Shri Ramdeobaba College of Engineering and Management

Department of Computer Science and Engineering

VEHICLE DETECTION & RECOGNITION SYSTEM

Group No. 14

Shift 2

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Problem Definition

VEHICLE DETECTION & RECOGNITION SYSTEM IN A DYNAMIC ENVIRONMENT

- Vehicle detection and counting is important for many applications such as surveillance, traffic management, and rescue tasks.

- The ability of on-line monitoring of vehicles distribution in the urban environments prevents traffic jams and congestions which in turn reduces air and noise pollution. Our aim focuses on “**Vehicle Detection, Tracking & Counting**".

Project Objectives

- Detection and classification of the vehicles (car, truck).
- Counting the number of vehicles passing in the video.

Scope

- This project can be used anywhere across the world and it is scalable.
- The future working in this project may be on Number Plate Recognition
- It can be extended to prediction of speed & color of vehicles.

Implementation Methodologies [Algorithm, Technologies, Tools, Datasets etc]

Tools Used

- Programming Language - python3
- Anaconda
    - package of multiple libraries and IDEs
    - Jupyter Notebook
- Libraries
    - Opencv - pip install opencv-python
- Algorithms -
    - Background subtraction algorithm- BackgroundSubtractorMOG2.
    - Morphological transformation operations.

Algorithms

- **BackgroundSubtractorMOG2** is a major preprocessing steps in many vision based applications.

- If you have an image of background alone, like image of the room without visitors, image of the road without vehicles etc, it is an easy job. Just subtract the new image from the background. You get the foreground objects alone. But in most of the cases, you may not have such an image, so we need to extract the background from whatever images we have. It become more complicated when there is shadow of the vehicles. Since shadow is also moving, simple subtraction will mark that also as foreground.

- It is also a Gaussian Mixture-based Background/Foreground Segmentation Algorithm. It is based on two papers by Z.Zivkovic, “Improved adaptive Gausian mixture model for background subtraction” in 2004 and “Efficient Adaptive Density Estimation per Image Pixel for the Task of Background Subtraction” in 2006. One important feature of this algorithm is that it selects the appropriate number of gaussian distribution for each pixel

