Smart Road Safety and Landslide Detection System

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Abstract-*Landslide monitoring is based on geotechnical instrumentations using, for examples ultrasonic sensors, water level sensors, vibration sensors, accelerometer, inclinometer, rainfall sensor, or. However, cable based monitoring systems are costly, require continuous maintenance, and are limited in their communication flexibility. To overcome these limitations, wireless sensor networks and Internet of things are a viable alternative technology. State-of the-art wireless landslide monitoring systems collect environmental data from the slope and transfer it to connected computer systems for persistent storage. It monitors and detects the landslide and alert people from landslide hazards through android app.*

Key Words: **Arduino Mega, earthquake, robotic arm, Obstacle, USB camera, Ultrasonic sensor**

1. INTRODUCTION:

Road accidents are undoubtedly the most frequent and, overall, the cause of the most of the damage. Accidents involving loaded vehicles occur too frequently despite calls for responsible behavior, for respect of the loading regulations and the Highway Code. Not only it is often drivers avoid the sign boards like School, Hospitals, no horn zone and also drive the vehicles so impetuous without considering the curves or speed breaker keeping their lives at risk. Several researches have been done for developing smart vehicle system that have all automatic functioning. A landslide is the down slope movement of soil, rock, and organic materials under the effects of gravity and also the landform that results from such movement. Landslides are known also as landslips, Slumps or slope failure. In the beginning of 2017 several countries hit by landslide such as Colombia, Italy, Indonesia, New Zealand, India, Bosnia, Kyrgyzstan. In March 31, 2017 a massive landslide hit Macao Columbia and at least 254 people had been killed, more than 200 were missing and at least 400 were injured. An early warning system can be used to minimize the impact imposed by landslide on human, damage to property and loss of live. The ability to monitor slope movements in timely fashion will inform the people of possible slope failures – giving them adequate lead time to relocate to a safer place..

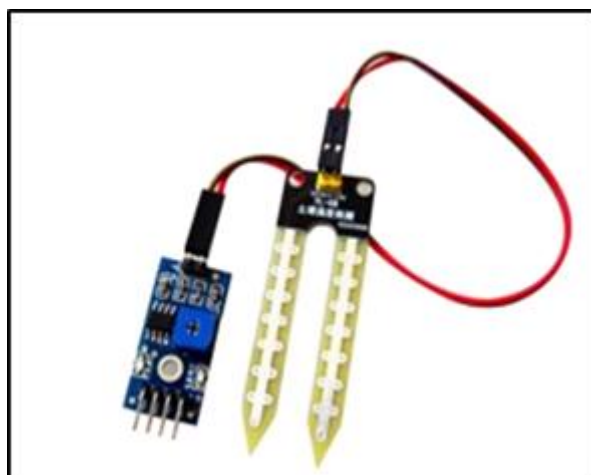## 2. METHODOLOGY:

1. Moisture Sensor:

Figure 1 Soil Moisture

The Moisture sensor is used to measure the watecontent(moisture) of soil. when the soil is having water shortage, the module output is at high level, else the output is at low level.
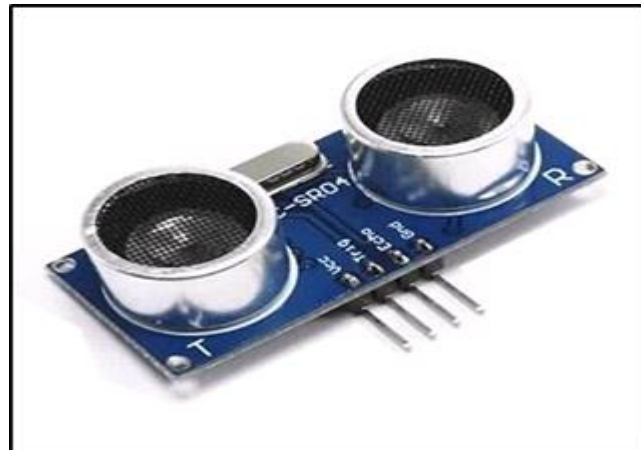
2. Ultrasonic Sensor:

Figure 2 Ultrasonic Sensor

Understood working of Ultrasonic ranging module HC-SR04 that provides 2 cms to 400 cms non- contact measurement functions, the ranging accuracy can reach to 3 mm. the module includes ultrasonic transmitter, receiver and control circuit.

3. Vibration Sensor:

Figure 3 Vibration Sensor:

Piezoelectricity is the electric charge that accumulates in certain solid materials in response to applied mechanical stress. The word piezoelectricity means electricity resulting from pressure and latent heat.

