ISSN XXXX XXXX © 2018 IJESC

Research Article Volume 8 Issue No.4

Embedded Based Road Accident Prevention and Safety Measures

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Abstract:
The RF transmitter is provided within the specified area. A RF receiver is fitted in the vehicle to receive the corresponding RF signal from the transmitter. Two speed sensors are used to sense the speed of engine and gearbox output shaft. All these input signals are send to the Electronic Control Unit (ECU), where the signals are processed and the logical decision is taken. And another concept is, If the detected speed is greater than a set speed threshold, a camera automatically captures the snap of the vehicle and license plate number is extracted using Digital Image Processing (DIP) techniques

Keywords: RF, IR, ECU, DIP

I. INTRODUCTION

Road accidents are a human tragedy. They involve high human suffering and monetary costs in terms of untimely death, injuries. Unfortunately, more than half victims are in the economically active age group of 25-65 years. Advanced life saving measures, such as electronic stability control, also show significant promise for reducing injuries. By observing previous accident history chart we are able to conclude that there are more number of people dies in each country. Moreover, each minute that an injured crash victim does not receive emergency medical care can make a large difference in their survival rate, e.g., analysis shows that reducing accident response time by one minute correlates to a six present difference in the number of lives saved. The aim of this project is to limit the speed of the vehicles on the road. This project is designed using embedded system and MATLAB technology. According to the National Survey it has been calculated that every year number of accidents that occur in India are close to 1.3 million. Out of which around half million people suffer from non-fatal injuries with many sustaining a disability as a result of their injury. We have used a camera which can continuously send signals on changes in the road. We have used a microcontroller which does a continuous image processing of the road and compute the results and prevents from vehicular accidents this operation are done by an Image processing technique.

II. MOTIVATION

More number of fatalities due to road accidents. Major reasons - Drunk and drive, Rash driving. Difficult to detect drunk and drive unless driver is checked manually. Rash driving leads to serious accidents. with certain cut-off ranges so that if there is any obstacle o

III.EXISTINGSYSTEM

In the existing system, it uses an ultraviolet ray to detect the objects in front of the car and applies brakes before the car hits the object which may be a car truck or any other obstacles. The proposed system uses a LIDAR/Camera which takes a real time image of the road and does an image processing to detect the obstacles in the road and accordingly prevent accident. The accident stoppage technique is that the camera is placed at the back of rear view mirror which acts as a perception system. It collects all the information regarding the condition on the road it may be any obstacle any flaw on the road and gives the data to a controller which is defined n the road, the processor will sense and check whether the car is slowing down or not. If not then the automatic braking system will be activated and hence the car will stop before hitting the obstacle.

IV.PROPOSED SYSTEM

Proposed system reduces road accidents in an efficient way and also controlled the speed of the vehicle in emergency zones. IR sensor is used to detect the speed of the vehicle. If speed is greater than the threshold a camera automatically captures the snap of the vehicle's number and extract the number by using image processing techniques. Then captured number is send it to toll gate by wirelessly. If speed is violated beyond the threshold value, a buzzer indication is given to the driver and an alert message is sent to the concerned authority. The RF transmitter is placed in within the specified region like school and hospital. The RF receiver is fitted in the vehicle to receive the corresponding RF signal from the transmitter. The speed of the vehicle is automatically reduced when receiver receives the signal from RF transmitter. Therefore the speed of the vehicle can be reduced.

V. HARDWARE COMPONENTS:

- PIC MICRO CONTROLLER
- RF TX, RX
- DC MOTOR
- IR TX, RX
- RASPBERRI PI
- WEBCAM
- BUZZER
- ZIGBEE

VI.SOFTWARE REQUIREMENTS:

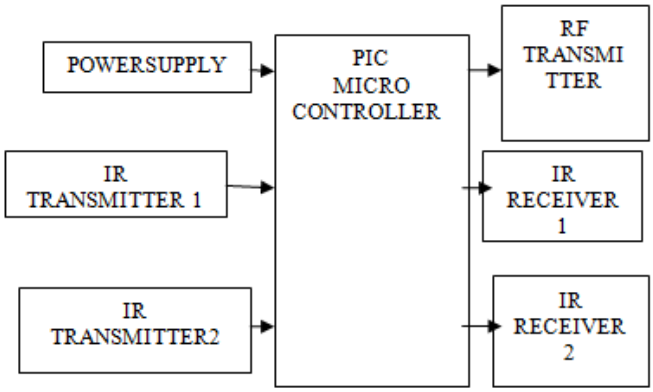
- MPLAB IDE V8.0
- EMBEDDED C
- MATLAB
- PYTHON

