Design of an Intelligent System for Highway using Wireless Sensor Network

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Abstract- In this paper presenting an Intelligent System for Highways. Recently a wireless sensor network (WSN) has come into importance due to the fact of monitoring physical or environmental phenomena. With the help of wireless sensor network monitoring and controlling the events such as traffic jam, water over flows on the bridge with the height of water on bridge, accident on road with CCTV monitoring, and landslide. After monitoring if something is happens then the message will be display on LED's which are place on road side and through the GSM message is send to the control room and control room send message to disaster management team if landslide happened, police and ambulance if accident happened. Here Xbee is used to make communication between the sensors.

Index Terms- WSN, CCTV, LED's, GSM, Xbee.

1. INTRODUCTION

Design of an Intelligent System for Highways is a concept of making cities and highways smart and by using LED display on road side showing the live status of roads. It said that road and transport system is the mean by which measure the development level of the country. And now a day's traffic jam on road, accident, water overflows on bridge, and landslide are increasing day by day so, there is need to manage such a things therefore designed system called as Intelligent System for highway. It can say there is a traffic jam when the vehicles are stop or vehicles are moving very slowly, accident mostly happened at squares and turning, in rainy seasons it's difficult to know the height of water on bridge, and in hilly areas there is chances of landslide for all these situations designed a system which continuously monitor and detect i.e. detection of traffic jam, water over flows on bridge with height of water on bridge, accident on roads with CCTV monitoring, and landslide. After the detection the message will be displays on LED's which are place on road sides and using GSM message is send to control room. Then control room take action as per situation occurred for e.g. inform to disaster management team for landslide, police and ambulance for accident etc.

2. SYSTEM MODEL

System for highways consist traffic sensor, water level sensor, accident sensor, and landslide sensor for detection, and LED display to show messages.
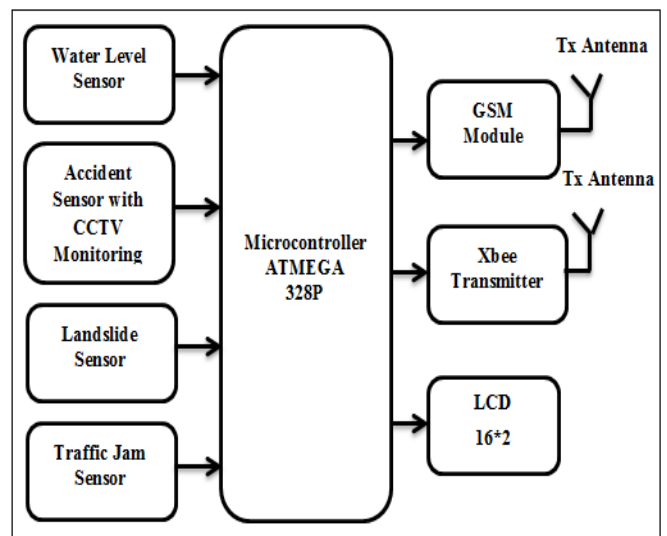
2.1. *Transmitter Section*

Fig.1. Transmitter Section

Above fig.1 shows the transmitter section in which microcontroller IC-atmega328p, four sensor, GSM module, Xbee transmitter, and LCD display used. The output of sensors given to the microcontroller as an input, whenever the condition occur it is detected by particular sensor and signal is given to the microcontroller it is heart of system which control all operations such as traffic jam, accident on road, water overflows on bridge, and landslide in hilly areas. The output of the microcontroller is given to the GSM module, xbee, and LCD display. Through GSM message is send to

control room. Xbee transmitter transmit message to receiver section.
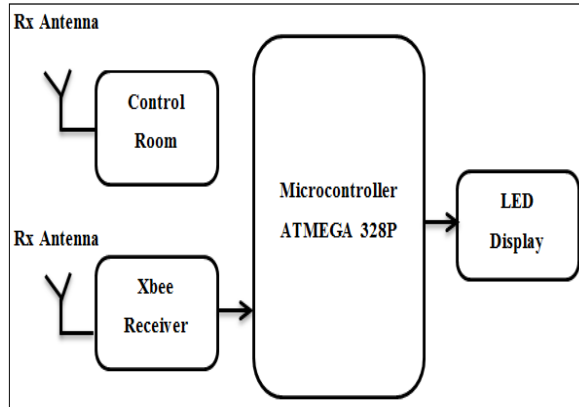
2.2. *Receiver Section*

