Life Rescue of Operation Under Rubble during Natural Disasters

M.Yogeswaran[1], B.Vasantha Raj[2], K.Sagadevan[3]
Department of ECE
IFET college of Engineering,Villupuram

***Abstract*—The effect of natural disasters such as storm, earthquake etc., creates a severe chain reaction and leads to the collapse and destruction of buildings which cost the life of many people around the world. In such a scenario, the most essential task is to detect the location of human being under the rubbles. Though there are many sensors to detect the location of human being under the rubbles, there are many drawbacks such as incapability to detect human when obstacles and range are more. Here in our project, we use a thermal sensor called D6T to detect the humans. The sensor is embedded with a robot for locomotion. A Bluetooth paired devices is used for controlling the motion of the robot using Wireless Local Area Network (WLAN) technology. On receiving the signals from the sensor, the coordinates are sent as a message to the Bluetooth device. Thus our project helps to detect the humans even under obstacles of longer range and it is time efficient.**

***Index Terms*—8951 microcontroller, Bluetooth module, thermal sensor, DC motor, motor drive**

[1] INTRODUCTION

Natural calamities do occur and they are unstoppable. Awareness in the concept of intelligent rescue operation by human are increasing gradually for such calamities so that precious life and material can be saved though calamities cannot be stopped. Still there are lots of disasters that occur all of a sudden and earthquake is one such thing. Earthquakes produce a destructive effect and they see no variation between human and material. Hence a lot of times humans are buried among the debris and it become impossible to detect them. A timely rescue aid only for people who are buried and wounded. Detection by rescue workers becomes time consuming and due to the vast area that gets affected in it becomes more difficult. In our project we deliver a system which detects humans under the rubbles by the help of locomotive robot which is used to narrow down the location of the person alive under the debris.

[2] EXISTING WORK

In the existing system, the PIR sensor and Obstacle detection sensor are used together to detect the humans under the rubbles. The PIR sensor picks up the heat radiated from objects such as humans, animals and others. Fresnel lens is used in PIR sensor which made up of translucent which captures the radiation from the visible spectrum of light.

[3] PROPOSED WORK

The project proposes an autonomous robotic vehicle that moves in the earthquake prone area and helps in identifying the live people and rescue operations. Hence precious life can be saved by timely detection in natural calamities even without the help of large number of rescue operators. Here D6T thermal sensor is used to detect the humans alive under the debris. Initially the robot is made to move on the earthquake prone area to pick up the traces no heat radiation. When the D6T thermal sensor senses the heat radiation from humans, it sends a signal to the 8951 micro controller and the coordinates are shown in the display. The L293D Motor Drive is used for the locomotive action of the robot.

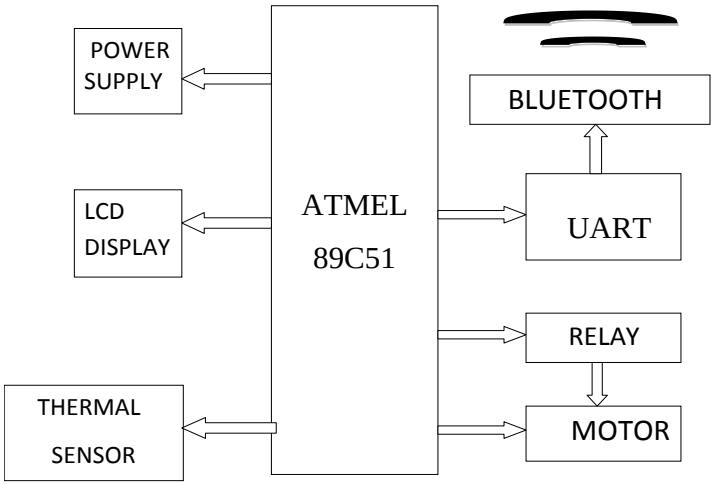

Fig.1 Block Diagram

[4] BACKGROUND

a. THERMAL SENSORS

The D6T series sensors are made up of a cap with silicon lens, MEMS thermopile sensor chips, and dedicated analog circuit and a logic circuit for converting to a digital temperature value on a single board through one connector. The silicon lens collects radiated heat (far-infrared ray) emitted from an object onto the thermopile sensor in the module. The radiated heat (far-infrared ray) produces an electromotive force on the thermopile sensor. The analog circuit calculates the temperature of an object by using the electromotive force value and a measured temperature value inside the module. The measured value is outputted through

