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Smart Highway Real Time Monitoring System

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Abstract*: *When we talk about smart cities, one of the key pillars is a smart management of traffic and transport infrastructure. In this paper, we propose an architecture to support highway monitoring in smart cities. Starting asphalt warning, real-time accident detection, adapting speed limits conditions, are examples of applications from a project to reduce cost of maintenance tasks in highways, we develop a comprehensive architecture for of our architecture to weather conditions, are examples of applications of our architecture, effectively monitor and manage future highways. Highway's security fence monitoring, frozen asphalt warning, real-time accident detection, are examples of applications of our architecture.
Keywords*: *Smart Highway, IOT, Computer Vision.

I. INTRODUCTION

All days, we have a tendency to use these highways to transport user/goods facultative our fashion. This sort of infrastructure, in conjunction with new vehicles with capability of connection with the infrastructure ought to be a reality for an efficient and safe use of future route. The introduction of the data technologies within the time period observation of highways can change to cut back maintain prices and to increase the protection as we are going to see later. Enhancing quality and transport is one in every of the key pillars within the sensible cities. We are going to analyse the way to deploy a Wireless Detector Network (WSN) within the route as observation infrastructure. Over this WSN we have a tendency to style 3 software package layers that provides a scalable and economical platform for sensible services concerning traffic control, highway's maintenance tasks, security considerations, etc. The rest of the paper is structured as follows. Section II describes drawback statement and a few previous works. Section III introduces the planned design as well as network topology concerns, detector sort, alternatives, etc. and conjointly describing the software package design designed. Section IV describes the paradigm creating stress in security wire fence observation that is that the main motivation of this work. Finally, in Section V, we are going to draw some conclusions and discuss potential future work.

II. METHODOLOGY

This project is designed in such a way where on the highway a car enters the first toll booth the image is captured and the image is processed using google vision to identify the number plate of the car. Once the car exists the first toll booth, it is given a certain predefined time to travel to the second toll booth. After this predefined time, if the car has not reached the second toll booth, an alert is sent to the highway patrol stating that the car has not reached the second toll booth in time hence detecting an anomaly. In Fig. 1. We show the flow of events, the car enters the highway where the toll booth fitted with an ultrasound sensor detects the car and an image of the car is captured immediately by the camera fitted on the toll booth. Now the entry of this car is logged and computer vision recognizes the number plate, and the car is allowed to enter. Once car has entered the highway, a predefined time is given for it to reach the second toll booth, if it reaches then it is detected that the car has crossed and no action is required, but if it has not reached the second toll booth then an alert is raised for anomaly and a drone is sent for patrol and if an accident is detected the highway patrol is informed with the location of the accident (future scope), if no accident is detected then no action is taken.

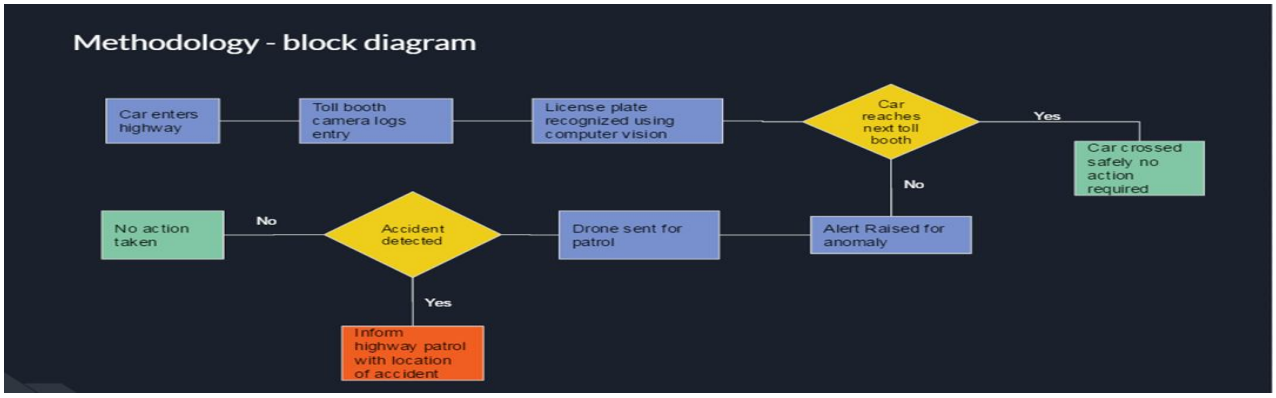


Fig. 1. Methodology.

