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Controls and Intelligence Behind "NISTARA": A Disaster Management Machine (DMM)

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1. Abstract

Fire is a very good servant, but a bad master. As long as fire is under control ,it serves a lot of purpose .But once it goes out of control, it can cause a lot of destruction .When situation is intense ,the only way out is rescue mission of those who are trapped. This paper presents a device called "*NISTARA*" (a Sanskrit word which means rescue and pronounced as Nistar) which helps in quick detection of fire and providing evacuation plan of the premises to the user in distress. Not only can it provide rescue plan during fire but also at times of terrorist attack, burglary and earthquakes. This paper discusses the intelligent control behind the working of this device. This paper also discusses the effectiveness and feasibility of implementing this device in premises such as hospitals, school and offices.

2. Introduction

The device *NISTARA* is especially made for uncertain times such as fire and earthquake. This is a simple electronic machine which is designed for the easy evacuation during such times. This device is intelligently designed to take inputs from various sensors as well as the user and based on the situation will provide the user the safest path to evacuate the premise. Device also shows the live footage of the situation from which user can also decide himself which way to choose. The speciality of this devise lies in the fact that it provides the user an additional option of informing the *Nation Disaster Management Authority of India (NDMA)* by sending an emergency message. A receiver module of this device would be installed in the NDMA office which will show the coordinate of the location where there is need for help. If the user thinks that the situation is intense and uncontrollable, he can send an emergency message.

3. Design concept

There are two inbuilt sensors in this device for sensing fire and earthquake. The seismic sensor is for sensing the earthquake and the thermal sensor for sensing the fire hazard. These two sensors are in direct control of the controller and would be on for all the time by the help of an internal battery. If any of the sensors will sense any activity for which they are designed, they will activate the alarm. Now when the user wants to use this device, he can press the switch which will switch on the cameras installed for live footage of the event. This can also bring footage from the already installed cameras (CCTV) in the facility, for monitoring purposes. The device will use a screen or a computer to show the live footage of the building. This device will also calculate the safest evacuation route of the building based on already stored protocols. Safest route will be shown on the computer/screen beside the live footage for the user to take decision himself. The evacuation map would be beneficial for the visitors of the building who barely know the place.

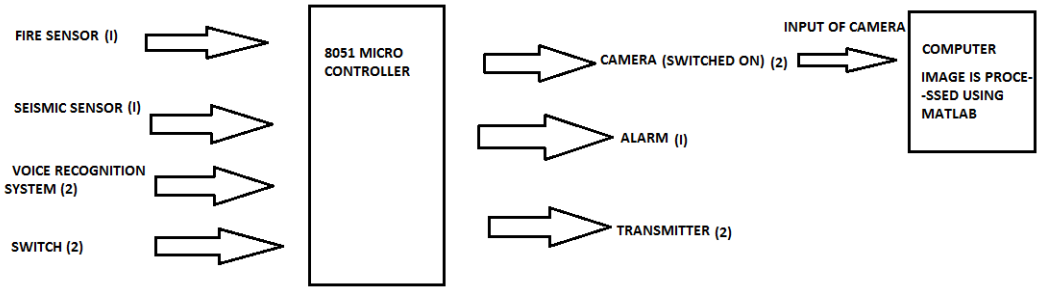

Figure.1 this figure shows the block diagram of the working of NISTARA

4. Circuit and Construction

Microcontroller –The Microcontroller used here is AT89S52. It is a high-performance, low-power CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is built using Atmel's high-density and non-volatile memory technology, and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash memory allows the program to be reprogrammed by a conventional non-volatile memory programmer.The pin connections are as follow:

1. Pin 1 to 8 of Microcontroller is connected to Voice recognition system.
2. Fire and Seismic sensor are connected to pin 1 and 2 respectively.
3. Pin 11 is connected to the Transmitter module
4. Pin 13 is connected to a Switch
5. Power supply on pin 20,31 and 40
6. Pin 22 is connected to Camera
7. Pin 21 is connected to an Alarm

