International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 04 | Apr42018 www.irjet.net p-ISSN: 2395-0072

Mob Density Evaluation using Image Processing

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Abstract - *Mob density evaluation means estimation of the overall density of the crowd. Estimating density from crowded images has a wide range of applications such as video. The proposed system uses methods such as Morphological processing, Edge detection, Feature Extraction, etc to evaluate the total number of people present in the image. The stages of operation in the proposed system are easy to implement, providing appreciable accuracy by choosing good radii for Hough Circle transformation. The number of circles obtained from the previous steps is counted to obtain the Mob Density- total number of people present in the image.*

Key Words: Mob, Density, Evaluation, Morphological, Edge detection, Feature Extraction, Hough Circle transformation, Spatial Detection.

1. Introduction.

Mob analysis has gained a lot of momentum in recent years because of its variety of applications. Human detection in crowd video scenes is getting more proliferation due to the variety of applications in crowd monitoring and tracking. For crowd analysis, automated and semi-automated solutions for density estimation and counting exist in field of computer vision. Our system employs the algorithm of Spatial Detection. The given algorithm goes through various operations to evaluate the total number of people present in an image such as Morphological processing, Edge detection, etc.[1][2][16]

2. Proposed system

The given system goes through various operations to evaluate the total number of people present in an image. It employs the algorithm of Spatial detection. After the acquisition of the image, image is converted into Double precision for making calculations more accurate. Image is converted into Gray scale to simplify the calculations. In Morphological operations, selecting structuring element, Erosion, Opening are performed in successive manner to obtain the edges of the objects in the image. Image is reconstructed for performing further calculations. Canny edge detection is done to obtain thick edges. By this process the objects 'edges become vivid which help in further computations. Hough Circle transformation is applied on the output obtained from the operation. Circles are counted by providing a range of diameter; to count only those detected circles that are within the aforementioned range. To visualize the output, markers are generated on the chosen circle. [1][2][16]

3. Spatial Detection Algorithm.

STEP 1: Start

STEP 2: Image Acquisition

STEP 3: Color Space transformation

1. Image Enhancement-converting image into double precision
2. RGB to Gray scale image

STEP 4: Morphological processing

1. Choosing the structure element.
2. Erosion
3. Opening

STEP 5: Reconstruction of image

STEP 6: Edge Detection

STEP 7: Feature Extraction

STEP 8: Searching for circles using Hough circle transform

STEP 9: Evaluating the total count -counting the number of circles.

STEP 10: Stop

4. Result

Result						
Sr. no.	Image number	Lower Radii	Upper Radii	Approx. Evaluated count	Approx.Ground truth	Approx. Accuracy %
1	1	6	11	56	52	92.31
2	2	5	11	1007	1265	79.0
3	3	4	11	1271	1487	85.47
4	4	2	11	1126	945	80.86
5	5	10	20	211	257	82.19

Table -1 : Result comparisons.

5. Accuracy:

Average Accuracy is approximately 83.96% .The output calculated can have approximately 8-9% of false positives.

6. Sample Output

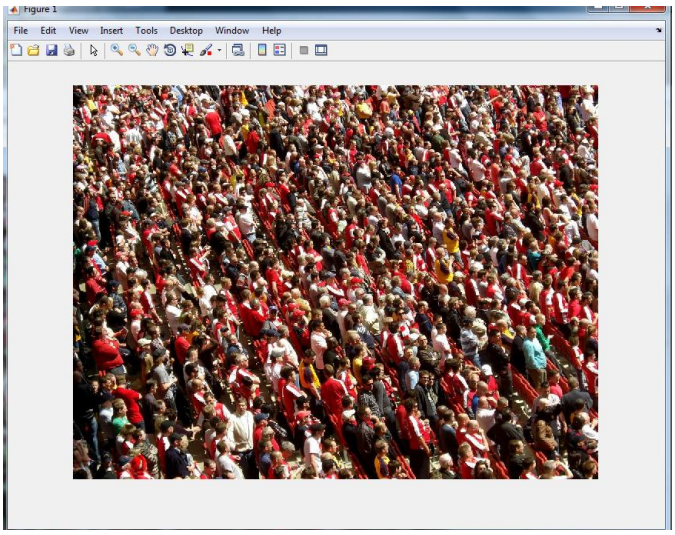

Figure-1: Input Image

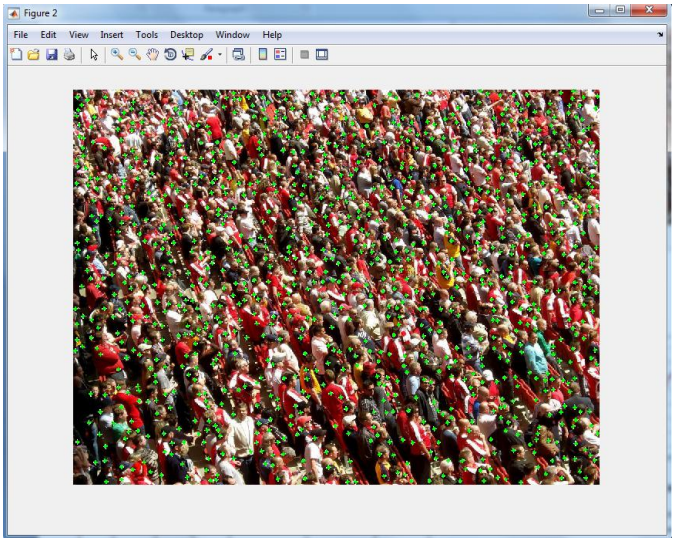

Figure -2: Image with output.

7. Applications

1. The given system is designed to be deployed in the areas of crowd management.
2. It can be used in Airports
3. It can be used in stadiums to monitor the crowd movement.
4. It can be used in Subways, Metro stations, etc.
5. It can be used for places having religious gatherings, concerts, etc.[14][4]

8. Scope

With the inclusion of clustering algorithms like K-means clustering algorithm, Hierarchical clustering, the system might be made from human help to choose radii range for Hough Circle transformation. This would result in greater automation of the crowd monitoring process. The algorithm can also be trained using the unsupervised or supervised algorithms. The system will be able to lean the radii range of the objects (People) to be counted. Also the algorithm can be used for processing on videos. With its optimized version and initial configuration, it can also be used for real time processing. The system doesn't need to process all the frames but it can choose only those frames from the video where there are drastic changes. [4][15]

9. Conclusion

The Spatial detection algorithm is an easy to implement algorithm which gives appreciable results if a good radii is chosen. System goes through stages such as Morphological transformation, Edge detection, Hough Circle transformation to evaluate the total number of people present in an image. With good radii chosen ,the accuracy can be in the excess of 80%. The system can be used for crowd monitoring areas such as airports, concerts, Railway stations, etc . By also implementing the clustering algorithms like K-means algorithm, Hierarchical algorithm, etc. There might not be a need to manually choose the radii range for Hough Circle transformation. [1][15]

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