Fig.2. Transmitter Section

Above fig.2 shows receiver section which consist control room, xbee receiver, microcontroller atmega328p, and LED display. Xbee receiver receives message and given to the microcontroller and through it the message display's on LED display which are place at road sides. Control room receives message from GSM and as per condition occurred informs to the police, ambulance, disaster management team etc.
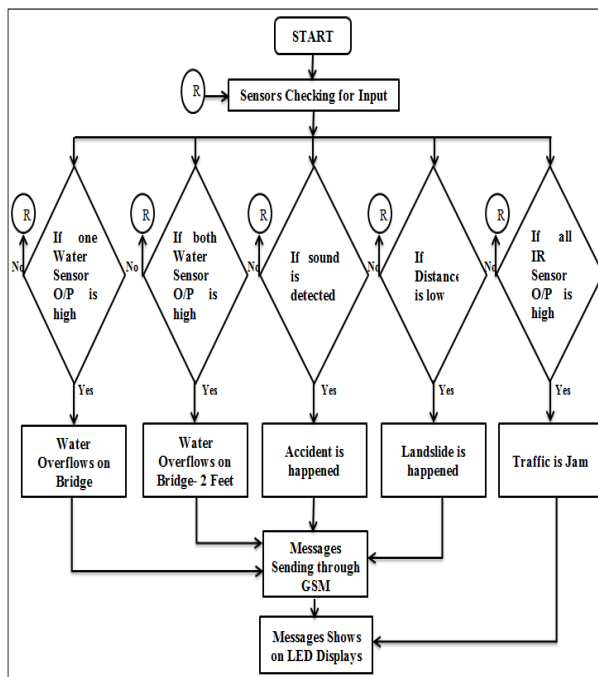
3. FLOWCHART

Fig.3. Transmitter Section

There are four sensors which are continuously checking for input. If any condition occurs i.e. water overflows over the bridge, accident, landslide, and traffic jam it is detected by specific sensor then the message regarding to condition occurred is sent to control room through GSM and displayed on LED board which are place at road side. If condition is false then it will check continuously for input.

4. CIRCUIT DIAGRAM

The microcontroller IC-atmega382p operating at 5V with 2Kb of RAM, 1Kb of EEPROM for storing parameters and 32 Kb of flash memory for storing programs. The clock is 16 MHz which translate to about executing about 300000 lines of C-source code per second. The board has 14 digital in/out pins and 6 analog input pins. In rainy seasons water overflows on bridge and it's difficult to get idea about the height of water on bridge and because of this traffic jam or accident may be happen so here water sensor is used to detect the volumetric content of water. Here soil moisture sensor is used as a water sensor. When the water sensor module detects the water level on the bridge its output is at high level. Accident mostly happened at squares or turnings and big sound occur so sound sensor is used to detect accident. It can detect the sound strength of the environment. The main component of the module is a simple microphone, which is based on the LM358 amplifier and an electrets microphone. It detects sound and gives output but sound generated by anything at highway so Closed-circuit television (CCTV) is used for surveillance. Video cameras are either analogue or digital, which means that they work on the basis of sending analogue or digital signals to a storage device such as a video tape recorder or desktop computer or laptop computer. In hilly areas there is chances of landslide which cause heavy loss or traffic jam so ultrasonic sensor is used e.g. Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. There is need to supply a short 10uS pulse to the trigger input to start the ranging, and then the module will send out an 8 cycle burst of ultrasound at 40 kHz and raise its echo. The Echo is a distance object that is pulse width and the range in proportion. Common cities road have to face many problem for e.g. traffic jam which cause loss of valuable time and there is nothing for indication so Infrared (IR) sensor is used for vehicle detection. GSM is used to inform control room if any condition is occurred. SIM900A module is a quad-band GSM/GPRS that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz, and PCS 1900MHz. Xbee is used to make communication between sensors and it operates in 16 channel of 2.4 GHz band and provides a data of 250 Kbps.

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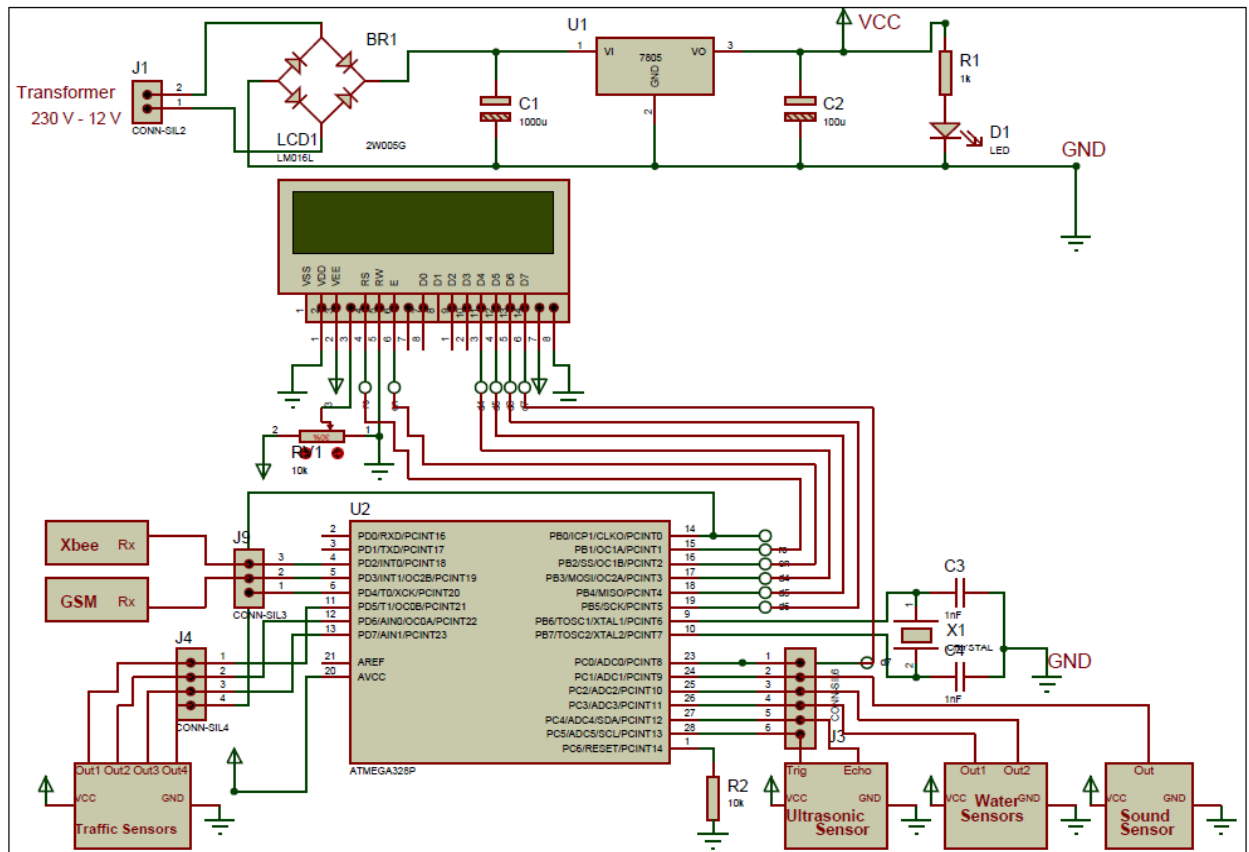*Available online at www.ijrat.org*

