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AMID BASED CROWD DENSITY ESTIMATION

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Abstract - *In the case of visual surveillance for a wide area a challenging problem is Crowd density estimation. So major problem is the safety of people in a crowd. Hence we proposed a video based crowd density analysis and prediction system which is based on Accumulated Mosaic Image Difference (AMID) to estimate the number of people in a crowd. Our system can adequately estimate a specific number of persons and velocity of a crowd.*

Key Words: *crowd density estimation, AMID, prediction system , visual surveillance.*

1. INTRODUCTION

This system is used in surveillance systems using Closed Circuit Television where monitoring of the objects and their behavior can be done through a long period. A human observer might miss some information because monitoring crowds through CCTV are very high and cannot be performed at a time for all the cameras. Therefore, the use of automated techniques for monitoring crowds like estimating a crowd's density, tracking a crowd's movement and observing the crowd's behavior, is necessary.

Crowd density estimation is one of the important applications in visual surveillance, and it plays a useful role in crowd monitoring and management. Specially for service providers in public places, crowd density estimation systems can provide the current state of waiting for customers and thus gives valuable reference to use the limited resources more efficiently. It has many advantages: curve fitting. Still, these methods may fail if background changes gradually over time.

Foreground based methods: In [2-3], first the foreground is extracted by removing background using a reference image, then considering function of the number of foreground pixels crowd density is computed. In [4], Optical Flow and Background Model is based on LK optical flow and GEM methods. This is computed for the complete image and used for crowd density estimation. This way overcomes the shortages of optical flow and background-subtract, such as sensitiveness of light changing and producing accumulate errors. But the modeling is time-consuming. In [5], Bayes decision rule is used for classification between background and foreground and the foreground of moving crowds is detected. The number of persons in a crowd is calculated as a linear function of foreground pixels. In [6], The Changes in pixel value, are noted using an Markov Random Fields based approach. Then by minimizing a MRF-based objective function, the optimal foreground is obtained.

Feature-based methods: To detect human heads in crowds, Haar feature based head detection [7] and integral channel features [8] based head detection [9] are used. By analyzing the sizes and positions of detected heads the total number of people in a crowd is estimated, but this method may fail if the observed area is much crowded and only a few heads can be detected. In.[10], Input images are used to extract texture feature vectors. To solve the regression problem of calculating crowd density a Support Vector Machine is used. This method is inconvenient for real applications.

Group based methods: In Ref. [17], A group-based method is Proposed by authors to accurately estimate the number of people. This method deals with the entire area occupied by a group as a whole, rather than trying to detect individuals separately. In Ref. [18], A framework is proposed by authors, to segment high-density crowd flows and detect flow instabilities using Lagrangian particle dynamics. In this method, moving crowds are treated as periodic dynamical systems manifested by a time-dependent flow field. In[19] , Size of extracted crowd region is used as density measurement.

In this paper, optical flow approach is used for motion detection and estimation as a part of a preprocessing stage. The calculated dense optical flow of the frame is divided into blocks for block-based relative flow analysis. Later, the flow analysis in the region of a frame is performed, where density is needed to be estimated.

This paper focuses on crowd density estimation for many reasons. One of the aspects of developing and maintaining a crowd safety system needs to identify areas where crowds build up before the event or operation of the venue. This step is important as crowds usually present in certain areas or at particular times of the day. Areas where people are likely to assemble require careful observation to make crowd safety.Therefore, estimating crowd density gives solution for providing crowd's safety.

