International Journal of Research in Engineering, Science and Management
Volume-2, Issue-12, December-2019
www.ijresm.com | ISSN (Online): 2581-5792
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Natural Calamities Detector using Microcontroller

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Abstract: **A natural disaster is a major adverse event resulting from natural processes of the Earth examples are floods, hurricanes, tornadoes, volcanic eruptions, earthquakes, tsunamis, and other geologic processes. A natural disaster can cause loss of life or damage property, and typically leaves some economic damage in its wake, the severity of which depends on the affected population's resilience, or ability to recover and also on the infrastructure available. For this We have made a prototype of warning system which gives warning about Earthquake and Tornado or Cyclone. We hope this system will help to warn the people from disaster.**

Keywords: **AT89S52, IR sensor, Vibration Sensor**

1. Introduction

Earthquake and Tornado Warning system is a combination of Microcontroller and Sensors which works together to measure the given parameters. If certain parameter is above given threshold it gives output accordingly. Brain of this system is AT89S52 microcontroller IC. Atmel IC's are cost effective and readily available in most places. We can interface it with many sensors at same time. Main purpose of this project to warn people before the calamity happens.

2. Materials and methods

Hardware: The components used are as follows.
- *Microcontroller:* A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip.
- *AT89s52:* The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit

timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry.
- *IR Sensor:* (IR range Frequency -3x1011Hz to 3.9x1014Hz) an infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that it is detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light receiver
- *Vibration Sensor:* Vibration sensor module alarm Motion sensor module vibration switch SW-420 module based on the vibration sensor SW-420 and Comparator LM393 to detect if there is any vibration that beyond the threshold. The threshold can adjust using an onboard potentiometer. When this no vibration, this module output logic LOW the signal indicates LED light, and vice versa. This module when compared with a normally open pneumatic shock sensor module, shock triggered much longer can drive relay module the use of the company's production of SW-420 normally closed type vibration sensors. comparator output signal clean wave well, driving ability, 15mA rated voltage and 3.3V-5V output: digital switching output (0 and 1) a bolt-hole for easy installation small Board PCB dimensions: 3.2cm x 1.4cm. using the wide LM393 voltage comparator.
- *PR33A:* The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and

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full suite of quality-enhancing features such as sample-rate convertor. This module records the audio in recording mode and then in play back mode it provides output in form of playback

- *LCD Module:* LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCO's or calculators. The appearance and the pinouts have already been visualized above now let us get a bit technical.16×2 LCD is named so because; it has 16 Columns and 2 Rows. There   are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16×2 LCD. So, it will have (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots.

Software: The software part is done as follows.

- The program is written in embedded C [Muhammad Ali Mazidi 2013]. The program written is converted into hex file using Keil μvision. This hex file is written into IC AT89S52 by the process called burning through development software called USB asp-IC Programmer for 89s51.

3. Results and discussion

Working:

There are two parts:

First is used to determine Earthquake:

In this part we have used Vibration sensor which detects Vibrations. Detection of Vibrations means it gives high output on its OUT pin when it detects vibrations otherwise it is low. But we just can't interface the vibration sensor directly to Microcontroller due to current coming through microcontroller. So have interfaced it via relay. Code for this is basic If else statement. If input pin is high then give Earthquake output.

Fig. 1. Showing when earthquake is detected

Second is used to determine tornado/ higher wind speed:

In this part we are using IR sensor which determines the Speed of wind. This instrument is known as Tachometer. We have used A rotation blades (black color) and add on colored tape piece. rotations of blades keep on happening so the colored portion's rotation too. Since IR waves can't get reflected on black surface it only gets reflected when the Colored tape comes in front of the IR waves it gets reflected and IR sensor give high

output. Once high output is fed to microcontroller it starts counting for more signals for particular time interval and it is converted for rotation per min. If we make windmill and install such theme to it is blade colors, we can find wind speed.

For tornado we can just give certain threshold to RPM so microcontroller determines if the RPM is high or low and will give out if it is high.
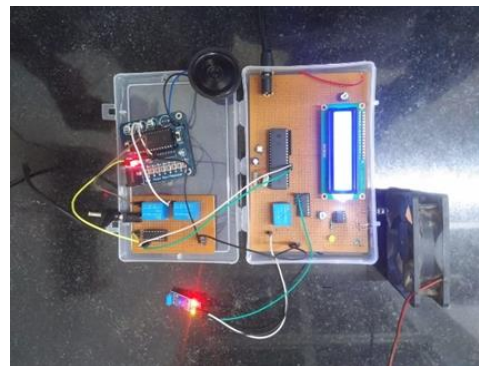

Fig. 2. The actual setup of the system

- *Right side:* IR sensor in front of Fan (considered as Windmill)
- *Button side: V*ibration sensor
- *Left side:* APR33A3 system

Now considering the output situation, we have given two output.

First one is LCD which show RPM and two warning messages for Earthquake and Tornado. Second is Audio output which is given by the APR33A3 module. This module needs grounding trigger so we have interfaced it with microcontroller via relay.

4. Discussion

For Earthquake vibration sensor senses the Pre vibration of Quake and provide it to microcontroller. Sensitivity of the vibration sensor can be adjusted by the Potentiometer present on vibration sensor. Once the signal is provided microcontroller provides the output signal to APR33A3 and displays the message on LCD.

For Tornado, IR sensor and Microcontroller programming together works as Tachometer which counts the RPM of windmill and if the speed of rotation of windmill is more than a particular speed then Microcontroller provides tornado warning signal to APR33A3 and shows message on LCD.

In mean time LCD is always showing the RPM of the windmill. This whole system is automatic so manual errors can be avoided by this.

Acknowledgement

5. Conclusion

The working model of Natural Calamities Detector using Microcontroller was designed and proposed. IT worked as warning system. The implementation of it can done in Some areas. This can save so many lives.

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