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APSIT Skills
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APSIT SKILLS INTERNSHIP – PROJECT ABSTRACT

BE COMPUTER: Batch 2

Project Batch: 2

Team Members Names :

Pradipt Kalamkar (Leader)

Technology Selected: Python3, OpenCV

Project Topic Name :

Basic Human Movement Detection using Python3

Domain: Digital Image Processing

Topic Description :

- In today's modern world of CCTVs and surveillance, many systems are being developed to track human motion in order to keep an eye on any suspicious person or his activity.
- For this, our first step will be to detect every person in the frame of the camera properly.
- Hence, our aim in this project will be developing a system that should detect all moving objects in our camera frame with a minimal number of errors.
- The objective of this project will be to develop a system that should detect moving objects using Computer Vision (OpenCV library) in Python3.

Technologies Used:

- Python3
- Libraries used :
  -OpenCV – For our processing our frames.
  -NumPy – For use of arrays.
- IDE: Jupyter Lab

Detailed Workflow :

1. Importing Libraries that we will need.

OpenCV as cv2 and NumPy as np (NumPy library provides a high-performance multidimensional array and basic tools to compute with and manipulate these arrays. SciPy builds on this, and provides a large number of functions that operate on NumPy arrays and are useful for different types of scientific and engineering applications.)

2. Capturing the Video (In our case we will use a test video)

We will use the *VideoCapture* method for this.

3. Convert the image into its grayscale.

We will use the *cvtColor* method for this

4. Blur and carry out the filtering process on the video.

We will use the Gaussian Blur and Simple thresholding. We have also used the dilate method to fill the holes.

GaussianBlur

dst = cv.GaussianBlur(src, ksize, sigmaX[, dst[, sigmaY[, borderType=BORDER_DEFAULT]]])

Parameter	Description
src	input image
dst	output image
ksize	Gaussian Kernel Size. [height width]. height and width should be odd and can have different values. If kernel size is set to [0 0], then ksize is computed from sigma values.

sigmaX	Kernel standard deviation along X-axis (horizontal direction).
sigmaY	Kernel standard deviation along Y-axis (vertical direction). If sigmaY=0, then sigmaX value is taken for sigmaY
borderType	Specifies image boundaries while kernel is applied on image borders. Possible values are : cv.BORDER_CONSTANT cv.BORDER_REPLICATE cv.BORDER_REFLECT cv.BORDER_WRAP cv.BORDER_REFLECT_101 cv.BORDER_TRANSPARENT cv.BORDER_REFLECT101 cv.BORDER_DEFAULT cv.BORDER_ISOLATED

Image thresholding is one of the simplest methods to separate regions which are higher than the set threshold.

Two broad types are

1. Simple or Global thresholding: Where one provides the threshold value as an input constant. This threshold is applied for all pixels of the image.
2. Adaptive thresholding: where the threshold is not a constant scalar - rather a distribution that is applied over a small window of pixels.

The first argument is the source image, which should be grayscale.
The second argument is the threshold value which is used to classify the pixel values.
The third argument is the maximum value which is assigned to pixel values exceeding the threshold.

OpenCV provides different types of thresholding which is given by the fourth parameter of the function. Basic thresholding as described above is done by using the type cv.THRESH_BINARY. All simple thresholding types are:

- **cv.THRESH_BINARY**
- **cv.THRESH_BINARY_INV**
- **cv.THRESH_TRUNC**
- **cv.THRESH_TOZERO**
- **cv.THRESH_TOZERO_INV**

The method returns two outputs. The first is the threshold that was used and the second output is the **thresholded image**

Dilate

cv.**Dilate**(src, dst, element=None, iterations=1) → None

Parameters:

- **src** – input image; the number of channels can be arbitrary, but the depth should be one of CV_8U, CV_16U, CV_16S, CV_32F` or ``CV_64F.
- **dst** – output image of the same size and type as src.
- **element** – structuring element used for dilation; if element=Mat() , a 3 x 3 rectangular structuring element is used.
- **anchor** – position of the anchor within the element; default value (-1, -1) means that the anchor is at the element center.
- **iterations** – number of times dilation is applied.
- **borderType** – pixel extrapolation method (see **borderInterpolate()** for details).
- **borderValue** – border value in case of a constant border (see **createMorphologyFilter()** for details).