VII.RELATED WORK:

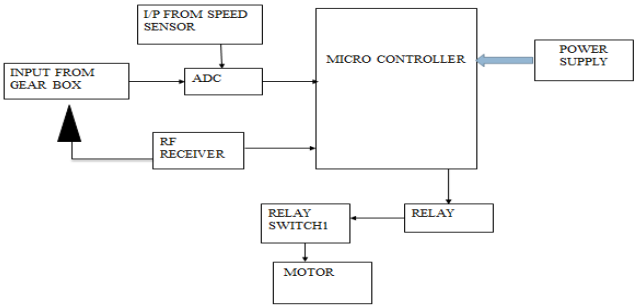
Embedded Based Accident Prevention Technique Using Image Processing,D.GuruPandi[5], J.Navarajan[6], R.Vishal[7], D.Vibuvasan[8]. The accident prevention system fully works on the basis of a continuous video processing system, a camera is placed at the backside of a rear view mirror which is placed in the front windshield of the car which works like a perception system collecting all the changes in the environment and gives it to an PIC controller which does processing and senses any obstacles present on road and if the size of the obstruct is minimum and doesn't cause any damage that it is well below the car, the car doesn't slow down and will be able to move continuously with the same speed, but if there is any obstacle that hinders the progress of the car the processor will check whether the car is slowing down or not . If it doesn't slow down the automated system applies brakes and slows down the car before getting collided with the obstruction. Initially our idea was to give a notification PIC controller to the driver inside the car but the response speed of human is less so we decided to make it fully automated.

VIII.BLOCKDIAGRAM

I.RF TRANSMITTER: (EMERGENCY ZONE)

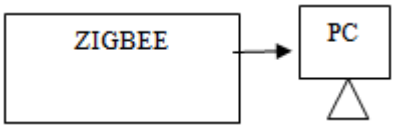


II.RECEIVER SECTION: (VEHICLE UNIT)



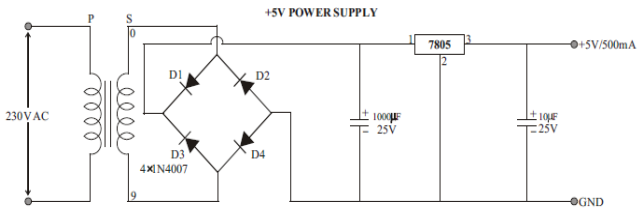
TOLL GATE: (CONTROL ROOM)

HARDWARE DESCRIPTIONS:



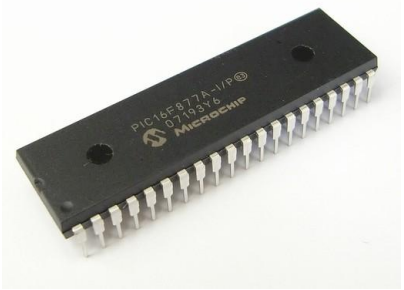
POWER SUPPLY UNIT:

This section describes how to generate +5v DC power supply. The power supply section is the important one. It should deliver constant output Regulated power supply for successful working of the project. A 0 12V/1mA transformer is used for this purpose. The primary of this transformer is connected into main supply through on/off switch &fuse for protecting from over load and short circuit protection. The secondary is connected to the diodes to convert 12VAC to12VDC voltage. And filtered by the capacitors, which is further regulated to +5V, by using IC7805.



PIC MICRO CONTROLLER:

A microcontroller (also microcontroller unit, MCU or µc) is a small computer on a single integrated circuit consisting of a relatively simple CPU combined with support functions such as a crystal oscillator, timers and etc. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, remote controls office machines, appliances, power tools, and toys.

