

TRACKING AND INDEXING
MOVING OBJECT
IN MULTITUDE ENVIRONMENT

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ABSTRACT

The project will be focusing on tracking multiple people in various environments specifically for outdoor scene. This will also involve in indexing each different person in the same area or background. Tracking 1 moving object is an easy works but if tracking involved more than 1 people the process will become harder. The complexity also is more complicated if it involves moving object occlusion and illuminations change in the image frame. In this tracking and indexing system, background subtraction model for each frame is being used for extracting the moving object from the background. But, before background subtraction model is executed, each frame (background and current) will be filtered by using Gaussian filter for reducing small noise in the frame and morphological filter process is perform after background subtraction. Next, each moving object will be labeled so as to differentiate each different people that exist in the same background or environment. This was done by using feature-based model method which used area, center point of each moving people and the average of RGB pixels value as recognition. All the work will be done in a grayscale image and applied to every frame. Without loss of generality, the indexing algorithm will be done up to 4 people within the same background with different types of actions (different posture) and different type of conditions (walking slow and faster). The results of this system are 100% accurate for 1 and 2 moving people without any errors. But, if the moving objects are from 3 to 4 people, the accuracy reduces around 25% due to the feature not robust enough in differentiating it.

ABSTRAK

Projek ini akan menumpukan kepada pemerhatian terhadap pergerakan manusia dalam latar belakang ataupun situasi yang berbeza di ruang terbuka. Ia juga akan melibatkan pengesanan untuk setiap manusia yang berbeza dalam latar belakang yang sama. Pemerhatian satu objek bergerak adalah perkara yang mudah tetapi apabila ia melibatkan pergerakan manusia lebih dari seorang prosesnya akan menjadi lebih sukar. Kesukarannya akan bertambah jika ia melibatkan pertembungan antara satu objek dengan objek yang lain dan perubahan cahaya yang ketara di dalam imej. Di dalam sistem pemerhatian dan pengesanan ini, model “penolakan latar belakang” digunakan untuk mengasingkan objek yang bergerak dengan latar belakangnya. Tetapi sebelum model ini dilaksanakan, setiap imej akan ditapis oleh penapis Gaussian untuk mengurangkan bendasing kecil dalam imej. Selepas model “penolakan latar belakang” dilaksanakan, satu lagi penapis digunakan iaitu penapis morfologi. Kemudian, objek yang bergerak itu akan dilabelkan untuk membezakan antara satu objek dengan objek lain. Ini akan dapat dilaksanakan dengan sifat-sifat yang telah ditetapkan iaitu keluasan objek bergerak, titik tengah setiap objek bergerak dan nilai purata piksel RGB. Setiap proses diatas akan dilaksanakan dalam imej skala kelabu. Secara umumnya, setiap proses dan model ini tidak akan menukarkan bentuk gambar asal dan indeks algoritmanya akan berfungsi untuk pengesanan dan pengesanan sehingga 4 manusia dalam satu gambar. Dengan aksi atau postur dan gerakan yang berbeza. Sistem ini mampu memberi 100% kejituan untuk menjejaki 1 dan 2 objek bergerak. Tetapi, apabila ia melibatkan 3 atau 4 orang bergerak kejituannya akan berkurangan dalam lingkungan 25% kerana sifat-sifat yang digunakan tidak mencukupi bagi membezakan satu objek dengan gerakan objek yang lain.

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LIST OF SYMBOLS

$M(x)$	Maximum intensity value for pixels x
$N(x)$	Minimum intensity value for pixels x
$I(x)$	Image for pixels x
$D(x)$	Difference of pixels x
$B(x)$	Background model for pixel x (Binarizing)
$F(u,v)$	Fourier transform at distance u and v
$H(u,v)$	Low-pass filter at distance u and v
D_0	Distance origin
$D(u,v)$	Distance from point (u,v)
A	Set of A
B	Set of B for structural element
\cup	Unity
\cap	Intersection
\subseteq	Element of
\oplus	Bounded sum
\ominus	Bounded subtract

- Opening
- Closing

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CHAPTER 1

INTRODUCTION

Tracking and indexing moving object is a method to track down a single or multiple moving objects within a given environment. This is to isolate the object within the image view without losing it.

In the case of moving people, it can differentiate between any kinds of actions within the camera range. All of the moving people actions such as walking faster or slower, people carrying other objects or baby can be recognized easily without error. It can be used for surveillance purposes.

1.0 PROBLEM STATEMENT

Tracking of a single person is relatively easy. However, when it involves many moving objects or people in the image frame, the tracking becomes harder and difficult. This difficulty is based on tracking each person by not losing any of them. It becomes more complex when people are moving among other people. Not only because of the intersection of the people makes it complex, other environmental factors such as shadows and the speed of the moving people also affect the tracking system.

The intersection among two persons as shown in figure 1.1 can make the tracking system a problem when it happens. It also can affect the accuracy of the system. A tracking system should not be affected by the intersection between each moving person and environmental problems.