5. Find Contours.

What are contours?

Contours can be explained simply as a curve joining all the continuous points (along the boundary), having the same color or intensity. The contours are a useful tool for shape analysis and object detection and recognition.

Contours is a python list of all contours in the image.

Each contour is a NumPy array of (x,y) coordinates of object boundaries.

Syntax:

contours, hierarchy = cv.findContours(thresh, cv.RETR_TREE, cv.CHAIN_APPROX_SIMPLE)

See, there are three arguments in **cv.findContours()** function,

The first one is the source image

second is contour retrieval mode,

third is the contour approximation method

Outputs given are the contours and hierarchy (optional o/p vector containing information about image topology)

6. **Once contours are located, highlight the movement using boxes.**

   This is a relatively easy step where use the boundingRect, rectangle(for the shape), and puttext methods.

putText

cv2.putText() method is used to draw a text string on any image.

Syntax: cv2.putText(image, text, org, font, fontScale, color[, thickness[, lineType[, bottomLeftOrigin]]])

Parameters:
image: It is the image on which text is to be drawn.
text: Text string to be drawn.
org: It is the coordinates of the bottom-left corner of the text string in the image. The coordinates are represented as tuples of two values i.e. (**X** coordinate value, **Y** coordinate value).
font: It denotes the font type. Some of font types are **FONT_HERSHEY_SIMPLEX, FONT_HERSHEY_PLAIN,** , etc.
fontScale: Font scale factor that is multiplied by the font-specific base size.
color: It is the color of text string to be drawn. For **BGR**, we pass a tuple. eg: (255, 0, 0) for blue color.
thickness: It is the thickness of the line in **px**.
lineType: This is an optional parameter.It gives the type of the line to be used.
bottomLeftOrigin: This is an optional parameter. When it is true, the image data origin is at the bottom-left corner. Otherwise, it is at the top-left corner.
Return Value: It returns an image.

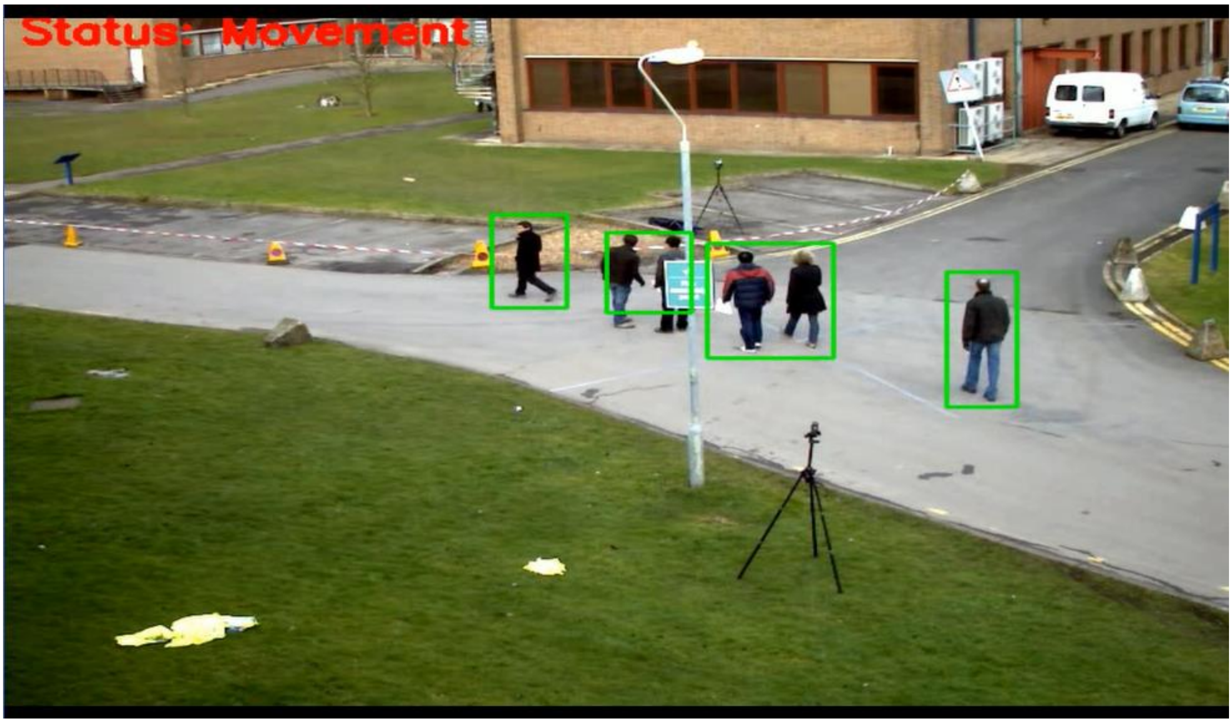
7. **Give the output video and save it.**