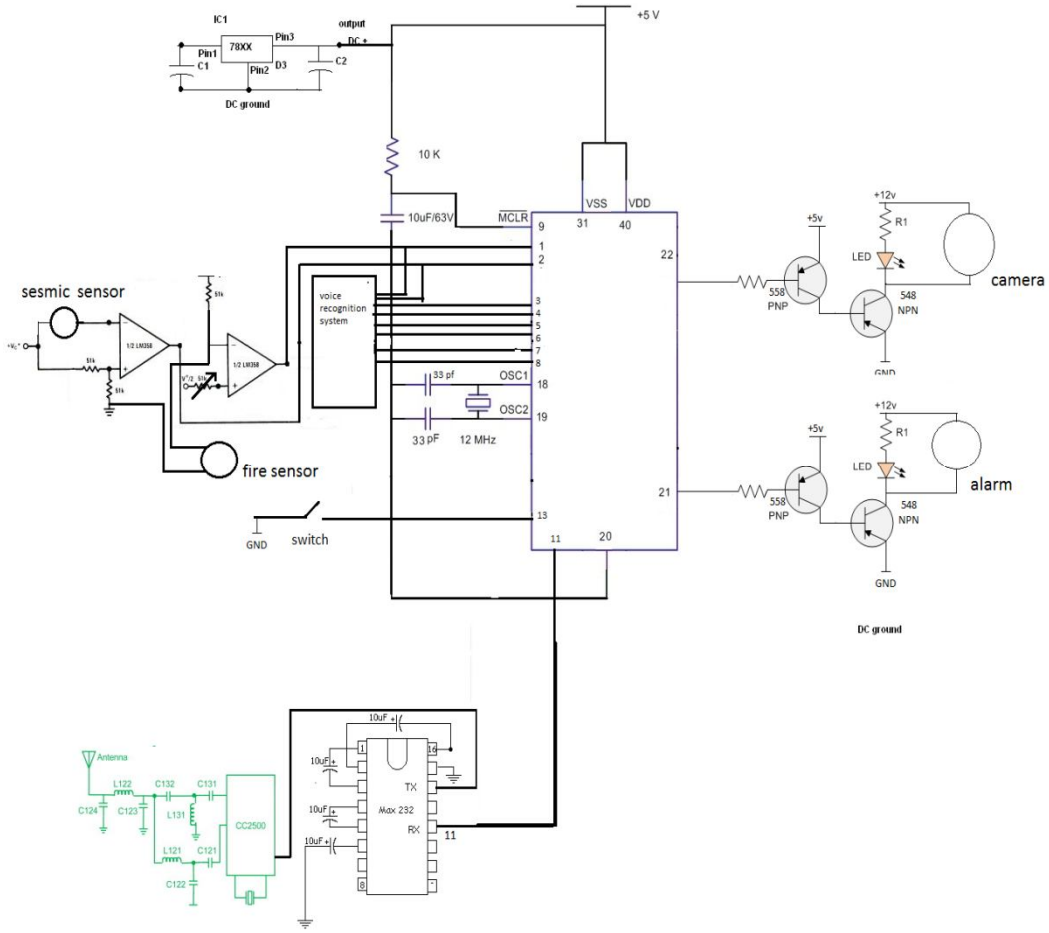

Figure 2. This is the circuit diagram of NISTARA

Voice recognition system: It is HM2007 IC based device. The speech recognition system is a completely assembled and easy to use programmable speech recognition circuit. Programmable, in the sense that you train the words (or vocal utterances) you want the circuit to recognize.

Transreceiver: It will be used to transmit instant message to NDMA (Nation Disaster Management Authority of India) as to get instant help or rescue. This High Speed CC2500 Based Wireless module is a plug and play replacement for the wired Serial Port (UART) supporting baud rates up to 38400.The receiver module of this device will be installed in NDMA office(for example) as shown in the figure 3.

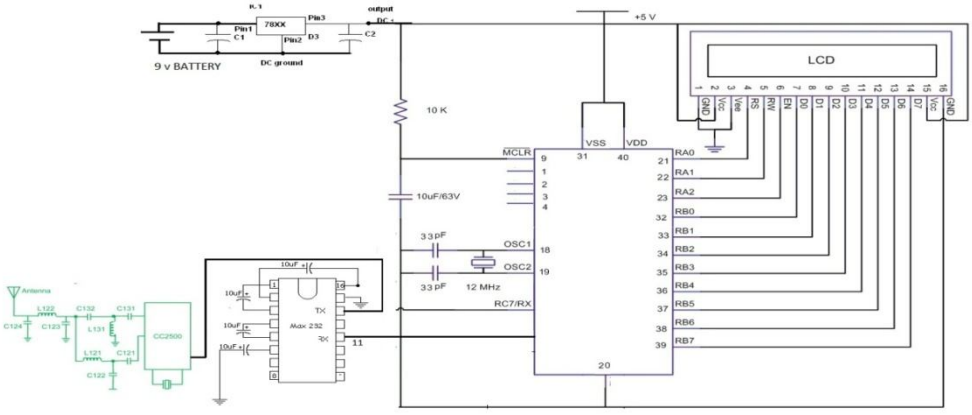

Figure. 4: This shows the receiver module of NISTARA at the receiving station (NDMA).

5. Working

NISTARA works in three stages:

STAGE I: As the input through fire or seismic sensor is given to the controller after detecting any hazardous situation (only fire and earthquake are covered in the prototype), controller processes the information and hence, activates the alarm.

STAGE II: As the user now knows that there is an emergency, with the help of either voice recognition system or a switch the user can activate the camera. Now the input of the camera is given to the computer .The microcontroller has the protocols of image processing in MATLAB coding, which will provide the device information of the intensity of disaster as well as for calculating all the alternative evacuation routes. The user can compare the live footage as well as the calculated evacuation route and decide which way to take. Hence, this device is advantageous in judging and conveying the best evacuation routes in the places such as schools and offices.

STAGE III: If the user feels that the intensity of disaster is very high and difficult to control he can send an emergency message to NDMA .The receiver module placed in NDMA office will display the location coordinates of the premise in danger.

6. References

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