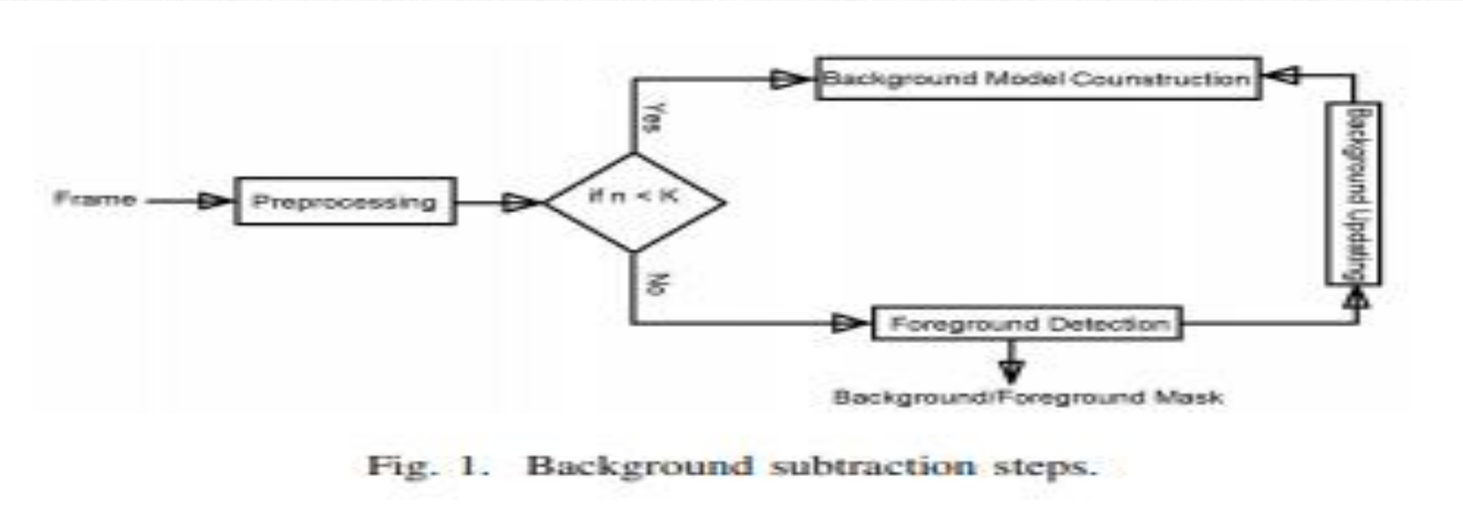
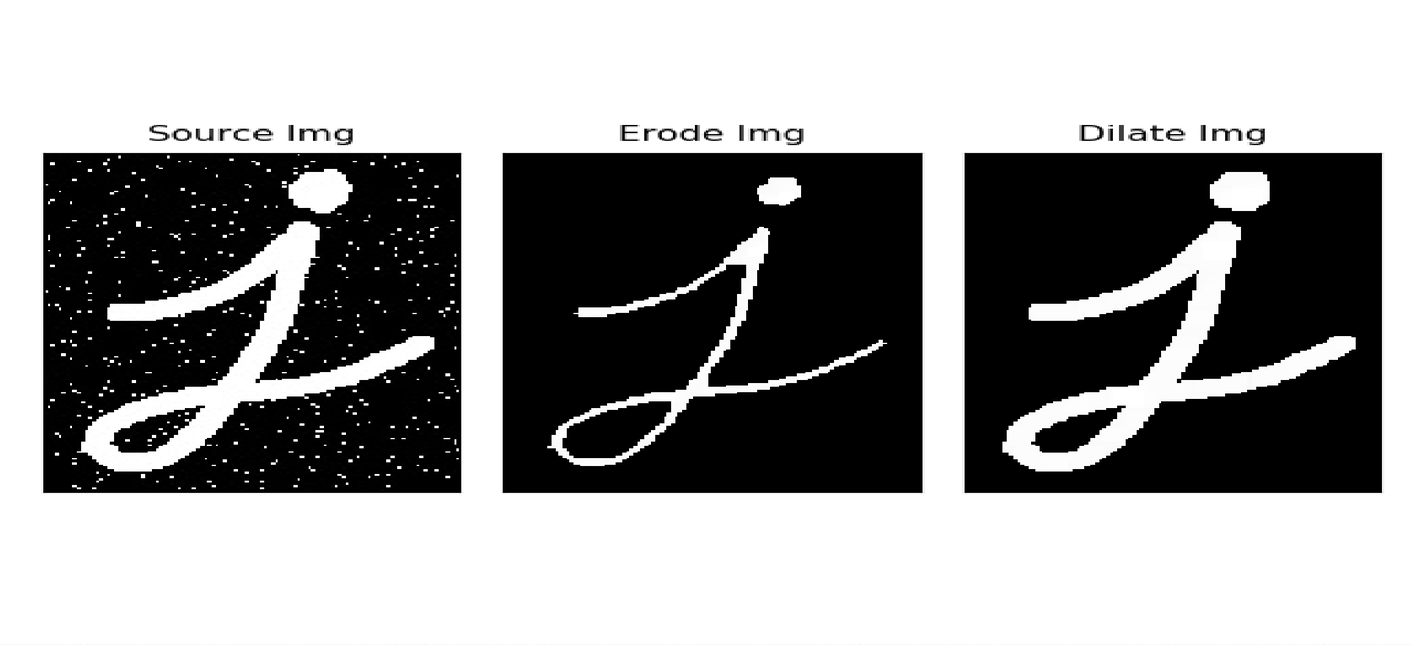


Fig. 1. Background subtraction steps.

Morphological Transformation

Morphological transformations are some simple operations based on the image shape. It is normally performed on binary images. It needs two inputs, one is our original image, second one is called **structuring element** or **kernel** which decides the nature of operation. Two basic morphological operators are Erosion and Dilation. Then its variant forms like Opening, Closing, Gradient etc also comes into play.

