Crowd Computing

APRIL 1

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PROBLEM STATEMENT

To detect the objects and compute the number of people in crowd.

DATASET

The dataset is made up of RGB images from video frame inputs that count the number of pedestrians (the object in the image) in each frame. A webcam in a mall captured three channels of 480x640-pixel photographs of the same location, but each channel showed a different number of people, creating a challenge with crowd counts.

A single Frame

The dataset was annotated exhaustively by labelling the head position of every pedestrian in all frames.

Annotated frame

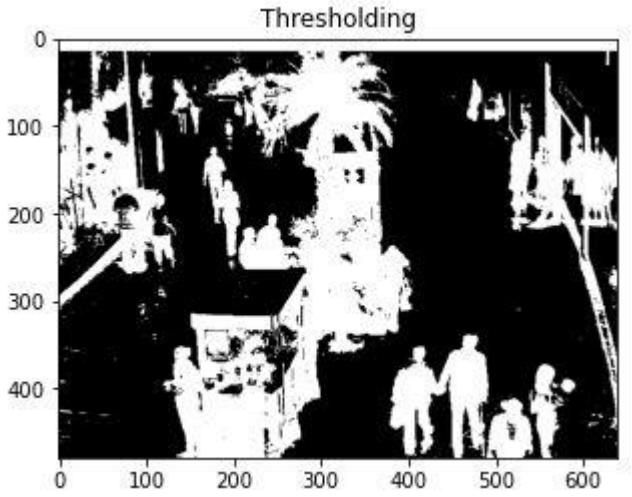
Video length: 2000 frames
Frame size: 640x480
Frame rate: < 2 Hz
Dataset Link: https://www.kaggle.com/datasets/fmena14/crowd-counting

IMPLEMENTATION

Algorithms and Models Applied

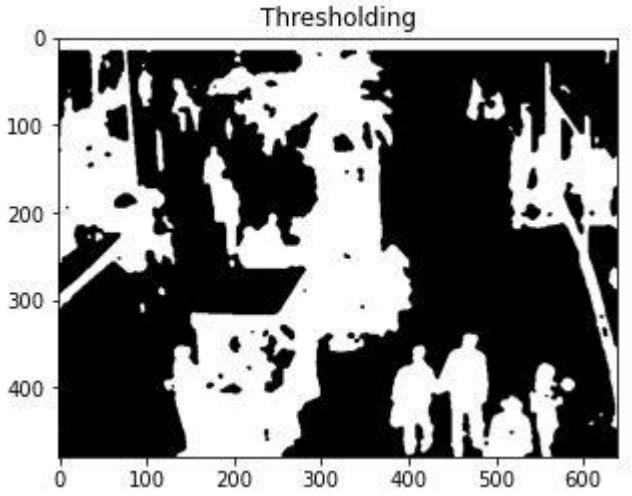
Object Detection has been demonstrated using classical computer vision by applying following methods:

1. Correct gamma to update the brightness and contrast of the image
2. Apply adaptive threshold by getting the mean of the pixels and converting the values below mean to 0 and rest to 1



Thresholding on image

3. After this, we dilate and erode the image to improve the smoothness and texture.



Dilute Errode

4. Used the median blurring technique to remove the noise from the processed image
5. finally, we use the connected Components function which helps in getting all the components in the image.

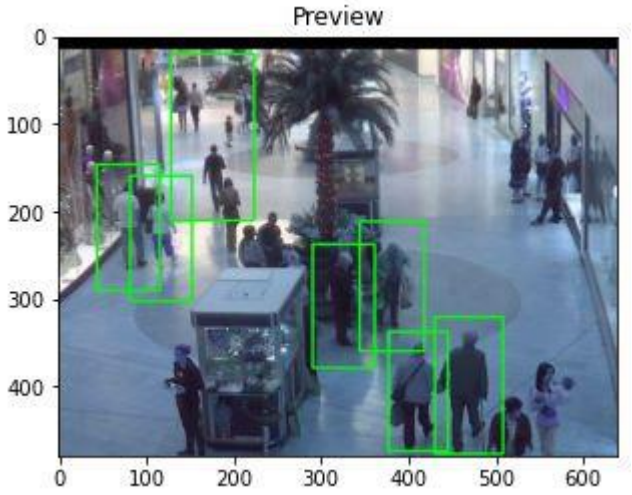
HOG Histogram of oriented gradients

A well-liked feature descriptor in computer vision for object detection and recognition is called HOG (Histogram of Oriented Gradients).

