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The Development of Various Methods for Object Tracking and Classification in Thermal Videos

Shivani Kesharvani[1], Gourav Saxena[2], Kishore Kumar[3]
Research Scholar, Thermal Engineering[1]
Asst. Prof, ,Mechanical Engineering[2,3]
Nagaji Institution of Technology and Management, Gwalior, India

Abstract: *Nowadays, thermal cameras play a major role because of its temperature-based photography in many applications such as video surveillance, monitoring electronics/electrical machines, forest monitoring, monitoring babies/adult patients, and suspicious object detection. Tracking pedestrians in thermal video is a major task for such applications. Thermal cameras usually create images based on temperature emitted by the object only and not on the lighting conditions and outdoor environment conditions. But still thermal images have constraints like no texture or colour information, more number of dead pixels, low resolution, and noticeable visual colour patterns in case of any temperature variations. So the challenge in tracking pedestrians in thermal videos is tracking objects/pedestrians throughout the video without an identity switch by overcoming these constraints which may mislead the tracking process. To overcome these constraints, the proposed system uses tri feature matrix (TFM) as an object descriptor which is used to uniquely identify and represent objects in thermal images. TFM is represented in more compact way as a triple matrix. It is a simple and accurate descriptor suitable for tracking objects in thermal video sequences without an identity switch. The proposed Pedestrian tracking system uses most of the advantages of thermal cameras by overcoming challenges in thermal videos effectively based on a novel descriptor TFM. The proposed system is evaluated with various data sets, and the results are analysed using true positive, true negative, false negative, false positive, accuracy, precision, recall, F-score, global identity mismatch (GMME) and track matching error (TME). The performance metrics such as accuracy, precision, recall, F-score, GMME and TME are computed as 99%, 100%, 99%, 99%, 2.3%, and 2.1%, respectively. From the observation, it is found that the performance of proposed TFM-based system is significantly improved. The experimental result shows that the proposed system achieved more accurate tracking compared to the conventional methods.*

Keywords: Thermal camera, TFM, Convex hull, Convex deficiency, Fourier descriptor

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