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III.HARDWARE

This project consists of the following hardware

A. Arduino Uno R3

The Arduino is used for detecting the car entering the toll booth. It communicates with the raspberry pi over serial to indicate a car which has crossed the toll booth using an ultrasound sensor which is used to detect the car using SONAR.

B. Raspberry Pi 3

When an image of the car's number plate is captured at the first toll booth, the Raspberry Pi sends this image to the cloud and is stored in the database. Once the same car enters the second toll booth the Raspberry Pi captures another image of the car's number plate and is verified if it is the same car to log in the entry and exit of this car.

C. Ultrasound Sensor

In this project, when the car enters either of the toll booths, an ultrasound sensor is placed right before the toll booth to sense if the car has passed or not. It uses Sonar to detect cars.

In Fig.2. The connection of the hardware is seen, which is how the above three components are connected together and performs each of it's functions.

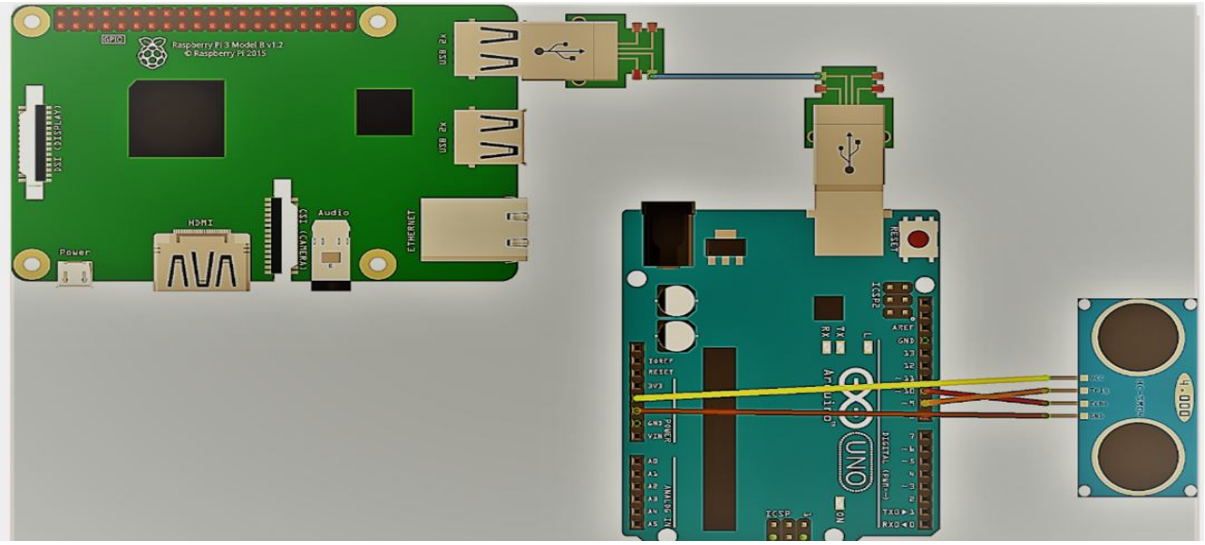


Fig. 2. Hardware Components.

IV.SOFTWARE

The software used are Python, Java, Google Vision API and Bootstrap. Python is used to code the Raspberry Pi to capture the image of the car as shown in Fig. 3. and send it to the cloud which is stored.



Fig. 3. Image of the car captured.