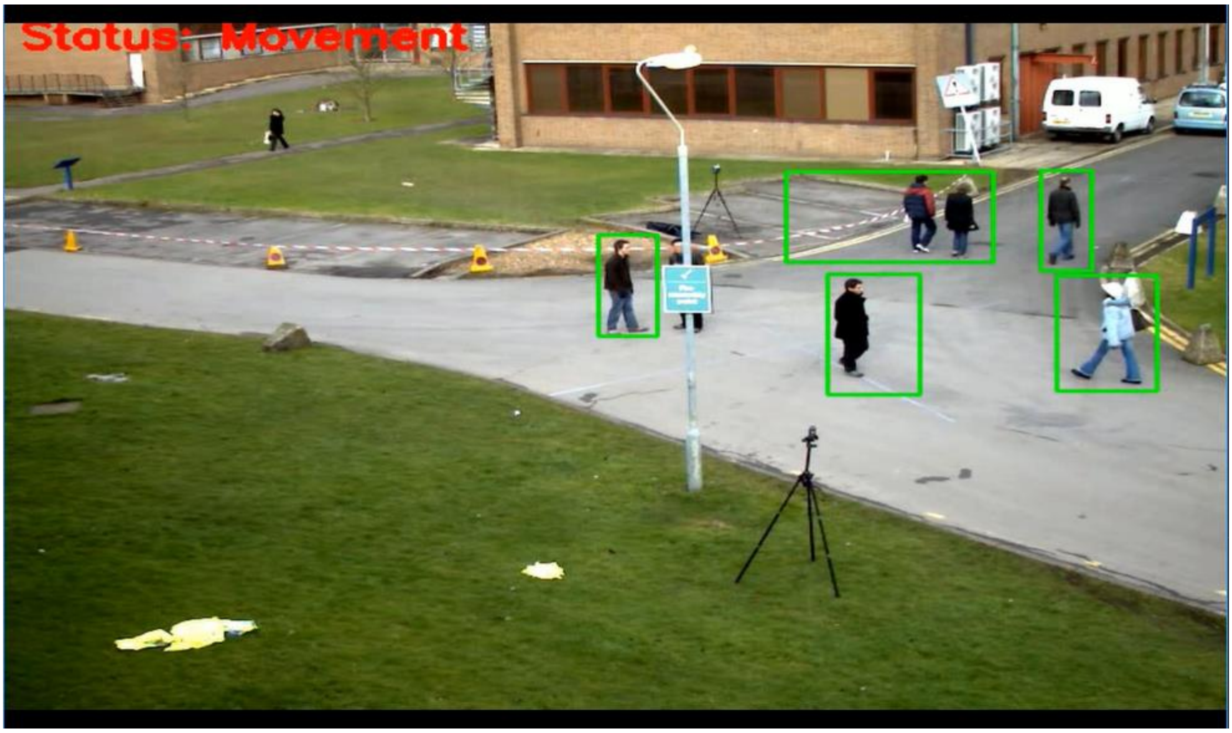
   We will use the write and iamshow methods in this final step.