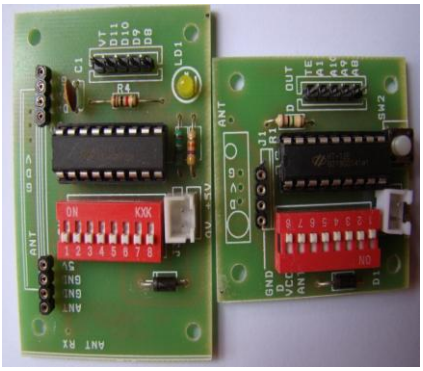


PIC ANALOG TO DIGITAL CONVETER

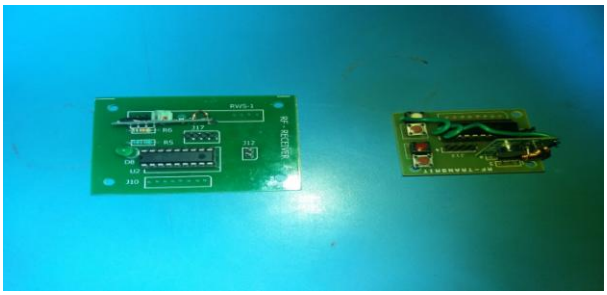
The role of the ANALOG-TO-DIGITAL CONVERTER (A/D) is to convert analog voltage values to digital values. Let's explore the principle of operation of the A/D converter: The ANALOG-DIGITAL-CONVERTER converts analog voltage to binary numbers. These binary numbers can be in different length – 2,4,8,10-bit. The more bits the binary number has, the higher the resolution of the A/D.

RF TRANSMITTER AND RECEIVER:

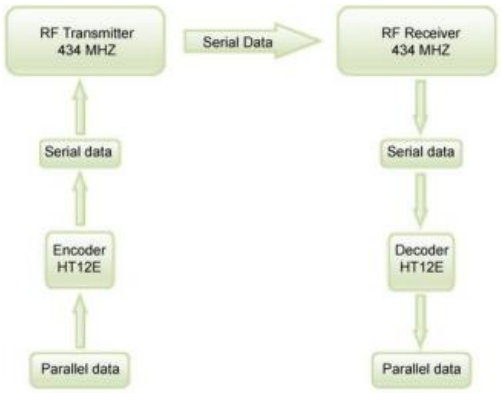
The circuit of this project utilizes the RF module (Tx/Rx) for making a wireless remote, which could be used to drive an output from a distant place. RF module, as the name suggests, uses radio frequency to send signals. These signals are transmitted at a particular frequency and a baud rate. A receiver can receive these signals only if it is configured for that frequency. A four channel encoder/decoder pair has also been used in this system. The input signals, at the transmitter side, are taken through four switches while the outputs are monitor in robot side.



RF TRANSMITTER AND RECEIVER



This radio frequency (RF) transmission system employs Amplitude Shift Keying (ASK) with transmitter/receiver (Tx/Rx) pair operating at 434 MHz. The transmitter module takes serial input and transmits these signals through RF. The transmitted signals are received by the receiver module placed away from the source of transmission. The system allows one way communication between two nodes, namely, transmission and reception. The RF module has been used in conjunction with a set of four channel encoder/decoder ICs. Here HT12E & HT12D have been used as encoder and decoder respectively. The encoder converts the parallel inputs (from the remote switches) into serial set of signals. These signals are serially transferred through RF to the reception point. The decoder is used after the RF receiver to decode the serial format and retrieve the original signals as outputs. These outputs can be observed on corresponding LEDs.



Encoder IC (HT12E) receives parallel data in the form of address bits and control bits. The control signals from remote switches along with 8 address bits constitute a set of 12 parallel signals. The encoder HT12E encodes these parallel signals into serial bits. Transmission is enabled by providing ground to pin14 which is active low. The control signals are given at pins 10-13 of HT12E. The serial data is fed to the RF transmitter through pin17 of HT12E. Transmitter, upon receiving serial data from encoder IC (HT12E), transmits it wirelessly to the RF receiver. The receiver, upon receiving these signals, sends them to the decoder IC (HT12D) through pin2. The serial data is received at the data pin (DIN, pin14) of HT12D. The decoder then retrieves the original parallel format from the received serial data

SPEED CONTROL OF DC MOTORS

Basically, there are three ways to vary the speed of DC motors:

1. With the use of mechanical gears to achieve the desired speed. This method is generally beyond the capability of most hobbyist home workshops.
2. Reducing the motor voltage with a series resistor. However this is inefficient (energy wasted in resistor) and reduces torque. The current drawn by the motor increases as the load on the motor increases. More current means a larger voltage drop across the series resistor and therefore less voltage to the motor. The motor now tries to draw even more current, resulting in the motor "stalling".
3. By applying the full supply voltage to the motor in bursts or pulses, eliminating the series dropping effect. This is called **pulse width modulation (PWM)** and is the method used in this kit. Short pulses means the motor runs slowly; longer pulses make the motor run faster.

