USING UNSTRUCTURED BEHAVIOURAL TRACKING TO ESTIMATE THE QUALITY OF ARCHITECTURE DESIGN BASED ON VIDEO TRACK

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Abstract

Behavioural tracking system is needed to track and analyse the behavioural patterns of people in public space.

This paper focuses on analysing the unstructured behaviour of humans. Obtaining statically measurements about human behaviour, and estimate the quality of the design architecture by using correlated Topic Model (CTM). This means each spatial location supports more than one or multi-modal.

In unstructured behavioural tracking that supports objects with different behaviour that vary over time. This model is hard to be modelled so a statistical measure to its behaviour object is a good solution to models and trace the tracked region.

The measurements could be obtained through costly manual processes, behaviour mapping and time lapse filming with human examiners .The system analyses the behaviour of user and compares with manual counting that we can be estimate quality of architecture design.

Keywords - Unstructured behaviour track, Correlated Topic Model, Video track, Quality estimation.

1 INTRODUCTION

Now a day there is increasing interest in human behaviour analysis from video surveillance data.

The crowd recognition has received some attention in the recent years. Where researchers interesting in seeking to address the problem of detecting, tracking, and evaluating the crowed structure to understand the group level activities [1].

Behaviour assessment is an improvement step in the system. Where there is two types of behaviours assessment: online assessment, and off-line assessment.

In on-line assessment the system is immediately analyse the collected data while observation. While in off-line assessment the system analyse the collected data after reading the whole video.

Currently both methods are done manually, which is apparently low efficient, costly to collect and analyse [2].

Computer vision in the past two decades have enabled computer aided automatic or semiautomatic tracking programs. To boost the capacity of analysing a large amount of data. And to reduce the number of human observers [3].

Behaviour tracking can be divided to structure and unstructured track. The structure track moves coherently in common direction, and the direction of motion does not vary over time.

That is each spatial location of the scene supports only one domain behaviour over the video. For instance a video of a marathon race represents a structured architecture because all athletes run along the same path, thus generating behaviour has a fixed direction of motion/pattern at each location of the path.

The unstructured tracking motion appears to be -1- with different participant's moving in different directions at different times. Each spatial location supports more than one multi model, for example sporting events, railways and airports [4]. As shown in fig (1).

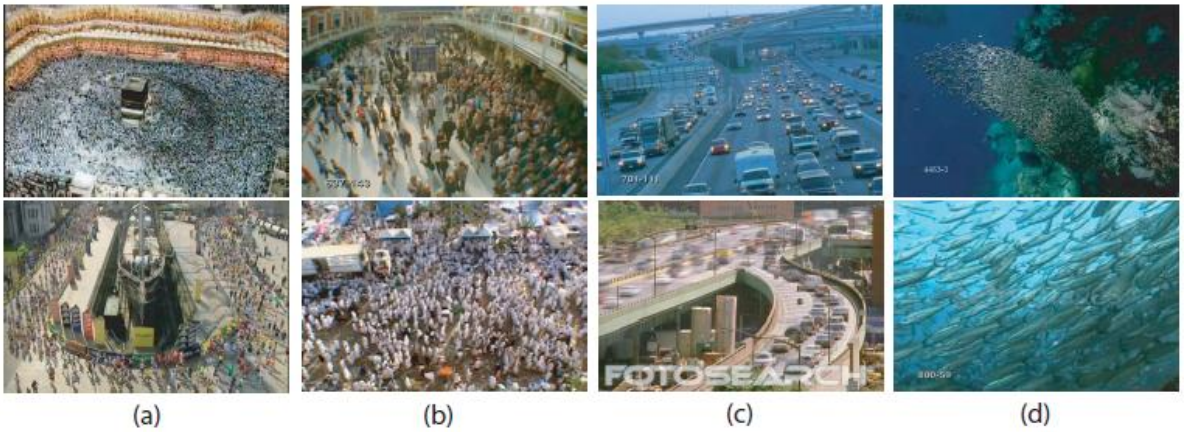

Figure 1. Several instances of structured and unstructured crowded scenes.

(a) Structured, (b) Unstructured, (c) Structured, and (d) Unstructured.

2 DESCRIPTION OF THE UNSTRUCTURED TRACKING SYSTEM

In an unstructured tracking, or multimodal based on correlated topic model (CTM). To capture different behaviours CTM provide an elegant way to handle multi-modularity of behaviour. Since each location have certain probability that belongs to certain behaviour.

CTM can obtain the statistical measurements that are needed for multiple behaviours that occurred on different special locations in the place within certain probabilistic.

Each of these behaviours can be then incorporated as high level information which can aid tracking individual in this class[5,6].

This research proposes to analyse the behaviour of people in crowded area by statistical observation and learning the system based on the collected data. To track the unmoral behaviour, like appearing of abnormal people numbers in unexpected hours.

The system analyse the crowd by detecting the people in the scene. People detection is done by detecting their heads and their upper body parts.