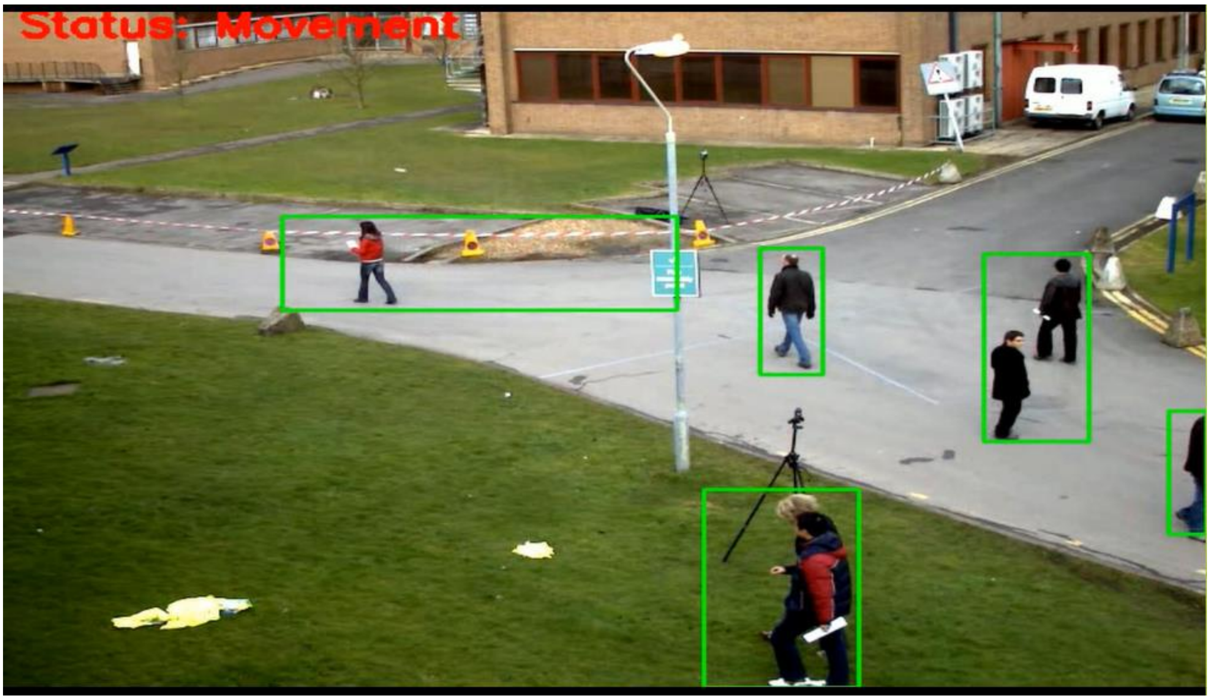
GitHub / Drive link of project :

https://drive.google.com/drive/folders/1kwKXZgV9xjxpmsB7ifQFWXesxFPiZuI7?usp=sharing

Output Screenshots :




Status: Movement


Status: Movement

References :

- D. Lee, H. Suk, S. Park and S. Lee, "Motion Influence Map for Unusual Human Activity Detection and Localization in Crowded Scenes", *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 25, no. 10, pp. 1612-1623, Oct. 2015.
- Arun Kumar Jhapate ; Sunil Malviya ; Monika Jhapate Unusual Crowd Activity Detection using OpenCV and Motion Influence Map https://ieeexplore.ieee.org/document/9170704/
- Varsha Shrirang Nanaware, Mohan Harihar Nerkar and C.M. Patil, "A Review of the Detection Methodologies of Multiple Human Tracking & Action Recognition in a Real Time Video Surveillance", IEEE International Conference on Power Control Signals and Instrumentation Engineering (ICPCSI-2017).

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