The local gradient orientation distribution of an image is represented by the HOG descriptor. The calculation involves breaking the image up into small cells, determining the gradient orientation for each pixel in each cell, and creating a histogram of the gradient orientations for each cell. The feature vector for the full image is created by concatenating these histograms.

The HOG descriptor has a number of benefits, including being reasonably computationally efficient and being resistant to changes in scale, rotation, and lighting. Many applications, such as pedestrian detection, face detection, and object recognition, have been effectively deployed with it.

1. **Applying HOG on complete image**



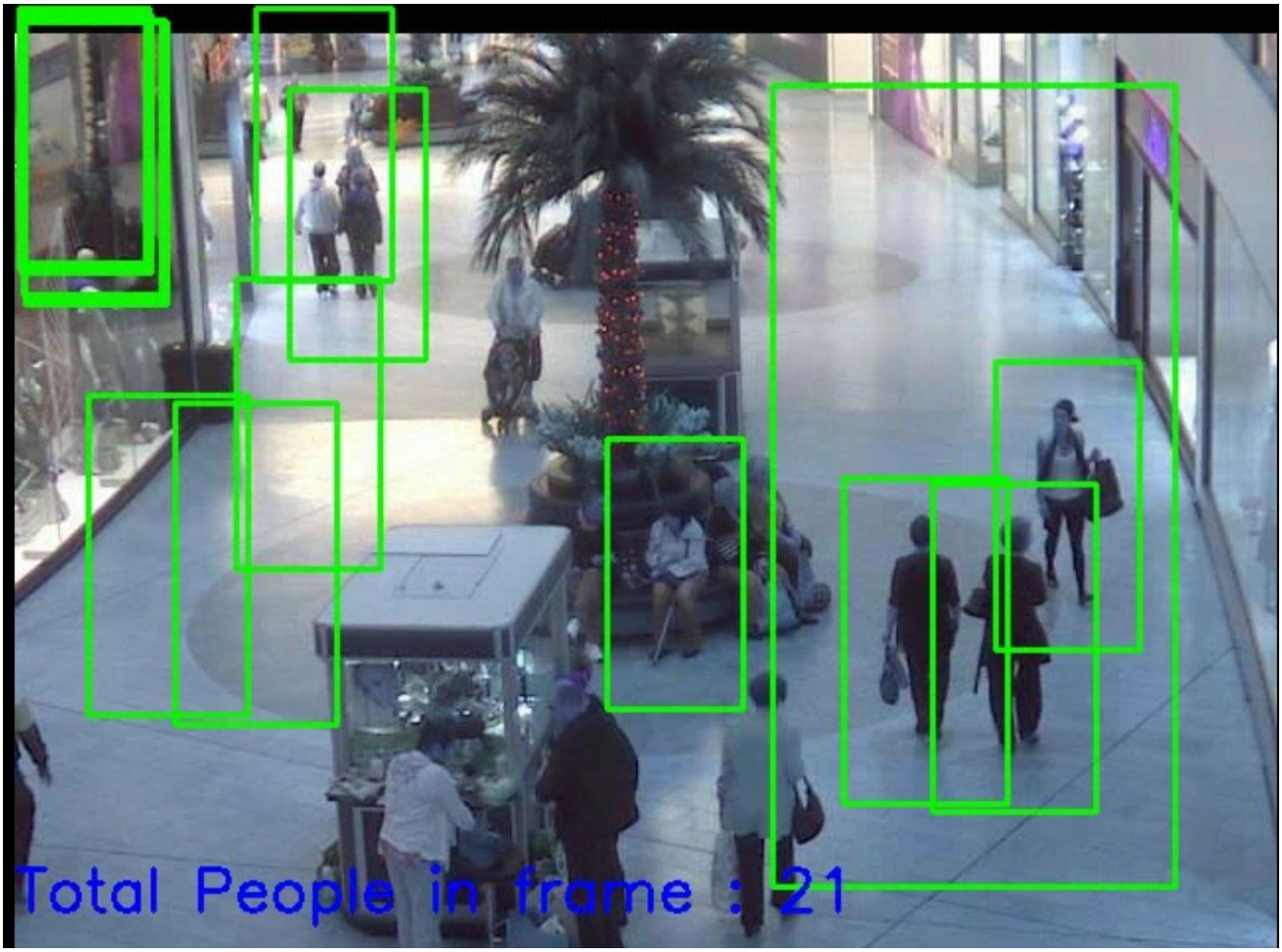
Try on complete image in one go

2. **Recursively applying HOG**

