved that the method proposed in this study is intrinsic in its simplicity and powerful in its accuracy. It has the capability to give good results even when the quality of the camera is low and therefore it does not unnecessarily compromise with the privacy of people being counted.