Idea/Approach Details

Technology Bucket : Smart Communication   Category   :   Hardware

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Solution Proposed

The main factors determining the switching of traffic lights are:

1) Density of vehicles.

2) Historic record of the traffic at that signal.

3) Incoming traffic information from the CCTVs at signals that direct traffic to the concerned signal.

4) Game theory algorithms will be used to decide the strategies of the decision of switching traffic lights with the aim of minimizing traffic delay.

5) Reinforcement learning with neural networks can be used on the decisions with reduced time delay in traffic as the positive reward and time delay as negative reward, which will help in automatically going towards the best decision.

6) The co-ordination of all the traffic lights will take place from a central server, which will calculate the optimal strategies using the game theory, reinforcement learning as mentioned above as well as using the data from the previous CCTV in the same path of traffic. The database will be stored in a central server as well with a backup in cloud in case of technical problems in the server.
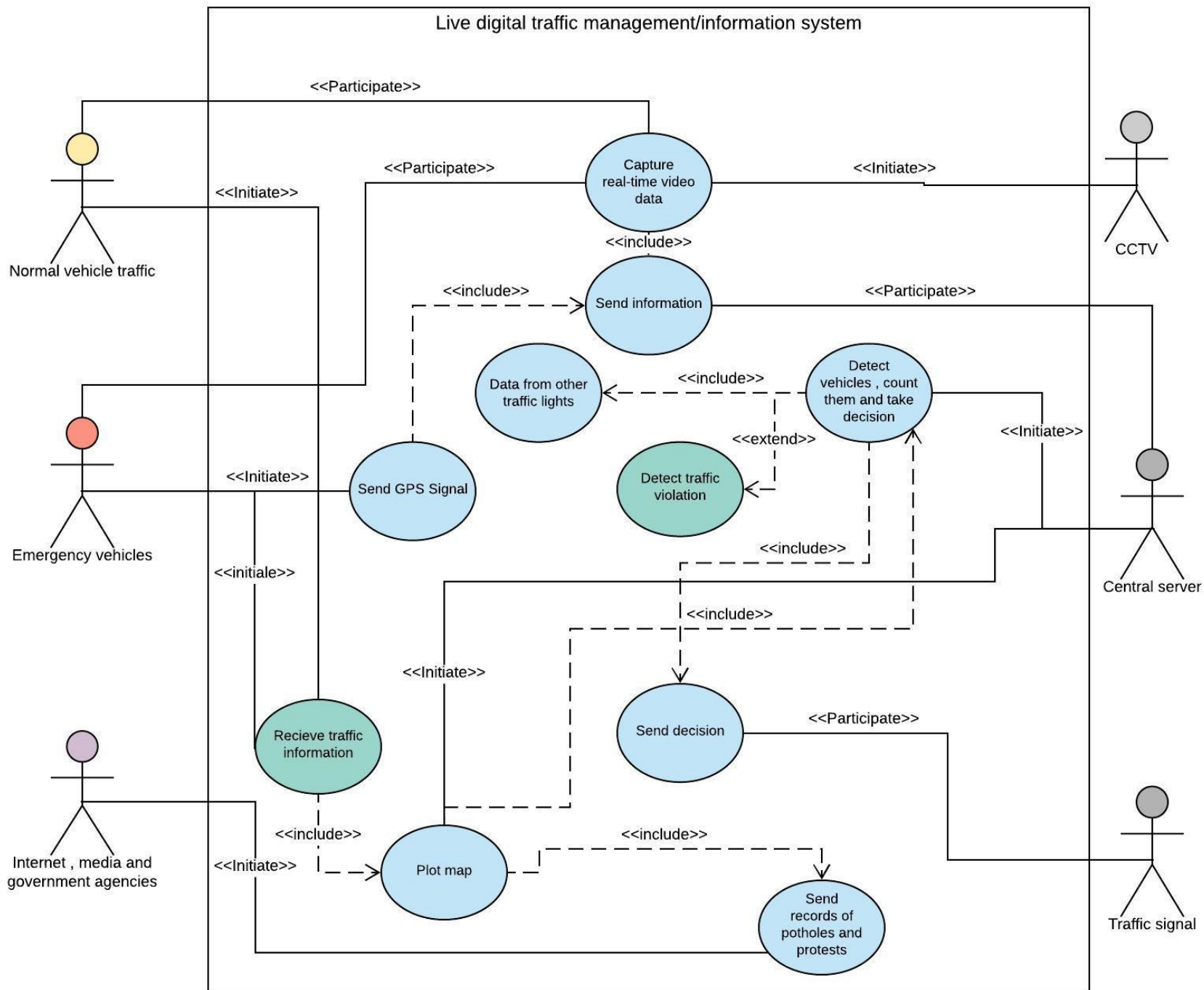
Emergency vehicles will be provided the main priority in minimizing their delay by tracking them with GPS and clearing path for them even before they reach the CCTV (traffic light) range.

Also, through CCTV Video traffic rules violators can be detected and be penalised using deep learning algorithm by reading the number plates.

Also road conditions will be taken into account if it is rough or smooth by using crowd sourced data using smartphone sensors such as accelerometers, gyroscopic sensors etc.. These sensors on having variations in their reading outputs will detect potholes and speed breakers and will mark them on map using GPS of the phone. This will lead to mapping of unsafe roads. This data will also be sent to government organizations to carry out maintenance work on such roads.

SRS is attached for the complete project SRS_for_GATISHEEL

Use Case Diagram

Live digital traffic management/information system

Normal vehicle traffic

Emergency vehicles

Internet , media and government agencies

<<Participate>>
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Capture real-time video data

Send information

Data from other traffic lights

Detect vehicles , count them and take decision

Detect traffic violation

Send GPS Signal

Recieve traffic information

Send decision

Plot map

Send records of potholes and protests

CCTV

Central server

Traffic signal

Technology Stack

- Microcronteller may come in handy to control the traffic lights
- Cloud computing will be used in central server.
- Darkflow (YOLO v3) for Object detection.
- Java and Android Studio for Smartphone app.
- Google Maps API.
- Python and its libraries:
  - Keras for Deep Learning
  - TensorFlow is used for object detection.
  - NumPy, Pandas for using the dataset.

Dependencies / Show Stopper

- CCTV Cameras at intersections.

- Centralised Server for storing of data.

- Traffic Signals Internal operation from the centralised hub.

- Labelled Dataset in the form of images of bikers who are wearing helmets and who are not.

- Smart Phone Sensors:
  - Accelerometer
  - Gyroscope Sensor