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Java is used in the cloud, for receiving images from all the raspberry pi and send to the Google Vision API and store the processed data in the database. This data is visualized on a dashboard designed with bootstrap. Google Vision API, the Pi cam captures an image and the Google Vision API recognizes the picture and identifies the number plate of the car and is then sent to the cloud and stored in the database.

A dashboard is created using Bootstrap where the entry and exit of the car is logged to show if there are any pending cars so an alert can be raised or else all the cars logged have passed both the first and the second toll booth as shown in Fig. 4.

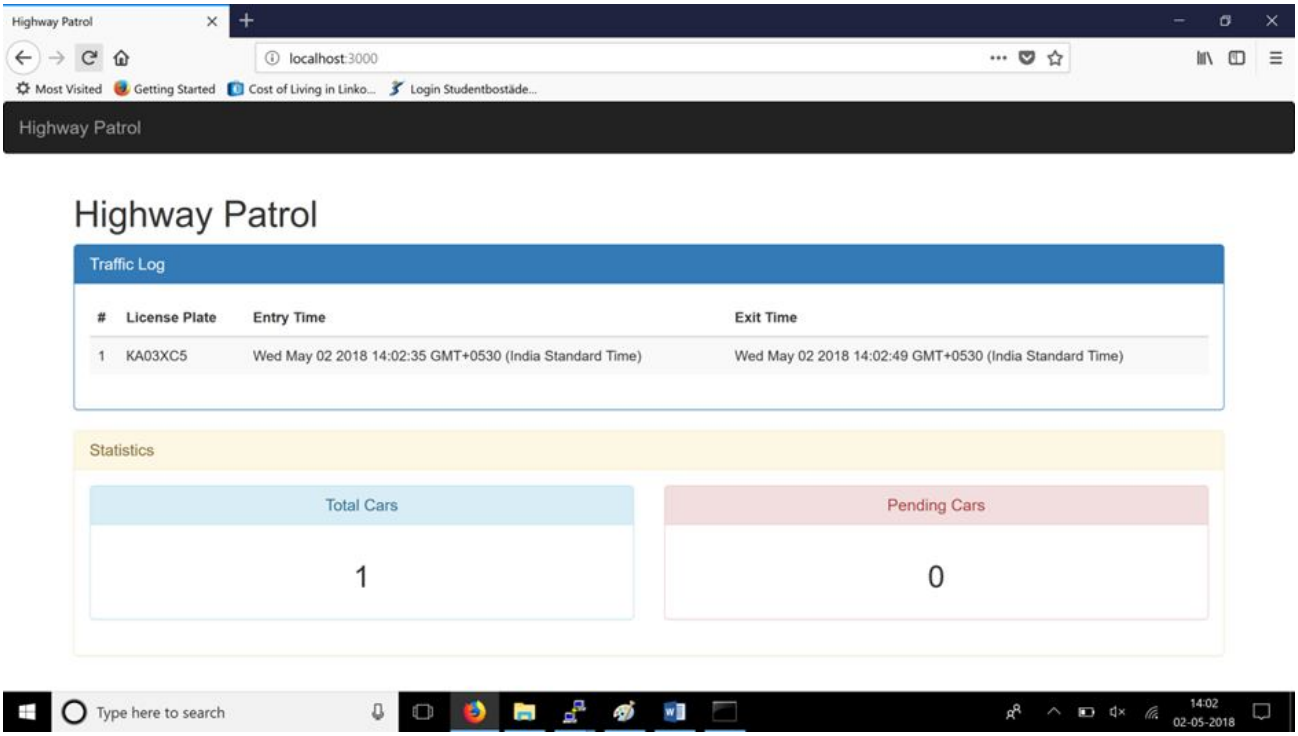


Fig. 4. Dashboard showing the log in and log out of the car.

V. CONCLUSIONS

The smart management of transport infrastructures could be a key purpose in future smart cities. This system allows for more effective and efficient way to monitor vehicles on highways. Bringing in a much more safer and smart environment. To secure the safety of fellow travelers, to ensure quick response in case of any anomalies, to prevent any sort of traffic violation and to ensure efficient and cost cutting methods.