WORKING PRINCIPLE OF DC MOTOR

A motor is an electrical machine which converts electrical energy into mechanical energy. The principle of working of a DC motor is that "whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force". The direction of this force is given by Fleming's left hand rule and it's magnitude is given by F = BIL. Where, B = magnetic flux density, I = current and L = length of the conductor within the magnetic field.

Fleming's left hand rule: If we stretch the first finger, second finger and thumb of our left hand to be perpendicular to each other AND direction of magnetic field is represented by the first finger, direction of the current is represented by second finger then the thumb represents the direction of the force experienced by the current carrying conductor. When armature windings are connected to a DC supply, current sets up in the winding. Magnetic field may be provided by field winding (electromagnetism) or by using permanent magnets. In this case, current carrying armature conductors experience force due to the magnetic field, according to the principle stated above. Commentator is made segmented to achieve unidirectional torque. Otherwise, the direction of force would have reversed every time when the direction of movement of conductor is reversed the magnetic field.

SOFTWARE REQUIREMENTS

MPLAB COMPILER:

The MPLAB X IDE is the new graphical, integrated debugging tool set for all of Microchip's more than 800 8-bit, 16-bit and 32 bit MCUs and digital signal controllers, and memory devices. It includes a feature-rich editor, source-level debugger, project manager, software simulator, and supports Microchip's popular hardware tools, such as the MPLAB ICD 3 in-circuit debugger, PIC kit Tm 3,and MPLAB PM3 programmer. **B**ased on the open-source Net Beans platform, MPLAB X runs on Window OS MACOS and LINUX, support many third-party tools, and is compatible with many Net Beans plug-ins. MPLAB Integrated Development Environment (IDE) is a free, integrated toolset for the development of EMBEDDED applications employing Microchip's PIC and DSPIC microcontrollers. MPLAB IDE runs as a32-bit application on MS Window, is easy to use and includes a host of free software components for fast applications developments and super-charged debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third party software and hardware development tools. Moving between tools is a snap, and upgrading from the free software simulator to hardware debug and programming tools is done in a flash because MPLAB IDE has the same user interface for all tools. Download MPLAB IDE and use the tutorial in the MPLAB

IDE User's Guide at the bottom of this page to explore how easy it is to create an application's. Write assembly code, build and assemble your project with MPLAB's wizards, then test your code with the build-in simulation and debugger. When you are re to test your own application, select one of the low-cost debugger/programmers to program a device and analyze your hardware.

EMBEDDED C:

Embedded c is a set of language extension for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, data type declaration, conditional statements(if, switch, case),loops(while, for),functions, arrays and strings, structures and union, bit operations, macros etc. During infancy years of microprocessor based systems, programs were developed using assemblers and fused into the EPROMs. There used to be no mechanism to find what the program was doing. LEDs, switches, etc. were used to check for correct execution of the program .But they were too costly and were not quite reliable as well.

As time progressed, use of microprocessor-specific assembly-only as the programming language reduced and embedded systems moved onto C as the embedded programming language of choice. C is the most widely used programming language for embedded processors/controllers. According to fundamental laws of nature, no energy conversion is possible until there is something to oppose the conversion. In case of generators this opposition is provided by magnetic drag, but in case of dc motors there is back emf.

When the armature of the motor is rotating, the conductors are also cutting the magnetic flux lines and hence according to the Faraday's law of electromagnetic induction, an emf induces in the armature conductors. The direction of this induced emf is such that it opposes the armature current (I_a) . The circuit diagram below illustrates the direction of the back emf and armature current. Magnitude of Back emf can be given by the emf equation of DC generator. When the vehicle enters in the normal area it speed does not decrease and it goes normally no action is performed. when the vehicle enters into the restricted areas that means it enters into the speed limiting. whenever it enters the transmitter module just send an information that contains how much speed a vehicle can go inside the speed limited region.