2. SYSTEM FRAMEWORK FOR WIDE AREA SURVEILLANCE

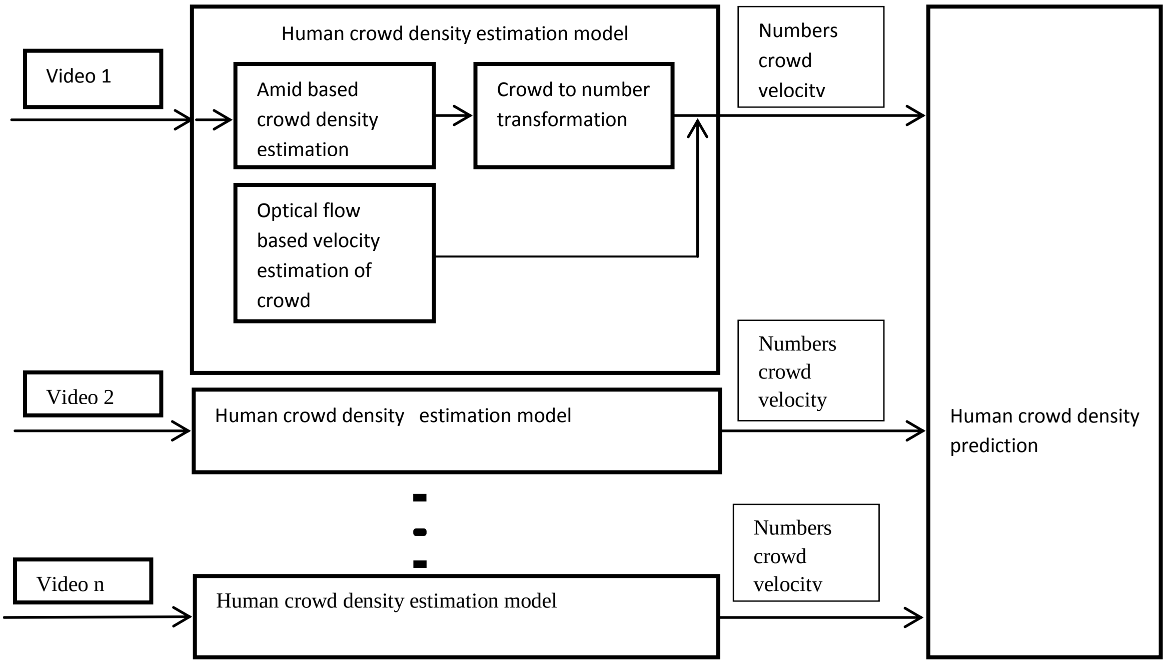


Fig-1: System Framework For Wide Area Surveillance

In Fig-1 Video is taken as input for processing. Then AMID algorithm is used to detect local image changes. To predict crowd densities, the transformation from crowd density to a number of people should be known. Optical flow based velocity estimation of a crowd is used to find the velocity of crowd density. Multiple video processing is possible for estimation of a crowd from more videos.

2.1 Image Mosaicing Process

Includes three steps:

First, registration of input images which is done by estimating the homography, in which pixels in one frame are related to their corresponding pixels in another frame.

Second, wrapping input frames, according to the estimated homography to align their overlapping regions.

Finally to build the result, paste the warped images and blend them on a common mosaicing surface.

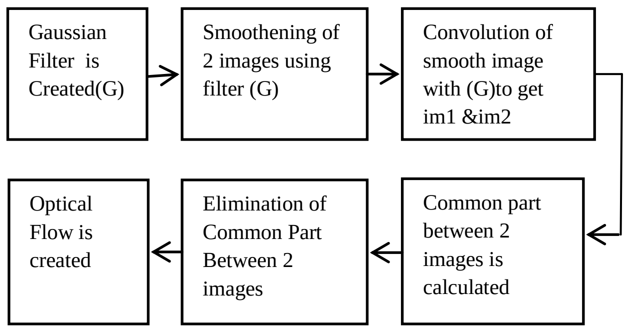
1. Image Registration: Given a set of m images $\{I_1, I_2, \ldots Im\}$ with a partial overlap between at least two images, compute an image-to- image transformation that will map each image $\{I_2, I_3, \ldots Im\}$ into the coordinate system of I_1.

2. Image Warping: From the computed transformation, warp each image,

3. Image Interpolation: resample the warped image.

4 Image Compositing: To create a single image on the reference coordinate system, blend images together

2.2 Optical Flow Determination



In Fig-2 Optical Flow determination is shown.

