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SMART AND INTELLIGENT SYSTEM FOR ROAD SAFETY IN HILLY AREA USING WSN & IoT

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Abstract The increased vehicular traffic and congestion in hilly area are the main cause for accidents nowadays. The parameters like sharp turns, river over flow, landslide, and accident plays the major role. In this paper we develop the system which overcomes the most of the difficulties occurred while driving in the hilly areas, which is most important for the safety of a person driving in hilly area. The newly develop smart and intelligent system makes driving easier and convenient. The alarm circuit has been designed in way that the driver will get the information in well advance like landslide, river overflow, sharp turn, accidental point in hilly area and traffic jam. The newly develop smart and intelligent system is the combination with some additional features of work done by some authors proposed in their research paper where they addressed the single issues like sharp turns and landslide detection.

Key Words: Water sensor, landslide detector, sharp turn parameters, accident detector

1.INTRODUCTION

The Smart and Intelligent system is been developed to make good things toward the society and country as well. As it is seen that the in hilly area the accidents are increase day by day due any natural calamities and the many are misguide in the area where no sign boards are available which cause road accident. There occurred many road accident due sharp turns and due to many natural calamities like land slide and bridge over flow .The natural calamities such as landslide the drivers and not even aware of the action, so this system could give the message at some distance so that to cure the accident. The sharp turn can also leads to the loss of many lives. It is being featured with the wireless sensor network (WSN) and Internet of Things (IoT) based system in order to track and give message to driver for the turn. This system is being implemented with the sensor which can give information to module connected wirelessly.

2. LITERATURE SURVEY

"Driver safety field based on driver vehicle road interaction" by Jianqiang Wang, Jian Wu, and Yang Li IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS.

In this paper author has discussed vehicle driving safety is influenced by many factors, including drivers, vehicles, and road environments. The interaction among them are quite complex. Consequently, existing methods that evaluate driving safety perform inadequately because they only consider limited factors and their interactions. As such, it is difficult for kinematics-based and dynamics-based vehicle driving safety assistant systems to adapt to increasingly complex traffic environments. In this paper, we propose a new concept, i.e., the driving safety field. The concept makes use of field theory to represent risk factors owing to drivers, vehicles, road conditions, and other traffic factors [2].

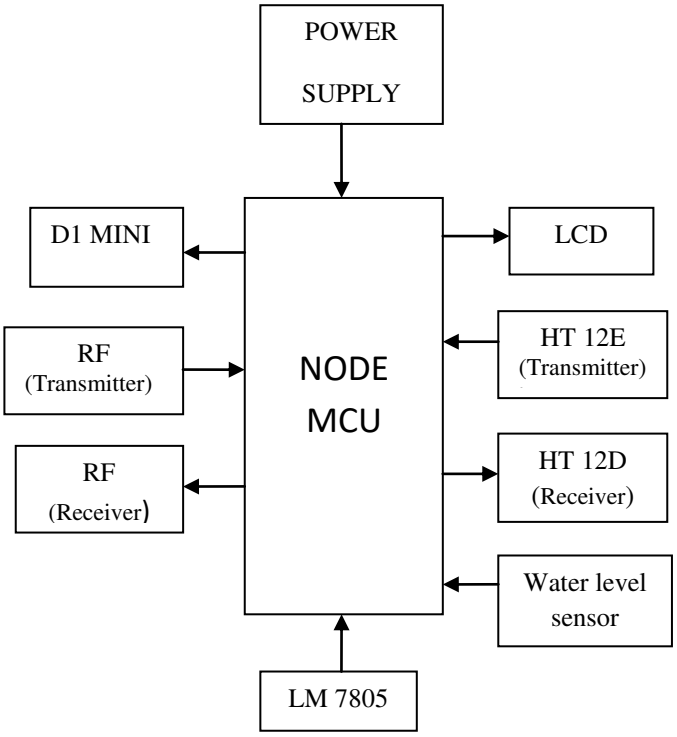
"Smart vehicle with everything" 2016 2nd International Conference on Contemporary Computing and Informatics (ic3i).

In this paper the number of vehicles is increasing day-by- day, the question of how to obtain information about the Vehicles is becoming more and more difficult. In such an situation Intelligent Transportation Systems (ITSs) has emerged as a solution that is an advantage from the unique features and capabilities of Wireless Sensor Networks (WSNs) and Internet of Things (IOT). WSNs are composed of tiny devices that work in manner to sense the parameters of the vehicle. ITSs can also solve situations like intimating ambulance after occurrence of accident and track the location of the vehicle using GPS sensors. This paper presents an efficient architecture that will increase the safety of road travel using the concepts of WSN and IOT. We have proposed a low cost system to prevent road accidents and to sense speed of vehicles during road travel and also to transmit data to the cloud.[1]

"Wireless machine-to-machine communication for intelligent transportation systems": Internet of Vehicles and Vehicle to Grid Ntefeng Ruth Moloisane, Reza Malekian, Dijana Capeska Bogatinoska MIPRO 2017, May 22- 26, 2017, Opatija, Croatia

