

## OBSTRONICS SYSTEM WITH AUTOMATIC CONTROL

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### ABSTRACT

This paper “obstronics system for two wheelers” presents the detailed description about an obstacle avoidance system using mechatonical aid. As it is needed for every vehicle, such a system which detects the obstacle or another moving vehicle and reduces the speed to minimum. If obstacle still comes near to vehicle then it must stop the vehicle automatically. It is possible to construct such system using one IR Transmitter and two IR Receivers with slight less efficiency with one another.

**Keywords:** Obstacle; Sensors; IR; RF;

### 1. INTRODUCTION

The project presented here is a novel approach towards vehicle navigation & safety implementation. As the title suggests, the project is aimed at automatically sensing the areas / zones like “School Zone”, “Hospital zone” or “Accident Zone”.

In convention, these special zones or areas are indicated at the roadside on a pillar or road sign poles.

As an example, near school zone, the sign board displays “School Zone Ahead, Drive Slowly”, or near a hospital, “Hospital Area-Do not Blow Horn”, but in reality rarely this is practices. Drivers go at very high speed as usual near school zone, or operate the harsh horns loudly causing inconvenience to the patients in the hospital.

Even though these are meant for the safety of the vehicles travelling and also for the general public, it is hardly practiced by the vehicle drivers. As a result, making the whole concept of displaying warning sign and messages on the roadside boards meaningless.

To provide a better alternative, one can develop a system which will automatically sense such traffic signs automatically and accordingly inform the drivers and also assist him in controlling the vehicle voluntarily or forcibly. All in all resulting in a very effective and fail proof system to provide traffic regulation, safety and convenience of the people.

As the whole project not just limited for these few functions, this project can be made mandatory. That way one can provide a more reliable security device and streamline traffic flow. Few additional features which can be integrated with this system are, “Down Hill Detection”, “Auto-Breaking with Obstacle detection” “auto Speed limit Sensor” etc.

As the design of this system goes, the project proposed here consists of a set of units

- 1) Zone / Area Unit
- 2) Vehicle Unit

The following block diagram shows the simplified arrangement of the system,

### **MAIN FEATURES OF THE PROJECT**

1. Effective in implementation.
2. Low power consumption, and compact size,
3. High reliability, due to the usage of power semiconductor devices,
4. Greater control range due the usage of Frequency Modulation with a PC.
5. Vehicles monitored from a remote area (no need of 'line-of-sight' arrangement).

## 2. BLOCK DIAGRAM & ITS DESCRIPTION

In BRIEF: This ‘Smart Zone Sensing System with Automatic Control’ system works like this. Each monitoring zones are fitted with RF Transmitter units with unique Identity Code. All the vehicles must be fitted with RF Receiver and respective circuitry on their vehicle’s number plate. Display will be fitted on the dash board for visual representation of the alert messages sent by respective zone Transmitters.

When vehicle with 70 Kmph speed enters the school zone, it receives the alert message”School Zone, Please go slowly. Speed limit it 30 KiloMeterPerHour”. Also receiver checks the speed limit of the vehicle and found above 30 kmph then reduces it until crosses the School Zone area.

When the same vehicle enters the Hospital Zone, it receives the alert message “Hospital Zone, Please do not blow Horn”, and reduces the supply voltage to minimum level such that horn should blow in low pitch.

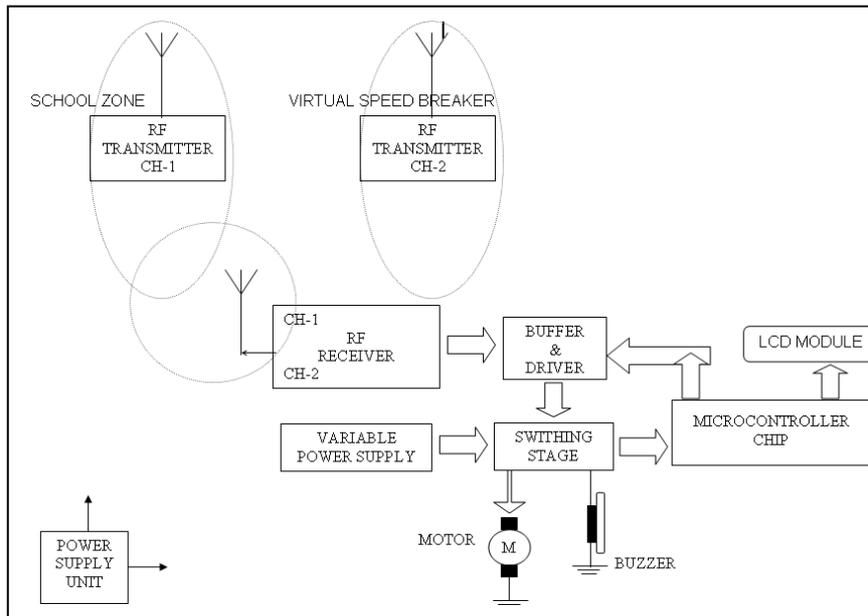


FIG.1 Obstronics system

The complete block diagram is shown in fig 2.2 and a transmitter position is shown in fig 2.1. The explanation of each block goes like this:

**RF TRANSMITTER:** The Radio Frequency Transmitter transmits the zone code to the receiving units. There are two zones in the present system: School Zone and Hospital Zone. Each Transmitter has carrying frequency of 144 MHz and data frequency range between 17, 19, 22 and 25. Transmitter #1 is set to data frequency of 17 and Transmitter #2 is for 19.

**RF RECEIVER:** The Radio Frequency Receiver receives the Zone Code transmitted by the Transmitter. According to the number of transmitter, here for Transmitter #1 & #2 respective output pins go high. The output is fed to directed opto-coupler for further processing.

**BUFFER & DRIVER UNIT:** This unit provides unit gain amplification to the received Zone Code signal and drives the relay for further feeding. The output of Zone Code signal is fed to Microcontroller chip as input and gets Speed Limit & Low Horn commands from it and drives the two more blocks.

**MICROCONTROLLER CHIP:** This is heart of this system. This takes Zone Code signal as input and generates four command signals for output purpose. The inherited software manipulates the inputted data and generates four command signals. Depends upon the Zone Code, it generates set of two command signals. If Zone Code is from School Zone Transmitter then the display message is generated and Speed Limit Command is outputted. Suppose Zone Code is from Hospital Zone Transmitter then respective display message is generated and Low Horn Command is outputted.

**LCD DISPLAY:** The Liquid Crystal Display shows the display messages generated by the Microcontroller chip, which is depending upon the Zone Code received.

**VARIABLE POWER SOURCE:** When Speed Limit Command is generated after certain delay by the Microcontroller chip, it is sent to this stage for

reducing the speed. This stage actually lowers the supply voltage to the vehicle's motor.

**REDUCED POWER SOURCE:** When Low Horn Command is generated after certain delay by the Microcontroller chip, it is sent to this stage for lowered horn sound. This stage actually lowers the supply voltage to the speaker, such that horn sound will be minimized.

**POWER SUPPLY UNIT:** As this stage has driver & relay stages, requires dual regulated power supply for working purpose. Specially designed +12 & +5 Volts regulated power supply is used to give proper working voltage to the whole section.

### 3. CIRCUIT DIAGRAM & ITS DESCRIPTION

The ASIC Transmitter IC has four inputs and only one output pin. The four inputs are for the frequency range of 17 KHz, 19 KHz, 22 KHz and 25 KHz and four switches are provided for each range. When any one switch is selected, that frequency is added to the Transmitter circuit as data frequency and transmitted in the air. The Crystal X1 with two coupling capacitor provides the working oscillator frequency to the circuit. The Capacitors C6 and C7 are to stabilize the crystal oscillator frequency. The ASIC output is added to the transmitter circuit's oscillator transistor T1s base. The data frequency is added with carrier frequency