4. 9- gram servo motor:

Figure 4 9- gram servo motor:

According to Flite Test web site, the 9g reference is the weight without the wire lead. They measured one model at 8 grams

rounded down If you purchase a 5g servo, it will be a different hole and you may have a 6 or 7-gram weight, but the servo fits as it should

5. GSM module SIM 800l:

Figure 5GSM module SIM 800l:

SIM800 is a quad-band GSM/GPRS module designed for the global market. It works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz.

6. Arduino Mega

Figure 6 Arduino mega

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC- to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila

3. SYSTEM ARCHITECTURE

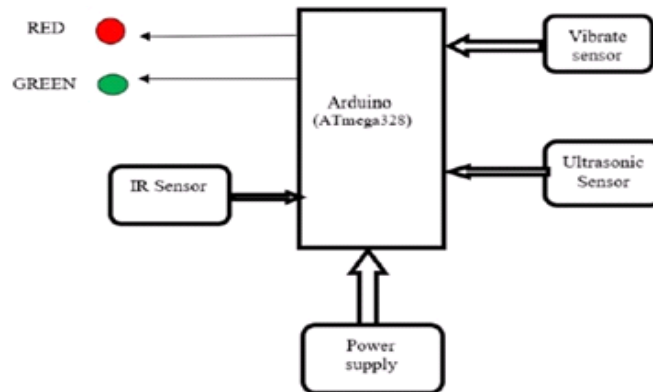### 3.1 Smart Road safety and landslide detection system:

Figure 7Block diagram of proposed system

Road safety and landslide detection system is a device having wireless connectivity and portability with simplex communication. The block diagram consists of various sensor, Arduino UNO microcontroller & power supply, Wi-Fi module, Li-Po battery, LED's. When the device is powered on the signals of the action performed is indicated by LED's. To control these actions tactile switches are available on the device. Wireless connectivity is provided by Wi-Fi module connected to Arduino processor in the device.

The sensors are connected to the Arduino and a power supply of 9v-12 v which is converted to 5V and given to Arduino i.e. standards voltage required to Arduino. The working of LED in road safety is the IR sensor will detect the vehicle coming, from opposite direction and gives the indication on the other side of the road to limit the speed or to stop the vehicle. When the device is powered on the signals of the action performed is indicated by LED's. To control these actions tactile switches are available on the device. Wireless connectivity is provided by Wi-Fi module connected.

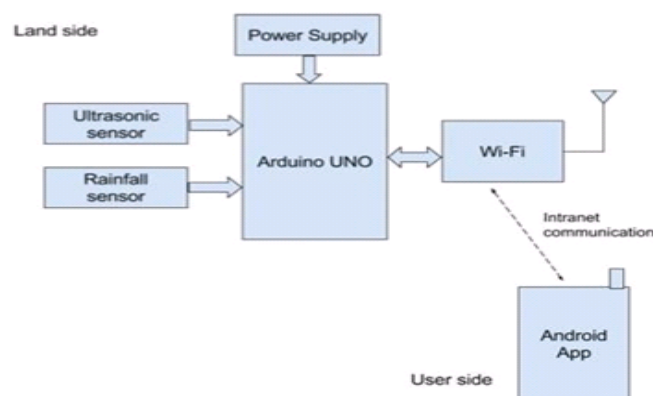Arduino processor in the device.

3.2 Connection to the Internet

Figure 8 Connnection to the Internet

Using the Wi-Fi module the mega gets an internet connection and the message of earthquake detection can be sent to the user through the app

## 4. Software Implemantation:

4.1 MIT App Inventor:

App Inventor for Android is an open-source web application provided by Google and now maintained by the Massachusetts Institute of Technology. It allows computer program to create software applications for the Android operating system. MIT App Inventor is an innovative beginner's introduction to programming and app creation that transforms the complex language of text-based coding into visual, drag-and-drop building blocks. The simple graphical

interface grants even an inexperienced person to create a basic, fully functional app within an hour.

App Inventor involves three steps :

(i) App inventor designer,

(ii) App Inventor Blocks editor,

(iii) An emulator or Android Phone.