VI. ACKNOWLEDGMENT

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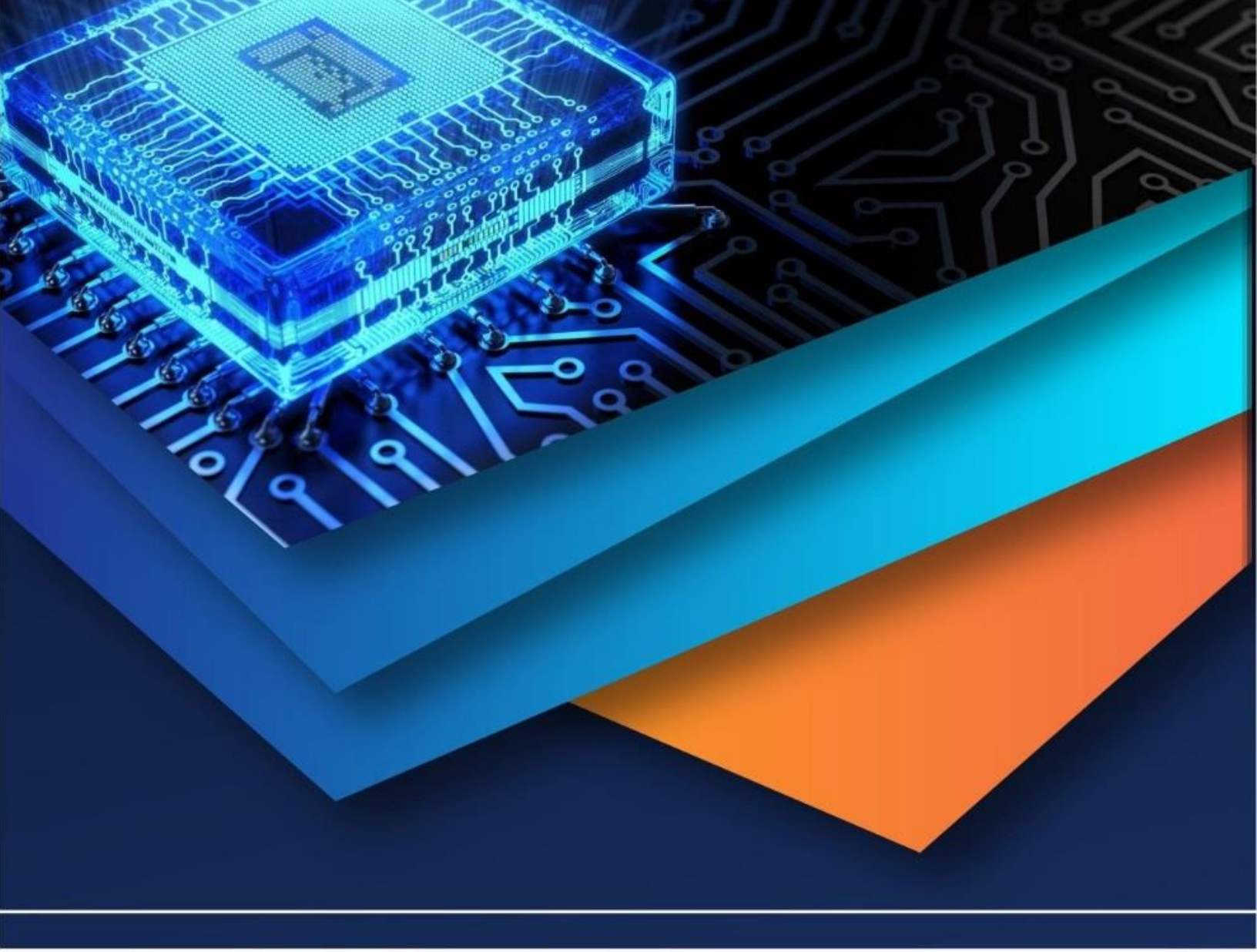
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