In this paper machine to machine communication in intelligent transportation is a technology that aims to interconnect various components such as sensors, vehicles, road infrastructures and wireless networks. The significance There of is to solve problems such as road congestion, road accidents and high vehicle fuel consumption. This paper gives an overview of how Machine-to-machine (M2M) communication can be used in intelligent transportation systems (ITS) improve road safety and efficiency, where Vehicular ad-hoc Networks (VANETs) play a major role.[3]

BLOCK DIAGRAM OF THE PROPOSED SYSTEM



(Fig.1)

In the proposed system, landslide, water overflow, sharp turn and accidental point are measured by various sensors. The sensors of sharp turn and accidential point are placed on the both sides of the road. When the earth jerk landslide occurred the land slips from its place. The sensors that are placed on hills will detect and transmits the collected information to the node MCU. The node MCU sends an alert message to the mobile through the IoT which is connected to the node MCU. After receiving the message, the concerned officials clear the road to reduce the accidents same applied for sharp turns and accidental points and river over flow.

HARDWARE USED:

NODE MCU:

Node MCU is a low-cost open source IoT platform.[4][5] It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module support for the ESP32 32-bit MCU was added. Node MCU is an open source firmware for which open source prototyping board designs are available. The name "Node MCU" combines "node" and "MCU" (micro-controller unit).[8]. The term "Node MCU" strictly speaking refers to the firmware rather than the associated development kits.

D1 MINI:

Esp8266 D1 Mini NodeMCU Wifi Development Board is an Arduino Compatible mini wifi board with 4MB flash based on ESP8266EX. The board is with 11 digital input/output pins, all pins have interrupt/PWM/I2C/one-wire supported(except D0) 1 analog input(3.3V max input) and a Micro USB connection.

- 11 digital IO,
- interrupt/pwm/I2C/one-wire supported(except D0)
- 1 analog input(3.2V max input)
- a Micro USB connection
- Compatible with Micro Python, Arduino, Node MCU

LCD:

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smart phones, televisions, computer monitors and instrument panels. LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube (CRT) technology.

HT 12E:

HT12E is an encoder integrated circuit of 212 series of encoders. They are paired with 212 series of decoders for use in remote control system applications. It is mainly used in interfacing RF and infrared circuits. The chosen pair of encoder/decoder should have same number of addresses and data format. HT12E has a transmission enable pin which is active low. When a trigger signal is received on TE pin, the programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium. HT12E begins a 4-word transmission cycle upon receipt of a transmission enable. This cycle is repeated as long as TE is kept low. As soon as TE returns to high, the encoder output completes its final cycle and then stops.

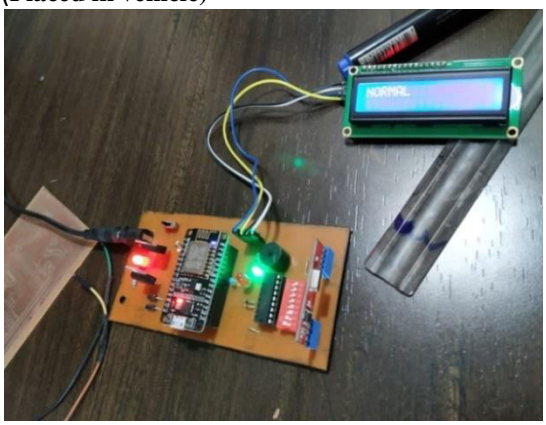
WATER LEVEL SENSOR:
Level sensors are used to detect the level of substances that can flow. Such substances include liquids, slurries, granular material and powders. Level measurements can be done inside containers or it can be the level of a river or lake. Such measurements can be used to determine the amount of materials within a closed container or the flow of water in open channels. RS Hydro have a wide range of pressure, ultrasonic, open channel, radar and capacitance level sensors and transmitters for sale and hire.

RF TRANSMITTER:
The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources. This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps – 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

RF RECEIVER:
An RF receiver module receives the modulated RF signal, and demodulates it. There are two types of RF receiver modules: super heterodyne receivers and super regenerative receivers. Super regenerative modules are usually low cost and low power designs using a series of amplifiers to extract modulated data from a carrier wave. Super regenerative modules are generally imprecise as their frequency of operation varies considerably with temperature and power supply voltage. [*citation needed*] Super heterodyne receivers have a performance advantage over super regenerative; they offer increased accuracy and stability over a large voltage and temperature range. This stability comes from a fixed crystal design which in the past tended to mean a comparatively more expensive product. However, advances in receiver chip design now mean that currently there is little price difference between super heterodyne and super regenerative receiver modules.

LM 7805:
There are common configurations for 78xx ICs, including 7805 (5 V), 7806 (6 V), 7808 (8 V), 7809 (9 V), 7810 (10 V), 7812 (12 V), 7815 (15 V), 7818 (18 V), and 7824 (24 V) versions. The 7805 is the most common, as its regulated 5-volt supply provides a convenient power source for most TTL components. Less common are lower-power versions such as the LM78Mxx series (500 mA) and LM78Lxx series (100 mA) from National Semiconductor. Some devices provide slightly different voltages than usual, such as the LM78L62 (6.2 volts) and LM78L82 (8.2 volts) as well as the STMicroelectronics L78L33ACZ (3.3 volts).The 7805 has been used in some ATX power supply designs for the +5 VSB (+5 V standby) output.