Then the signal or information is received by the receiver and the signal acquired from the speed meter is also given to the controller. the signal is basically analog in nature that will be converted into digital so only the micro controller able to process the signal. The signal from the transmitter and the speed meter is compared by the controller. in this there are two case: first, the current speed is less than the transmitted speed the vehicle goes normally no action is required. second, the information from the speed meter is greater than the transmitted speed by the transmitter module the controller waits for few second whether the driver reduce the speed to the below value if the driver does not reduce the speed means it automatically takes the control and reduce the speed according to it.

IX. WORKING

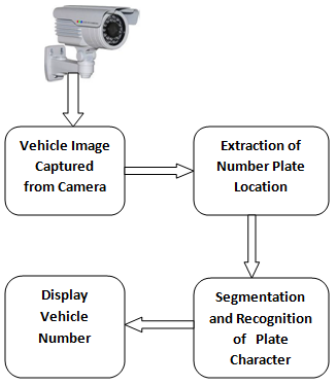


Figure.2. Captured Image of the vehicle

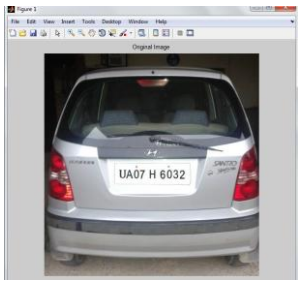


Figure.3. Original Image

B.EXTRACTION OF NUMBER PLATE LOCATION

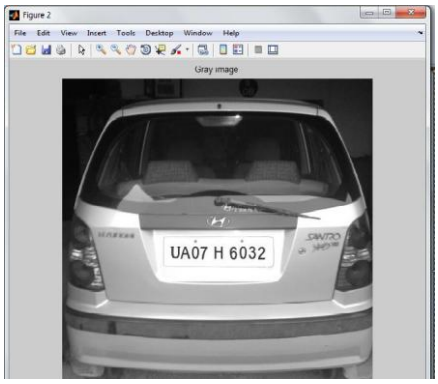


Figure.4. Gray Scale image

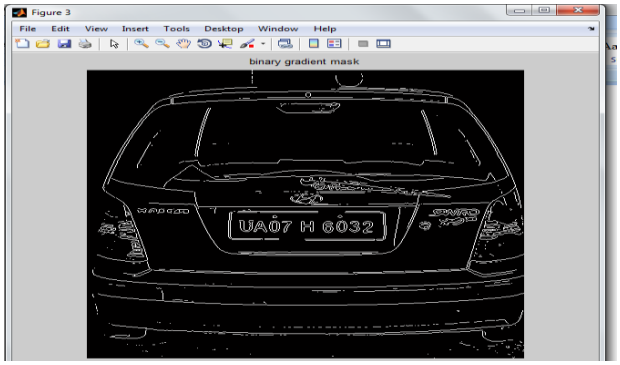


Figure.5. Binary gradient image with sobel edge detector.