Mostly people in the crowded scene either have dark heads, dark upper body part, or both [7]. It is more practical to detect to detect heads. Because heads are small, and there is a good sing their chance to count people using their heads. Where heads do not tend to overlap [8].

After applying people detection. The interrelated objects linked together in the movie scenes to observe the needed statistical measures for learning data knowledge.

To describe and evaluate the proposed behavioural tracking system. A public published 8 hour video for Spoul Plaza is used. The video is an observation for Spoul Plaza in 4 days from 3PM To 5PM. During university summer session 2003.

The video resolution is 720x480 pixel RGB mode. The video is converted to Grey Level Mode.

The observation would be on two areas Fountain, and plaza. Because people behaviour in the two places are different as will described in the following sections.

2.1 PEOPLE DETECTION

In the crowed scene people are detected using their heads and upper body parts.

First the area to be monitored is selected manually and sets target region. In the Spoul Plaza video the fountain is selected as target region as shown i ...)) and plaza is excluded as background.

And to track people in the plaza the plaza is select -2- ually and the fountain is excluded as shown in Fig(2(b))

(a) fountain (b) plaza

Figure (2) Manual selection for the monitoring area

Now people detection is done by detecting heads and the upper body part, using intensity threshold to detect the darkest pixels.

Then background subtraction is done, and finally each threshold region is grouped in blobs interrelated object observation.

The output of body detecting process is shown in Fig (3) fountain area.

(a) (b) (c)

Figure 3. The steps of detecting people's heads and upper bodies in a single frame

2.2 INTERRELATED OBJECT OBSERVATION

To analyse the object behaviour there is some information about each object are needed to be collected. It is not easy to link interrelated objects between successive frames in certain video.

A Hungarian algorithm to link the blobs is applied on successive frames. Where the method will be applied based on people distance as entries to the cost matrix. As shown in Fig (4) for the Fountain region.

The method is fairly accurate, where the results mostly close to the manual counting of people.

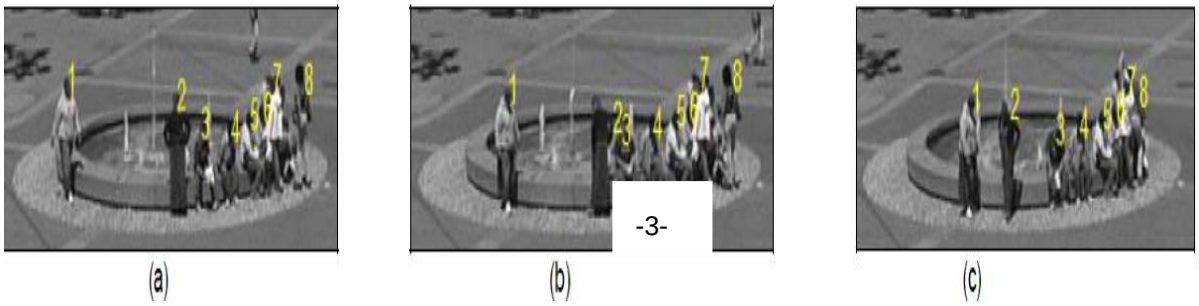

Figure 4. Image sequence shows linking people by the fountain over frames (a), (b), and (c)

2.3 Object Tracking

After motion detection, system track moving objects from one frame to another in an image

Sequence by compare the current video frame with one from previous frames or with something known as the “background”, this process of locating the moving object in a sequence of frames is known as tracking. This tracking can be performing by using the feature extraction of object and detection objects in sequence of frames. The Algorithm of object tracking is:-

Step 1 : input video

Step 2 : Convert video to sequence of frames.

Step3 : for loop process to each frame

Convert from RGB to Binary representation.

Find foreground blob image.

Apply intensity threshing on the foregrounding.

Apply Hungarian algorithm to link blobs from frame to frame.

Step 4 : Compare the result with manual count

Step 5 : display the result to explain the quality of architecture design.

3 RESULT

To validate the system performance. The proposed method is applied on two places in Spoul Plaza video (fountain and plaza).

The needed information to track people behaviour by the fountain is: how much is the average number of people that sit by the fountain? And how much is the averages of people come and stand? The average period the mostly people spend around the fountain?

For plaza region the needed information would be different since the people behaviour is changing. In the plaza usually people are moving usually in a large space and faster in speed than that in fountain. The number of people that stand is less than the number of people that stand by the fountain. The probability of overlapping by the fountain is much more than that in the plaza.

The process of detecting people in the fountain and plaza are the same. Starting by manually setting target region and detecting people normal back ground subtraction, size threshold, and finally get foreground blobs image.

For interrelated object observation in each pace for fountain the Hungarian method is used to link people. While in plaza region the same method is used but with modifying the entered people speed and distance to enhance the system learning based on environmental changing. Then apply CTM on

each scene with an association with observed statistical observed information to get the final tracking result.