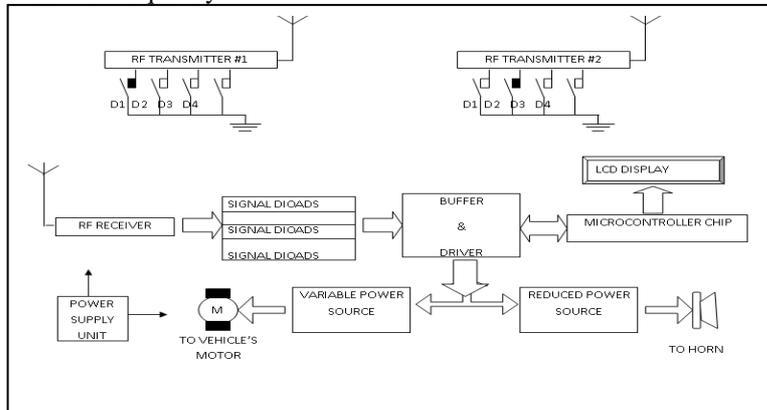


FIG2. CIRCUIT DIAGRAM

147 MHz and aired for transmitting purpose. The transistor T1 is heart of the Hartely Oscillator and oscillates at carrier frequency of 147 MHz along with tuned circuit formed by coil L1 and capacitor C4. The Data frequency is fed to T1 on base through resistors R4 and R5. Capacitors C1 and C3 and for stabilizing the tuned circuit along with resistor R3To increase the range of the circuit, transmitting signals must be strong enough to travel the long distance [i.e., upto 100 meters in this prototype]. So the generated signals are made strong by amplifying to certain level with the help of Transistor T2 and associated circuit.The Radio frequency thus generated is fed to pre-amplifier transistor T2 on base terminal. The resistor R6 provides the bias voltage to T2 and capacitors C5 & C7 removes the noise and harmonics present in the circuit. The antenna coil L2 transmits the radio frequency in the air.

### **3.1. Anti-collision Detection System**

As it is needed for every vehicle, such a system which detects the obstacle or another moving vehicle and reduces the speed to minimum. If obstacle still comes near to vehicle then it must stop the vehicle automatically. It is possible to construct such system using one IR Transmitter and two IR Receivers with slight less efficiency with one another. The working of system is explained in Brief of Block Diagram & its Description section.

The system's IR Transmitter and IR Receivers must be fitted in front of vehicle and system must be supplied with power only when vehicle starts moving. That means power supply line of the system must be in series with ignition key of vehicle, and when rider switches ON the ignition key vehicle starts and system comes into action.

### **MAIN FEATURES OF THE SYSTEM**

1. Effective in implementation.
2. Low power consumption, and compact size,
3. High reliability, due to the usage of power semiconductor devices.

## BLOCK DIAGRAM & ITS DESCRIPTION

The Obstacle Detection System FIG,3 is explained in Brief as follows:

There are two IR Receivers fitted both sides of single IR Transmitter. The IR Receiver #1 is normal receiver where as IR Receiver #2 is slightly less efficiency receiver. So when IR rays transmitted by IR Transmitter hits to any long distance obstacle and comes back, they are received only by IR Receiver #1. Its output goes HIGH and which in turn energizes switching stage relay. The relay's N/C [Normally Connected] pin supplies normal voltage to motor from Variable Power Supply to move vehicle in normal speed. When relay gets energizes then N/O {Normally Open} pins comes into action and supplies Low voltage from Variable Power Supply to run motor in low speed. Thus vehicle reduces its speed when any obstacle is observed in front of vehicle in a safe distance.

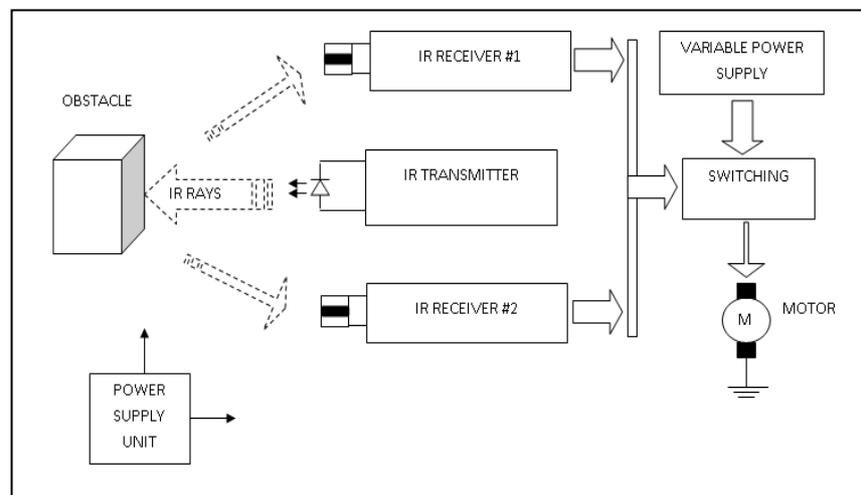


FIG.3 OBSTACLE DETECTION SYSTEM

When obstacle comes very near then IR rays transmitted by IR Transmitter are detected by less efficient IR Receiver #2 .Thus its output goes HIGH and which in turn energizes switching stage relay. This relay's N/C pins are in series of power supply line of motor and hence motor is running in low

speed when obstacle is detected in a safe distance. When obstacle is very near then relay gets energized and contacts change. This contact change breaks the power supply line of motor and hence motor stops running. Thus vehicle stops when obstacle is very near to it.

**IR TRANSMITTER:** This transmits Infra Red rays in pulse form towards front direction for detecting any obstacle. These rays are reflected back by hitting any obstacle and received by both IR Receivers.