Fig-2: Optical Flow Determination

Initially, a Gaussian Filter is created, which can be used for smoothening of image1 (im1) and image2 (im2).Then convolution operation is performed. Then common part between two images is calculated and eliminated. So finally we get the optical flow.

2.3 Processing of Videos

In Fig-3 Motion density with respect to frame is shown. This figure is the plot, after performing AMID operation.

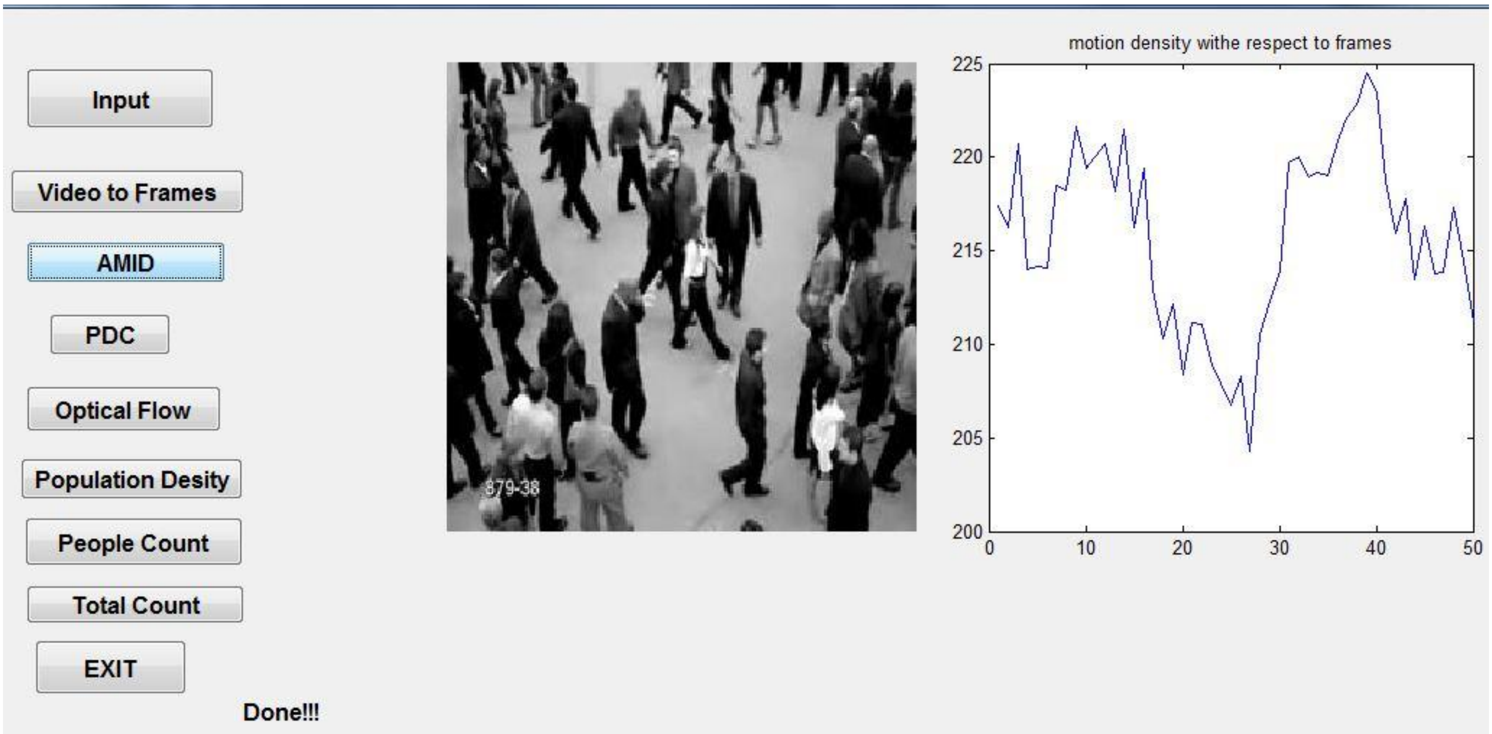


Fig-3: Motion Density With respect to Frames

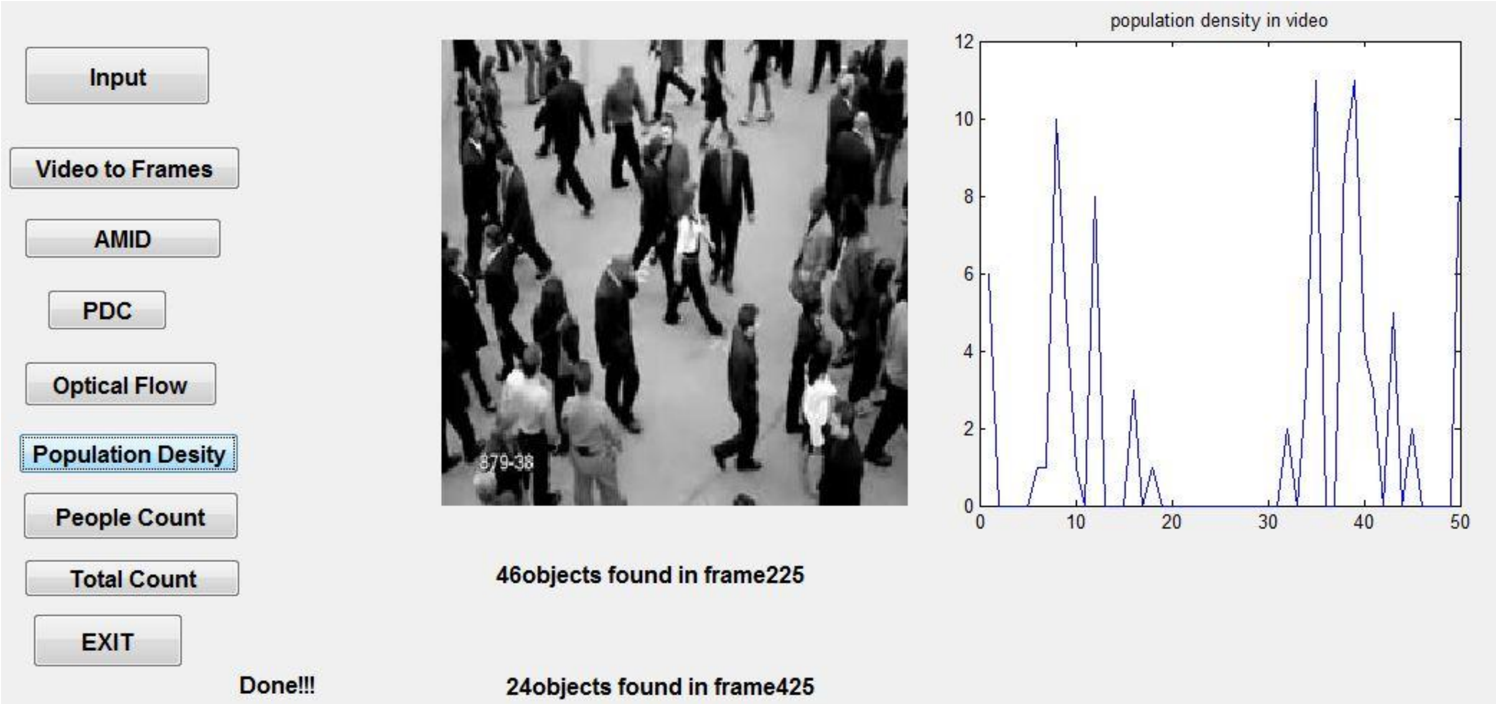


Fig-04: Population Density and Population count in video

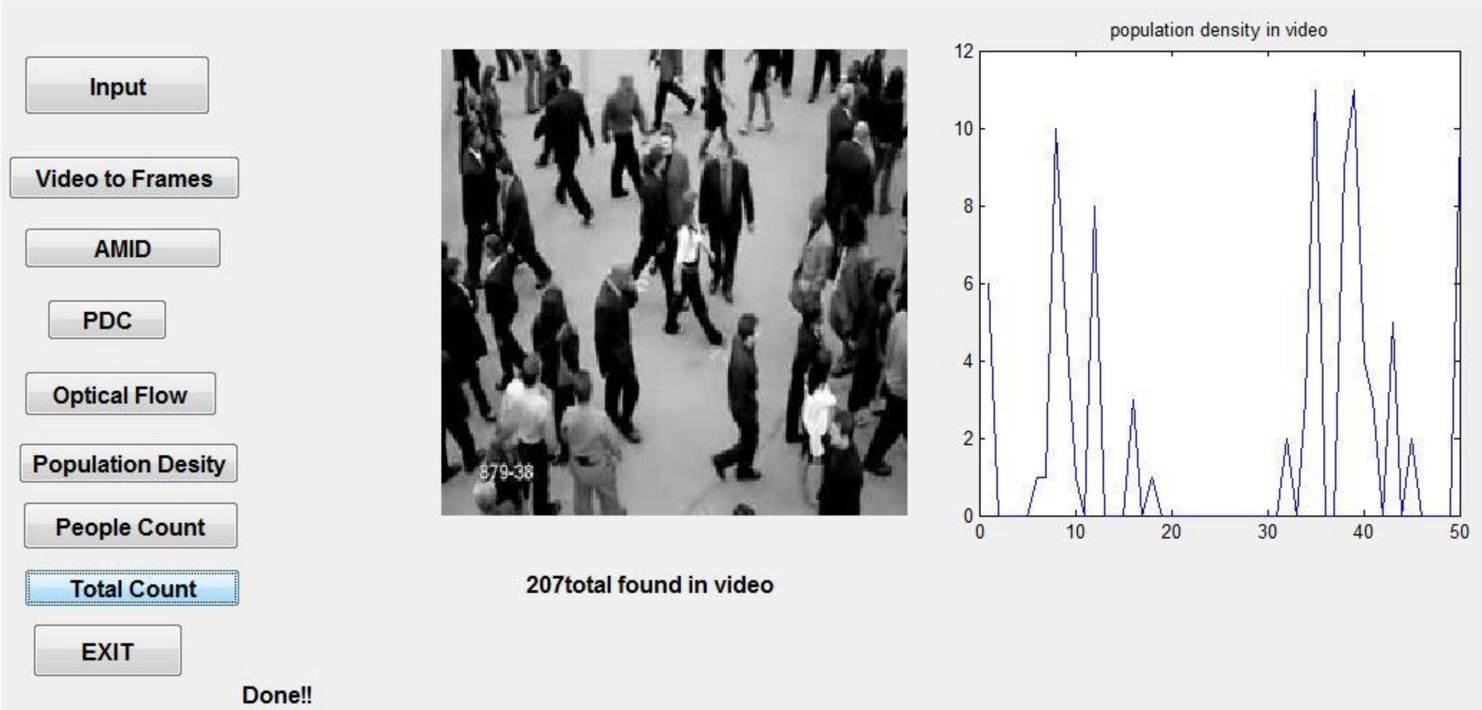


Fig-05: Total Count in Video

In fig 4. Population Density and population count are shown. Only the frames having the maximum count and the minimum count is shown here.
In fig 5 shows the total count of people in the video.

3. CONCLUSION

To estimate crowd density we have proposed AMID based approach.
The basic concept in this paper are as follow:
First, the notion intra-crowd motions are proposed.
Second, To represent the local intra-crowd motions the AMID series are proposed,
Then Population Density is calculated. So finally Population count is shown.

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BIOGRAPHIES

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