Technology Bucket : Smart Communication
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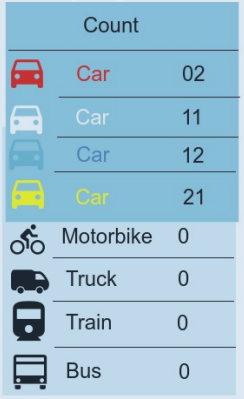
Category:Hardware
Problem Code :AM1
College Code : 1-3508248462

Idea

- We will use Tensorflow object detection API which is an open source google framework built on top of TensorFlow that makes it easy to construct, train and deploy object detection models and categorise vehicles as car,truck,bike ,emergency and also detect protest and accident.
- For prediction of traffic we have used Mask R-CNN (Region Convolutional Neural Network) which was released recently(2017).
- This model generates bounding boxes(box around the object) and segmentation masks (creates a mask over object like shown in the diagram below) for each instance of an object in the image.
- The user can create prediction box (like red box shown below) which will to avoid all the vehicles which are need not to be counted as they are not in the signal range(waiting for signal) like the vehicles which are parked.
- We will train a special SoftMax layers for prediction of ambulance, fire vehicle.
- We will be using Jetson Tx1 AMR based computer on a module, powered by NVIDIA Pascal architecture like that of raspberry pi but much power.So the processing will take place at junction only so no need of cloud computing which many cause delay in prediction.
- The system will automatically get shut down and save energy ,whenever there is very less frequency of vehicle like at night.

Prototype

- In Dashboard the red indicates the numbers of cars that violets the zebra crossing or passed through that red area box indicates that vehicle voileted the signal.
- Other white , Blue and yellow colour shows count of vehicles in that range.
- The diagram below where the vehicles going in opposite direction can be avoided by making prediction boxes which help to recognise all the vehicle inside yellow box.
- This will help in way that we need not have to change the direction and arrangement of existing CCTV's it will simply avoid all the other vehicles not in the range.
- Here as in dashboard the yellow has max count of vehicles (21) then that signal will go green till minimum number of vehicles(like 2 or 3 vehicles can be set by operator) or maximum time limit is reached this both paraments can be decided according to width and frequency of traffic of that area .
- Linking CCTV help to link all CCTV's associated with a single junction. And all CCTV's can be combine for prediction.
- If a Emergency vehicle is detected in any lane then regardless of traffic it will give green to that lane.

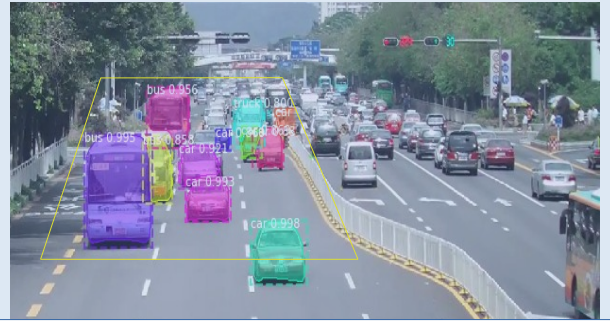


Crop area for prediction

Link CCTV

Start System

Dashborad showing live object dection

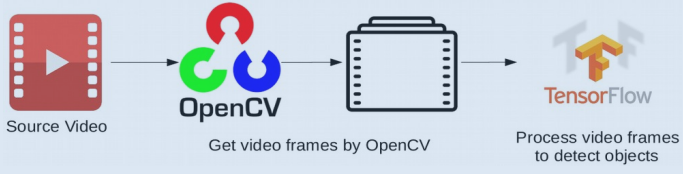


Link 1 or more CCTV (here only 1 is linked)

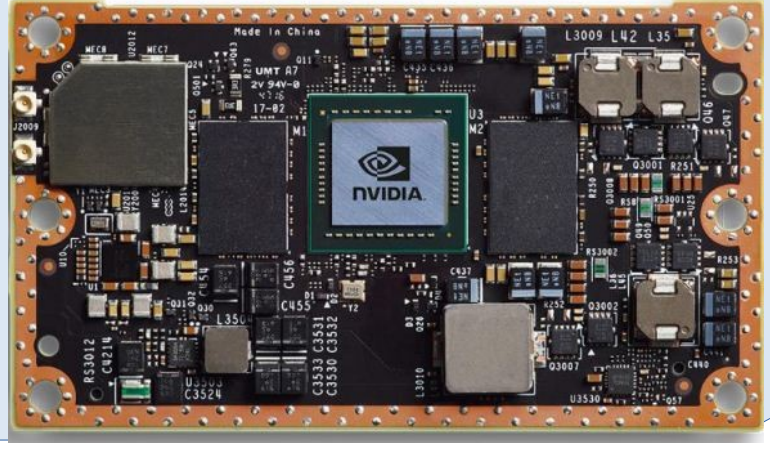
Croping area helps to detect vehicles Only in range

Technology Stack

- **Python 3.6** or any version of python-3
- **Python-tk** : Graphical user interface as shown in prototype
- **Opencv** : Takes input frame by frame,it then manipulation and calculation Image pixel (making crop for virtual reality like red colour prediction box made by operator shown in 1st slide).
- **Jetson Tx1 :** AI ARM based computer on a module, powered by NVIDIA Pascal architecture.
- **Tensorflow object detection API**
- **Protobuf 3.0.0** : Platform-neutral, extensible mechanism for serializing structured data
- **Pillow 1.0** :Python Imaging Library adds support for opening, manipulating, and saving many different image file formats
- **Lxml** : Library for processing XML and HTML data.
- **mask_rcnn_inception_v2_coco** :COCO-trained models
- **Matplotlib** : To render the plots
- **Cython** :Superset of the Python programming language,
- designed to give C-like performance
- **Contextlib2 :** Context manager



Jetson Tx1



Use case

Operator

- Make prediction boxes by simple mouse click.
- Link videos for combined prediction.
- Set maximum time limit.

System

- Take input for cctvs.
- Process the input and give signal to LED red/green.
- Shut down when there is very less frequency of traffic.

Dependency

- Dataset : CCTV images including emergency vehicles images
- Detail about the junction where the system need to be set up

Show Stopper

- System is totally based on Computerised control output.The man power is only required at time of system breakdown.
- Maintenance cost of camera malfunctioning due to short circuit birds.
- Accuracy make reduce due to weather conditions when visibility is low like fog or heavy rainfall.