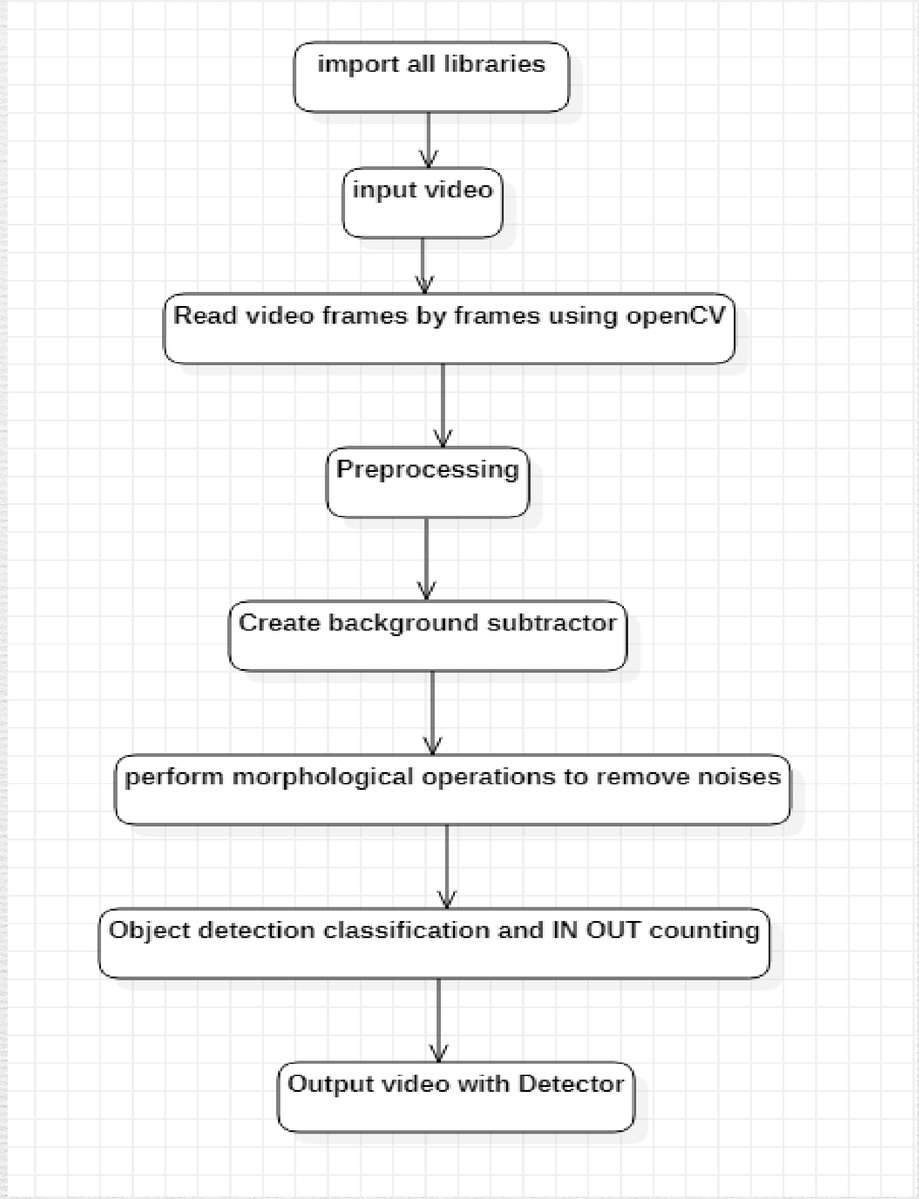


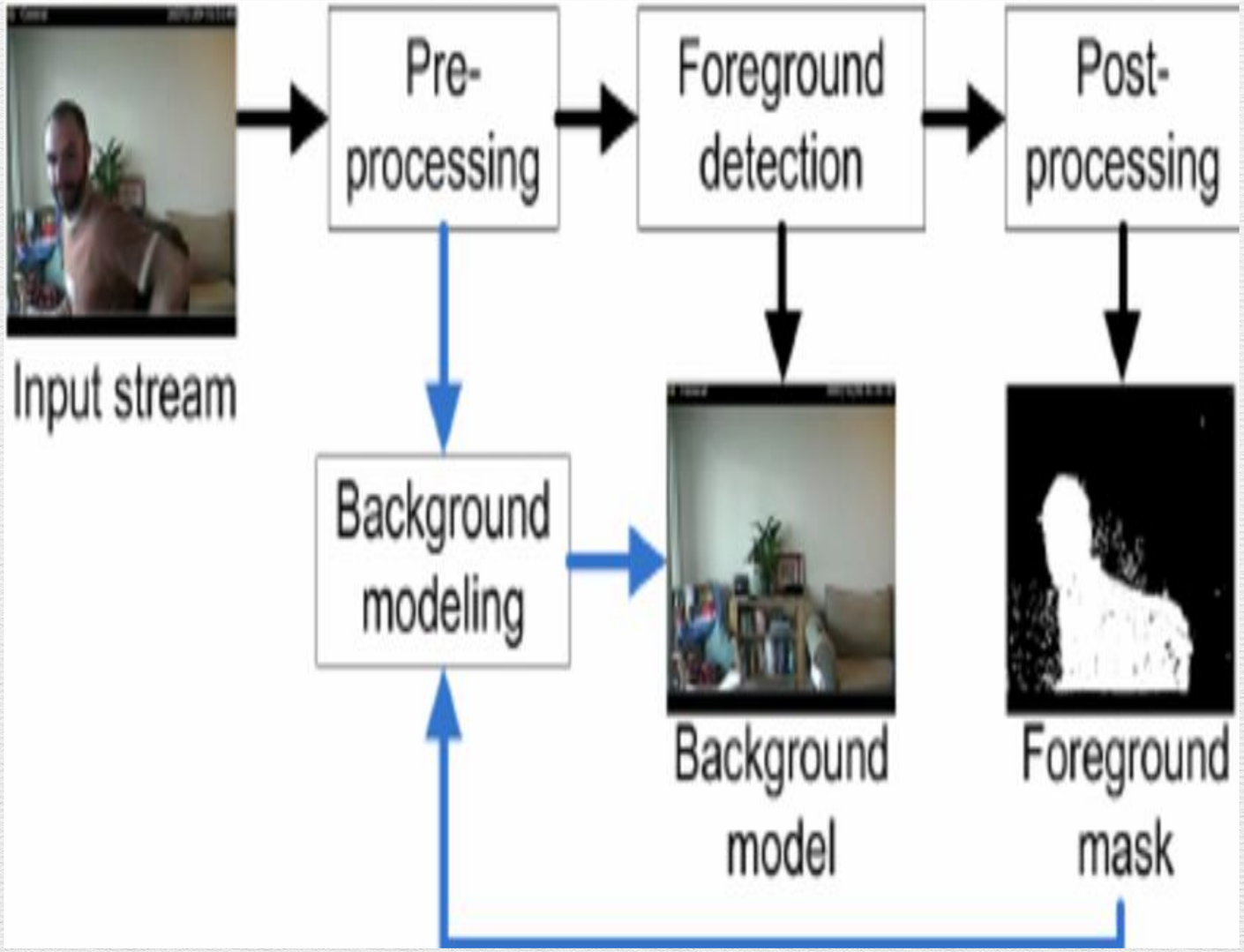
Implementation Methodologies

Giving video as an input and reading the video frame by frame using OpenCv.

Vehicle detection, classification and counting will be developed using background subtractions methods of OpenCV Library of Python and morphological transformations.

Data flow diagrams




Input stream
Pre-
processing
Foreground
detection
Post-
processing
Background
modeling
Background
model
Foreground
mask

Usefulness/ Application of the Projects with respect to society/ Environment etc

- Traffic Management - Reduce air and noise pollution
- Rescue task
- Surveillance
- Automated parkings
- Automated toll plaza

References

- https://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_imgproc/py_morphological_ops/py_morphological_ops.html
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- https://docs.opencv.org/master/d9/df8/tutorial_root.html
- https://www.researchgate.net/publication/326902920_Review_-_Moving_object_detection_using_background_subtraction/link/5b6b1718299bf14c6d953a9c/download

Thank You

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