By tracking the Spoul Plaza video the following information is collected:

1. The estimation number of people that sits in different places in both target regions were calculated by dividing the numbers of sitters on each type of seating by the total number of walkers entering the plaza, which is 10257+ -4- e n is a small number, show table(1) and fig(5)

Table (1): Probabilities of people entered the plaza chose to sit in different places

	Fountain	**Steps**	**Benches**	**Total**
Prob.	630/(10257+n) approx 6%	234/(10257+n) approx 2%	79/(10257+n) approx 0.7%	8.7%

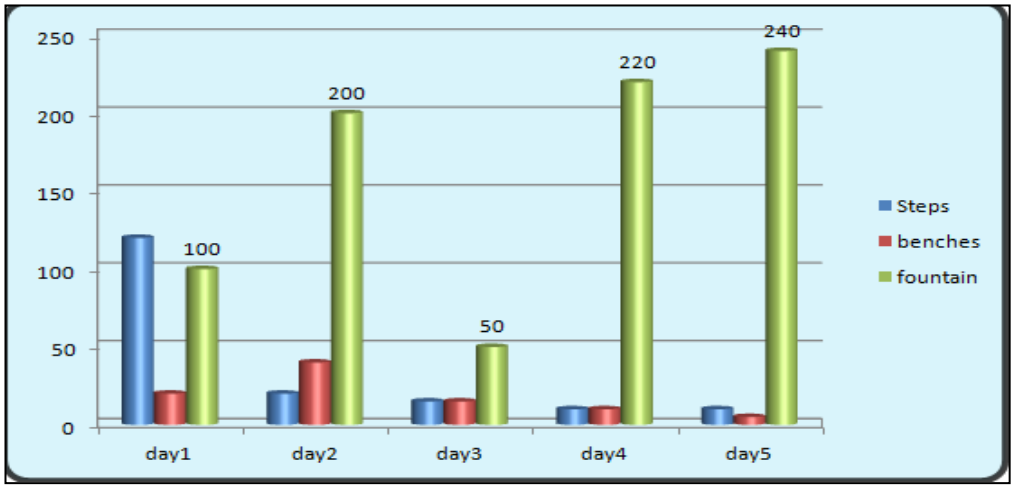

Figure 5. Numbers of people sitting in different places in different days

2. The total number of walking people in the plaza, around the fountain is shown in Fig (6)

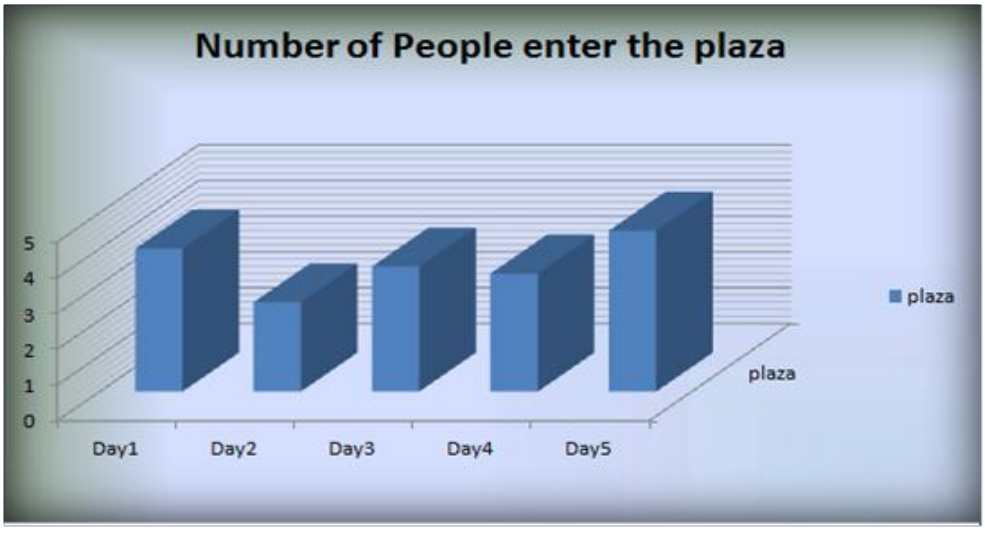

Figure 6. number of people entered the plaza in different days

The proposed system may miss counting some people due to mistaken in the detection process. But in average the result is very satisfying and close to the manual calculation.

4 CONCLUSIONS

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This work represents a frame work of unstructured behaviour track to estimate the quality of architecture design by using CTM in which each scene is associated with a set of behaviour properties, where behaviour distributions over low-level motion features .the model is capable of capturing all the correlation amongst different pattern of behaviour ,where behaviour represent the distribution over motion features .By this modal it can be obtaining important statistical measurements about user behaviour and compare them with manual counting .In order to test the proposed approach experiments are performed on a video represent a crowded domain.

conclude that computer vision techniques are likely to be remarkably effective at producing a statistical picture of how people behave in public

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