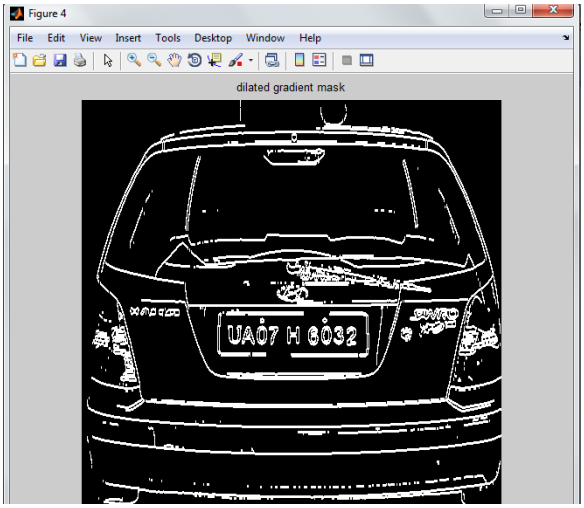


Figure.6. Dilated image

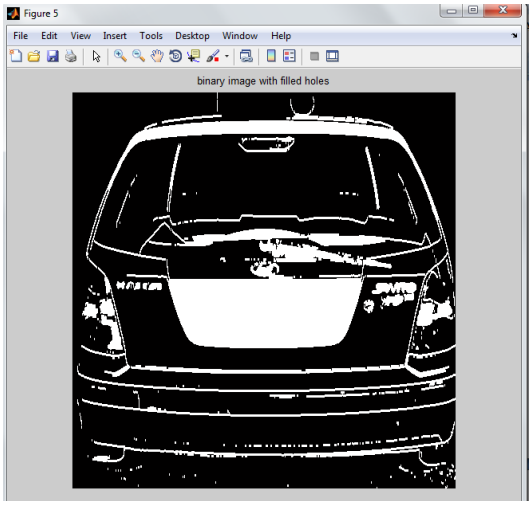


Figure.7. Binary Image with filled holes.

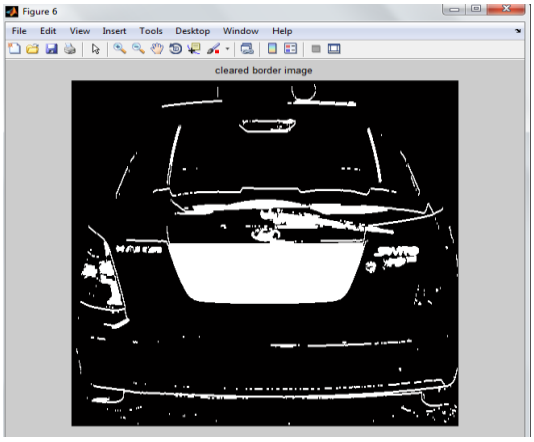


Figure.8. Removed connected object image

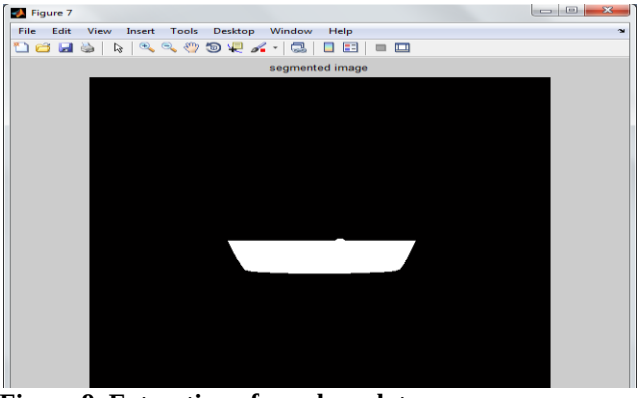


Figure.9. Extraction of number plate area

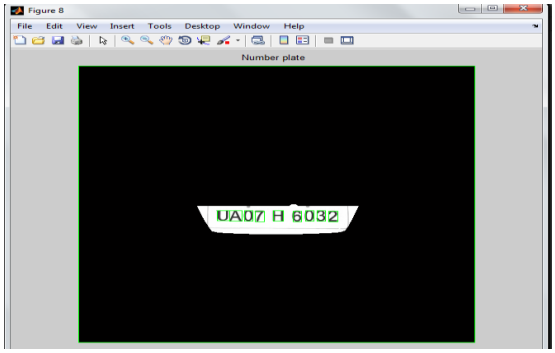


Figure.10. Number plate of Vehicle image

VI. MATLAB RESULTS

It displays number plate of the desired vehicle.

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Number Plate:-UA07H6032
Number Plate:-06-Aug-2014
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```

Figure.15. Image of result stored at text file

X.CONCLUSION

In this system, application software is designed for the detection of number plate of vehicles using their number plate. At first plate location is extracted using morphological operation then separated the plate characters individually by segmentation. Finally template matching is applied with the use of correlation for recognition of plate characters.

Some of possible difficulties:

1. Broken number plate.
2. Blurry images.
3. Number plate not within the legal specification.
4. Low resolution of the characters.
5. Poor maintenance of the vehicle plate. Similarity

between certain characters, namely, O and D; 5 and S; 8 and B, E; O and 0, etc. we developed a new design to control the speed of the automobiles. In normal driving mode, we can expect other vehicles interfering restricted areas nearby and possibly blocking or attenuating RF signals.

XI. REFERENCE

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