**IR RECEIVER:** There are two IR Receivers, receiver #1 is normal in efficiency and receiver #2 is less efficient. The receiver #1 is used to detect safe distance obstacles and if found generates HIGH signal. The receiver #2 is used to detect very near obstacles and if found generates HIGH signal. Both High signals energize two separate relays for switching action.

**VARIABLE POWER SUPPLY:** This power supply is tapped for two power supplies, Normal and Low.

**SWITCHING STAGE:** This stage is comprised of two relays, one each for receiver #1 and #2. Both tapings of Variable Power Supply are connected to receiver #1 relay's N/C and N/O pins. The Pole is connected to N/C pin of receiver #2 relay and its Pole is connected to power supply line of Motor.

**POWER SUPPLY UNIT:** The specially designed regulated power supply is needed for proper working of the system and hence this Power Supply Unit is constructed.

## **4. PRODUCT SPECIFICATIONS**

### **4.1 General**

The LCD of the unit is STN (Super Twisted Nematic) Gray , Transflective type. Low power consumption with the dot-matrix LCD panel and CMOS LSI. Built-in backlight LED with high luminance and stable radiation. Thin, lightweight design permits easy installation in a variety of equipment. Allowing for being connected at general-purpose CMOS signal level, the unit can be

easily interfaced to a microprocessor with common 4-bit and 8-bit parallel inputs and outputs. Multiplexing driving : 1/16duty, 1/4bias, 6 o'clock. Built-in character generator ROM and RAM, and display data RAM: Character generator ROM 225 different 5 x 7 dot-matrix character patterns (Alphanumeric and symbols) Character generator RAM 8 different user programmed 5 x 7 dot-matrix patterns

#### **Display data RAM 80 x 8 bits**

Numerous instructions Display clear, Cursor home, Display ON/OFF, Cursor ON/OFF, Blink character, Cursor shift, Display shift The unit operates from a single 5V power supply Liquid crystal panel service life 100,000 hours minimum at 25 °C -10 °C. 3.3 definition of panel service life Contrast becomes 30% of initial value Current consumption becomes three times higher than initial value Remarkable alignment deterioration occurs in LCK cell layer. Unusual operation occurs in display functions

#### **Safety**

If the LCD panel breaks, be careful not to get the liquid crystal in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

#### **Handling**

- Avoid static electricity as this can damage the CMOS LSI.
- The LCD panel is plate glass; do not hit or crush it.
- Do not remove the panel or frame from the module.

The polarizing plate of the display is very fragile; handle it very carefully; Mounting and Design; Mount the module by using the specified mounting part ; and holes.

To protect the module from external pressure, leave a small gap by placing transparent plates (e.g. acrylic or glass) on the display surface, frame, and polarizing plate

Design the system so that no input signal is given unless the power-supply voltage is applied.

Keep the module dry. Avoid condensation; otherwise the transparent electrodes may break.

### **Storage**

Store the module in a dark place, where the temperature is 25 °C - 10 °C and the humidity below 65% RH. Do not store the module near organic solvents or corrosive gases. Do not crush, shake, or jolt the module (including accessories).

## **5. CONCLUSIONS**

The project is used to secure and avoid the road accidents. It can be used as part for automation of s or Public Transportation. This system is used to trace the culprit vehicles by police persons. This project can also be used by Cargo Companies to intimate their on-road vehicles about the next delivery spot or assignment. This system can be used to 'time keeping' purpose in public transportation, such as departure & arrival timings, number of rotations each vehicle turned etc. This application is very useful on any kind of vehicle. This application is easy to install and easy to operate. Manpower can be saved by implementing auto detecting circuits. More reliable than manual Operation.

### **Future Developments**

The following modifications can be made to the present circuit, which leads to still smarter project.

Present Project can handle only two vehicles, which want to pass the one after the other, or one-by-one. This will not happen in actual case. The two track road allows two vehicles at a time, and this complicates the working of the Vehicle Detection Stage. One can enhance the vehicle detection stage to detect any number of vehicles at a time. The ID of vehicles can be made more sophisticated and secured by implementing Microcontroller/PC technology.

This system can also be used as advanced Global Positioning System or as an advanced system for Automation and Vehicle Tracking.

This project can be efficiently used in 'Vehicle Tracking & Automation' with further improvements. Such as, the vehicle owner can pay the 'toll fee' through his credit card by mentioning so in his application form. Hence forth, whenever he come across such 's, the System detects the vehicle and charge the fee to his credit card, and allows him to pass the gate without even interrupting him. That makes the owner to feel-free and saves his time & energy.

This project is open for developments from all sides. It is the users' imagination which limits the working of this project. One can go on adding the extra, rich features to this project.

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