The set-up process for the software is very easy. Also the system requirements are very basic. It is compatible with Windows and Linux Operating systems. Browsers required for the software are Mozilla Firefox 3.6 or higher, Apple Safari 5.0 or higher, Google Chrome 4.0 Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground,
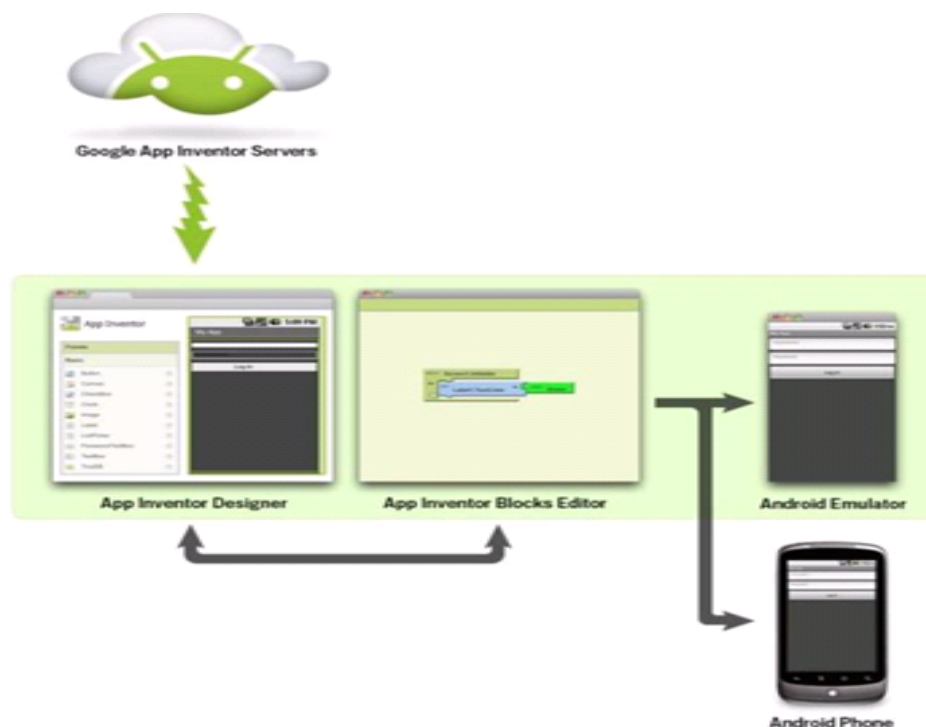
making it easier to put into DFU mode. You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU bootloader).

Power: The input voltage to the board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin. 5V. This pin outputs a regulated 5V from the regulator on the board.

The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7- 12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it. 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND. Ground pins.

4.2 Interfacing with Arduino mega:

The ATMega328 board can be programmed with the Arduino Software (IDE). The ATmega328 on the Mega 328 comes preprogrammed with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files).You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit

Serial Programming) header using Arduino ISP or similar The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available in the Arduino repository. The ATmega16U2/8U2 is loaded with a DFU bootloader. On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2. On

13:20

System Active SMS
Earthquake Detected

System Active SMS
Landslide Detected
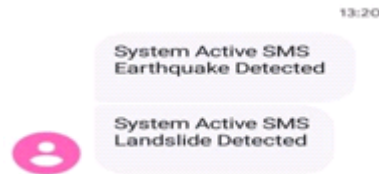
After the detection of Signal Above the threshold the mega using the wifi module send SMS to the number saved in the code .as shown in above figure
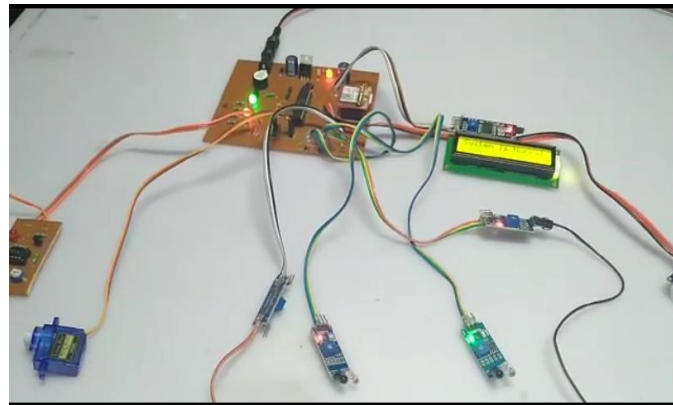
Smart Road safety and landslide detection system

5. Applications:

➢ This project can be used at homes for manypurposes like picking up and placing some objects from one to other.

➢ Since spying on someone is a sensitive task instead of humans this robot can help in spying operations.

➢ Making video surveillance of any disaster affected area where human beings cannot go.

➢ This pick and place surveillance robot can be use as a prototype in various industries as well as in military.

6. Conclusions:

This system is developed using ATMega328, Arduino processor. In the transmitter section we have sensors connected to Arduino which is further connected to Power supply if any sensor detected any disturbance then it transmits signal to receiver and it displays in LCD at receiver. By using the detection system we can take prevention and save the life and properties of humans.

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