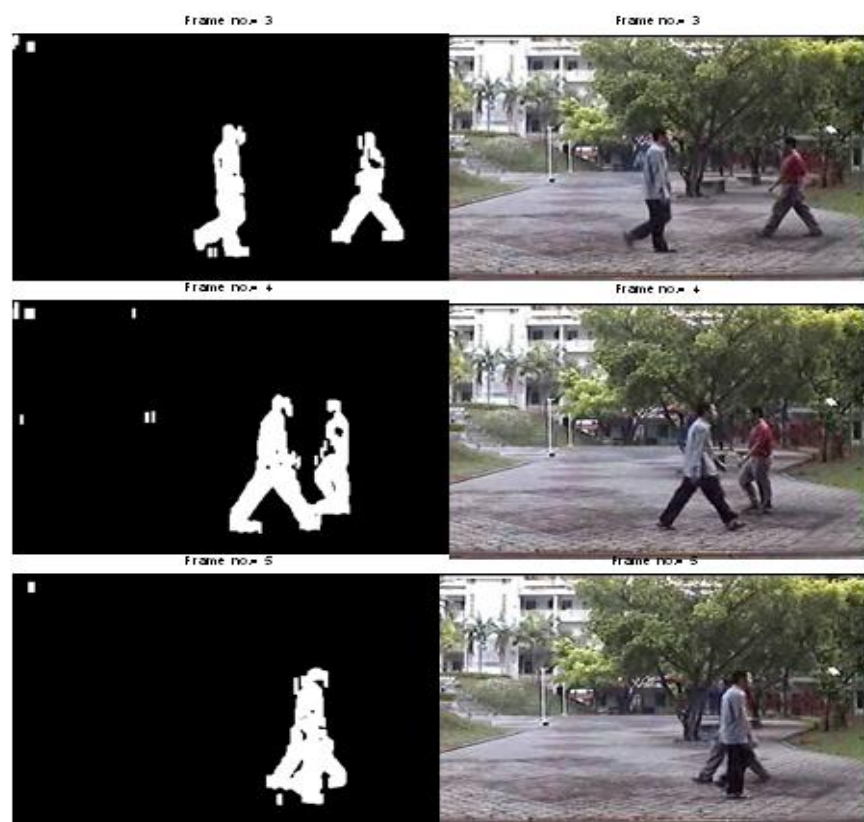


Figure 1.1: Two moving person walking towards each other (intersection)

This problem can be solved by using image processing method which is useful for tracking. The image processing method is based on the specific algorithm for tracking and it will track down each moving people without any errors.

1.1 PROJECT GOALS

The main approaches of this project are by using background subtraction model and differentiating the moving people using feature based tracking. Each of the moving object will be classified with a unique number which will be maintained through out the image sequence.

The unique number assignment will be done in the indexing stage. This stage will give an appropriate number for each of the moving people inside the frame without losing each of them. This indexing will refer to feature based tracking method as mentioned as above.

1.2 OBJECTIVES OF THE PROJECT

The objectives of the project are:

- a. To track a moving object consisting of single person or multiple people.
- b. To index the moving objects (human) so as to differentiate each other within the same scene.

1.3 SCOPE OF PROJECT

Tracking and indexing moving object are not a new research in surveillance applications such as for security. It has been used and explored by many researchers. But, each of the researcher used different method to achieve tracking and indexing moving object in either real-time or non-real-time environment.

In this project, tracking and indexing was only done for non-real-time mode which have the same background. It can track up to 4 people only where each person will be bounded by a box. All of the boxes will be numbered by a unique number for differentiating each of the people in the frame image.

Basically, the tracking must be robust in the sense that no matter how the person moves around in the scene, the algorithm of the numbering will still be able to follow him or her. For achieving this, the system would need to assign a unique number for different people or person based on certain features.

The design of the tracking and indexing algorithm will be based on MATLAB 7 environment using mainly the image processing toolbox. All the data of the moving people image will be pre-processed by MATLAB coding or programming.

1.4 PROJECT OUTLINE

The project is organized into five chapters. The outline is as follows:

- Chapter 1 Introduction
This chapter discusses the objectives and scope of the project and introduces some background with respect to the problem to be solved.

- Chapter 2 Literature Review
This chapter is about previous works that have been done in tracking moving object regarding on object detection and object tracking method. It will also describe and explain how filtering was done to get a better tracking consumptions without resulting any errors by using low pass filter and morphological process.

- Chapter 3 Design Methodology
For this chapter, it will explain stages of tracking and indexing moving objects. It also will describe method or model being used in this project for better object detection and indexing which will be based on certain features.

- Chapter 4 Results and Discussion
In results and discussions, it will show and explain the evaluation on accuracy of the experiments being done for all frame image which consists of 1 moving person, 2 moving persons, 2 moving persons (intersection) and for 3 to 4 moving persons in same background environment.

- Chapter 5 Conclusion
The last chapter will conclude every single detailed in this project. It also will give some future works development which will be based on the problems occurs in this project. The future work also is based on upgrading this project to the next level.