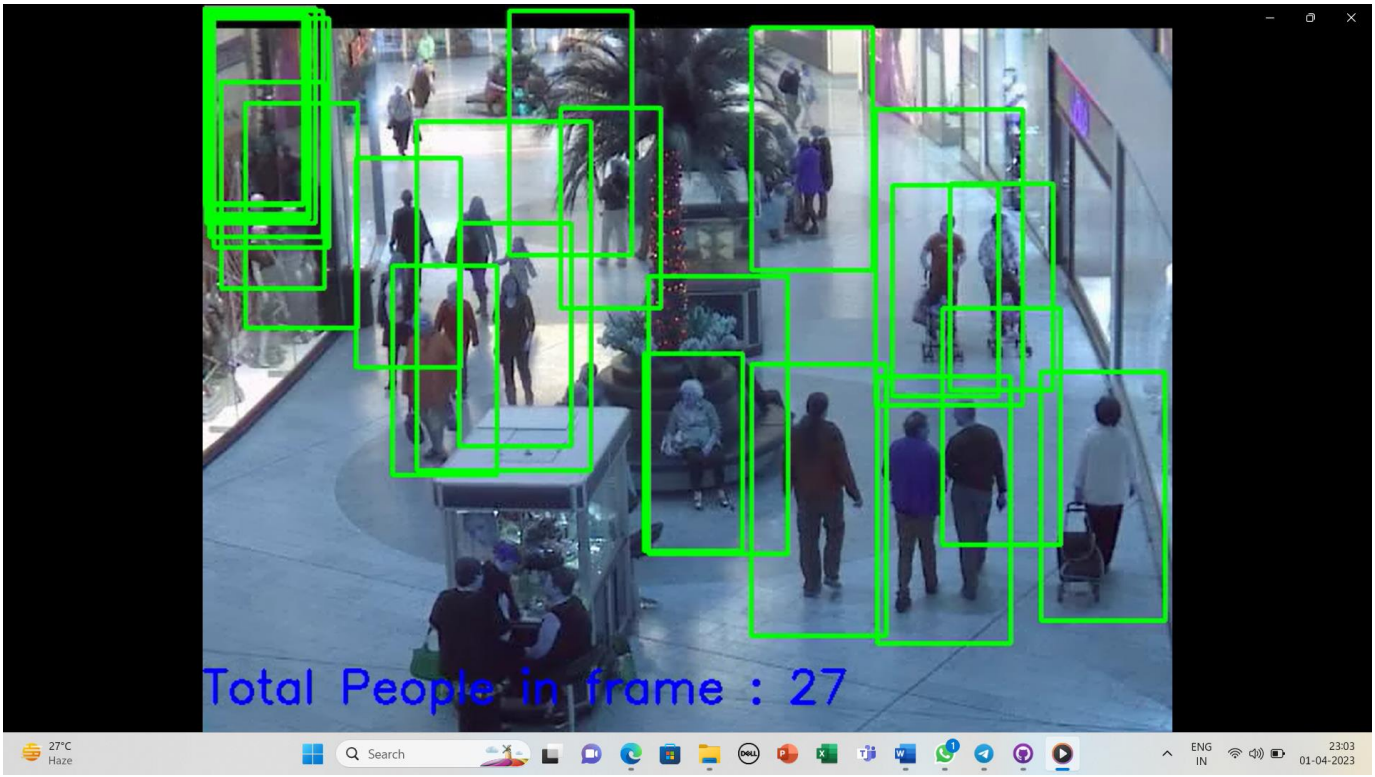
HOG recursive to extract more people

RESULTS

The video has been produced detecting the people in the video and counting the number of humans in the process for 1 minute. The link is given below for the video and some sample screenshots are given below taken from the video.



People detected with number of people



Detection of humans and counting their numbers

Video Link: https://github.com/Mayank-Gupta1805/Object-People-Detection/blob/main/Crowd%20Computing%20Cv%20Project.mp4

FUTURE SCOPE

1. Deep learning models can be used to increase accuracy.
2. Object identification can be implied after being detected.
3. Larger number of datasets can be used at various different types of locations and lighting so as to increase its usability in real world.
4. Mannequin can be ignored.