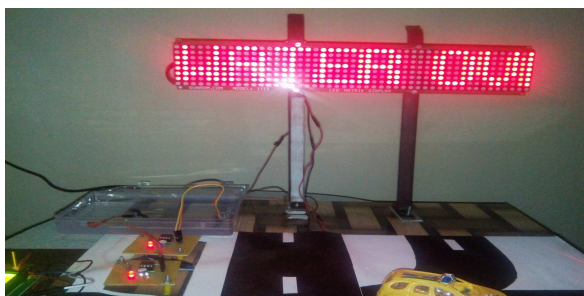Fig.4. Circuit Diagram

5. RESULT

Fig.5. Water level sensor detected water overflow on bridge

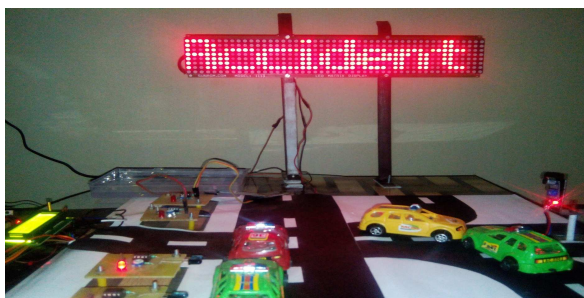Fig.7. Ultrasonic sensor detected landslide in hilly areas

Fig.6. Sound sensor detected accident on road

Fig.8. IR sensor detected traffic jam on road

6. CONCLUSION

In this paper, proposed system to make city smart and taking information from highways about events with the help of sensors which detects the traffic jam, water overflows on bridge with the height of water on bridge, landslide, and accident on road with CCTV monitoring by using Infrared, water level, ultrasonic, and sound sensors respectively. Messages send to control room through GSM for controlling and displayed on LED board which are placed at road side.

REFERENCES

[1] A. Chatteraji, S. Chakrabarti, S. Bansal, S. Halder, A. Chandra (2009): An Intelligent Traffic Control System using RFID, IEEE Potentials, Volume No. 28, Issue No.3.

[2] Byung-Tae Chun (2015): A Study on Intelligent Traffic System related with Smart City, International Journal of Smart Home. Volume No.9, Issue No.7, pp.223-230, ISSN No. 1975-4094.

[3] Mrs. Manali Chaudhari, Prof. Srinu Dharavath (2014): Study of Smart Sensors and their Applications, International Journal of Advanced Research in Computer and Communication Engineering. Volume No. 3, Issue No. 1, ISSN No. 2278-1021.

[4] Ms. Promila Sinhmar (2012): Intelligent Traffic Light and Density Control using IR Sensors and Microcontroller, International Journal of Advanced Technology & Engineering Research (IJATER), Volume No. 2, Issue No. 2, ISSN No. 2250-3536.

[5] S. P. Bhumkar, V. V. Deotare, R. V. Babar (2012): Accident Avoidance And Detection On Highway, International Journal of Engineering Trends and Technology, Volume No. 3, Issue No. 2, ISSN No. 2231-5381.

[6] Vijay Laxmi Kalyani, Shailee Joshi, Vidhi Choudhary (2015): Smart Highway of the Future: Utilizing Green Energy, Journal of Management Engineering and Information Technology (JMEIT), Volume No. 2, Issue No. 6, ISSN No. 2394 – 8124.