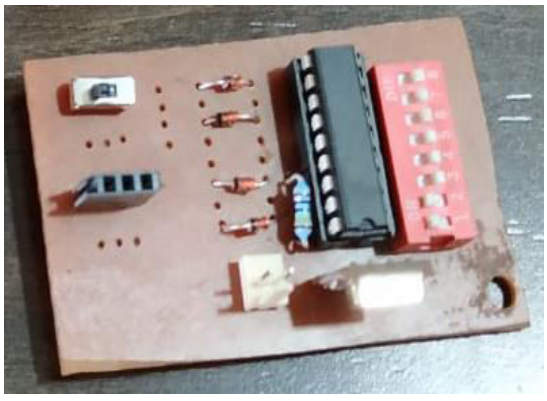
RECEIVER
(Placed in vehicle)



(Fig.2)

The fig.2 Receiver section, this device is to be placed in the vehicle .The transmitter send the alert message to the receiver.

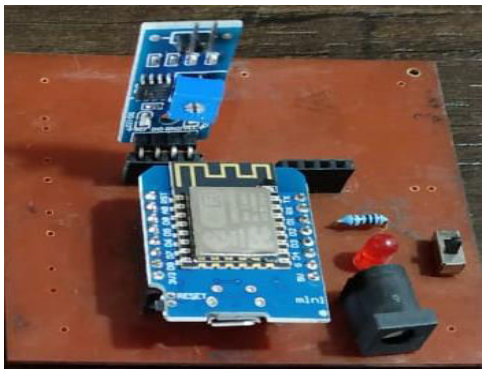
SHARP TURN



(Fig.3)

The fig.3 is device of sharp turn is the transmitter which will send message wirelessly to the receiver so that the driver get alert message before the sharp turn arrival.

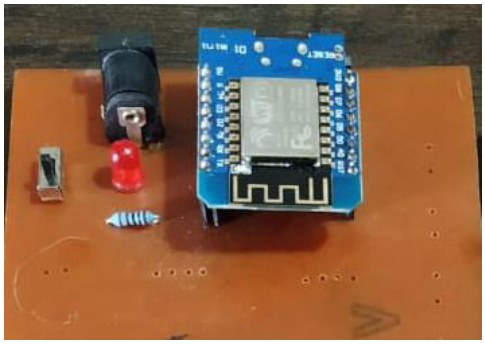
BRIDGE OVER FLOW



(Fig. 4)

The fig.4 is the device contents water level sensor which senses the level of water and sends message to the receiver.

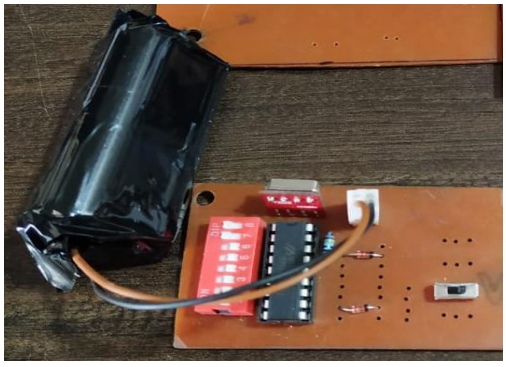
LANDSLIDE



(Fig. 5)

The fig.5 is landslide detector is placed near hills so that it could sense the jerk when landslide occurred.

ACCIDENTIAL DETECTOR



(Fig. 6)

The fig.6 is device of accident detector is the transmitter which will send message wirelessly to the receiver so that the driver get alert message before the accidential point arrival.

WORKING

The smart and intelligent system for road safety in hilly area is mainly based on WSN and IoT. In this system the sensors plays the important role. There are landslide sensor, water level sensor sharp turn, accidental point detector these are the main features in the system.

The landslide sensor are been placed near the hills so the landslide occurred, the sensors will sense the jerk and send message to WSN and IoT and it to the base station and it will send message to the receiver in driver's vehicle .The water level sensor will sense the water level at particular level, as when the water level increase sensor will sense and send the data through WSN and IoT it immediately send the message to receiver in drivers vehicle to prevent the accident. The sharp turn detector are designed in such way that the sensors for the sharp turns are been placed on particular spots while driving the vehicle when the sharp turns occurred before the spots the message will send so as the awareness is concerned these same applications are applied for the accidential point detection.

3. CONCLUSIONS

The proposed project smart and intelligent system uses major technologies like Internet of Things (IoT) and wireless networks. This system is based on the IOT and WSN that contains different types of sensors which is used to provide the desired result. With the help of these sensors, WSN and IoT, information can be communicated to the concerned officials. The natural calamities such as landslide the drivers and not even aware of the action, so this system could give the message at some distance so that to cure the accident. The sharp turn can also leads to the loss of many lives. It is being featured with the WSN and IoT based system in order to track and give message to driver for the turn. This system is being implemented with the sensor which can give information to module connected wirelessly. The system thus provides the safety majors to the driver in hilly area and these are the combine features inbuilt in one project.

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