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Real-Time Vision-Based Moving Object Detection and Tracking

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Abstract: ***In applications involving surveillance cameras, action recognition, and automotive safety, moving object detection and tracking is commonly a major element. The primary goal of the project is to detect and track the faces of moving objects and people using a static integrated camera capable of detecting the facial attributes of the discovered faces. We describe a comprehensive system for detecting and tracking moving objects that would be centered on a vision system using an image difference algorithm and the feature tracker Kanade Lucas Tomasi. Our project focuses on identifying and locating a person's movements as long as they remain within the recording plan. To accomplish this, the image difference algorithm in MATLAB / Simulink software is being used, and the KLT algorithm is being used to extract features. Our project describes an algorithm to detect the facial features of multiple faces in a given frame. It also keeps the track of the face even when the person tilts his/her head, or moves towards or away from the camera.***

Keywords: Vision System, Moving Object Detection and Tracking, Image Difference Algorithm, KLT Algorithm

1. Introduction

Individual tracking is necessary for many scenarios where video surveillance of human activity is being used. It is necessary for security reasons. Every vision-related endeavor requires object tracking. As an outcome, our vision-based system for identifying and locating moving people is able to grab video without varying the lighting zone in relation to the background against which these people evolve. Two steps are particularly critical in the process leading from an acquired image to information about the objects in it: background segmentation and monitoring. We present a simplified multiple object detection based on the Kanade Lucas Tomasi algorithm and image difference that uses MATLAB software. We have developed a simple system for single/multiple face detectors in a live video stream using an integrated webcam. MATLAB provides webcam support through a hardware support package via a support package installer.

2. Method and Material

The system utilizes a vision system with a video capture process including an image variation way to detect and place any moving objects.

Vision System

Many vision-based systems rely on automatic sensing and tracking entities. In cognitive and computer sciences, image processing, analysis, and computer vision are interesting and dynamic fields. Vision System included a high-resolution camera and hardware card (supported to camera); the camera is an interface to a personal computer. The personal computer system must have a camera-supported frame grabber and a multicore fast processor to take photographs with a snapshot for the vision system. An image acquisition system was used to collect the video. Read all images or frames from the MATLAB platform, the first image is called the background or reference image. All the number of frames is subtracted from the background, so the difference is greater than the threshold where the object is detected.

Image Difference Algorithm

In image processing, image differencing is a technique for finding differences between images. The difference between two frames is estimated by subtracting each data point from each image frame and establishing a new image from the result. First, the two shots must be oriented such that corresponding dots line up, and their photometric values must be made uniform, either through rigorous calibration or post-processing. The amount of pre-processing needed prior to differentiation is entirely determined by the image type. To recognize and identify objects that change luminance or migrate away from the star field, image differentiation techniques are used.

To begin, you must locate the face. Use the undefined function to get the location of a face in a video frame. The Viola-Jones detection approaches, as well as a learned classification model, are used in the cascade object detector. By default, the detector is designed to detect faces, but it can also be used to detect other objects.

KLT Algorithm

We utilized the Kanade-Lucas-Tomasi (KLT) algorithm to trace the face over time. While the cascade object detector can also be used on every frame, it is expensive. It may also fail to recognize the face of the person moving or sways his head. The kind of trained classification model deployed for detection is the origin of this limitation. Through the video images, the KLT algorithm tracks a series of feature points. Following the detection of the face, the example's next step is to identify feature points that can be successfully monitored.

3. Result

We used an image difference approach to develop and implement moving object recognition and tracking in MATLAB. We have used an integrated web camera, and the experimental results showed that we succeeded in getting good results when compared to prior studies that used noise

reduction filters and structural elements for morphological operations.

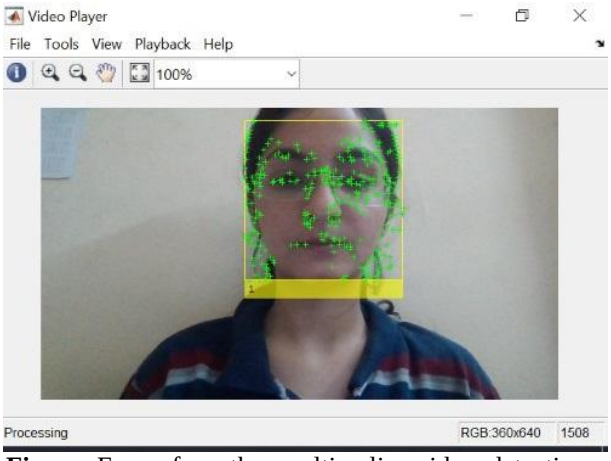

Figure: Frame from the resulting live video, detecting a single face

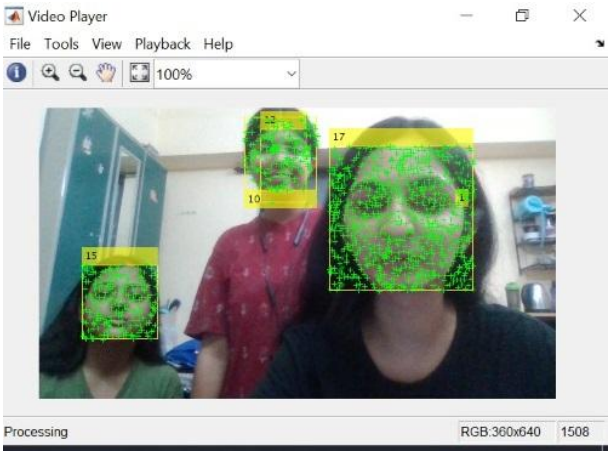

Figure: Frame from the resulting live video, detecting multiple faces

4. Conclusion

We implemented our motion detection and tracking system on MATLAB software. During the process, we gained knowledge of various topics including the image difference algorithm and Kanade-Lucas-Tomasi algorithm.

Our system can be used for;

- Tracking pedestrians on the crosswalk
- Tracking a face in a scene
- Using live video capture, users can track multiple objects around the same time.

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