an I2c bus. The non-contact temperature sensor measures the surface temperature of an object. D6T-44L-06 and D6T-8L-06 have sensor chip arrays of 16 channels (4x4) and 8 channels (1x8) respectively. By mounting the signal processing circuit closely to the sensor chip, a low noise temperature measurement is realized.

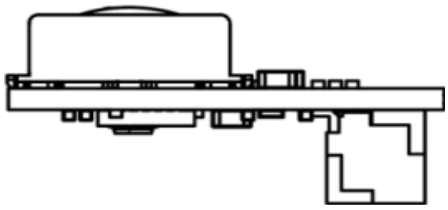

Fig.2 Module Outline

The module can also be used for detecting the presence of human beings. Omron's non-contact temperature sensor can solve the shortcomings of a conventional pyro electric sensor, which cannot catch the signal of a stationary person because the sensor detects the change of signal [in principle]. Moreover, Omron's non-contact temperature sensor keeps detecting the far-infrared ray of an object, while the pyro electric models do not.

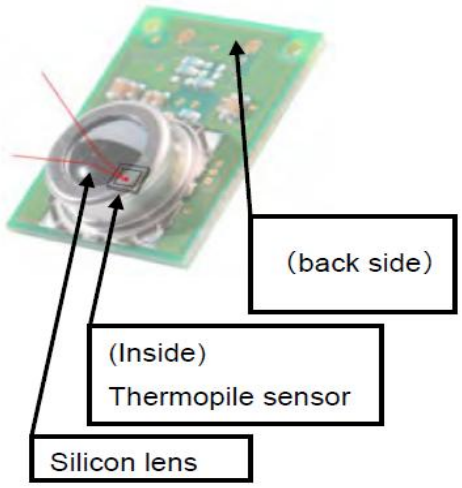

Fig3. Module Construction

b. WIRELESS COMMUNICATION

Wireless communication is the transfer of information over a distance without the use of Electrical conductors or "wires". The distances involved may be short (a few meters as in television remote control) or long (thousands or millions of kilometers for radio Communications). The term is commonly used in the telecommunications industry to refer to telecommunications systems (e.g., radio transmitters and receivers, remote controls, computer networks, network terminals, etc.) which use some form of energy (e.g. radio frequency (RF), infrared light, laser light, visible light, acoustic energy, etc.) to transfer information without the use of wires. Information is transferred in this manner over both short and long distances.

c. MOTOR DRIVE

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge *Motor Driver integrated circuit* (*IC*). The l293d can drive small and quiet big motors as well, check the Voltage Specification at the end of this page for more info.

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.

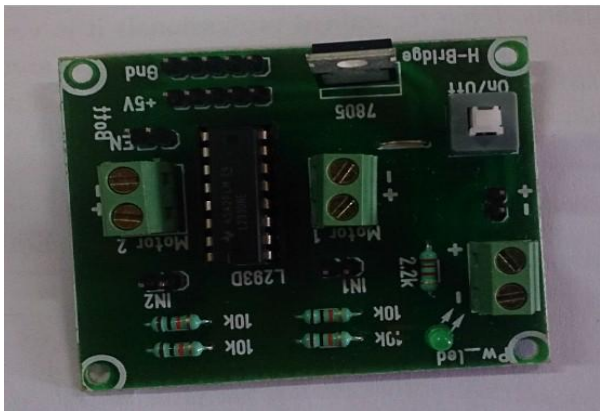

Fig4. Motor Drive Module

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

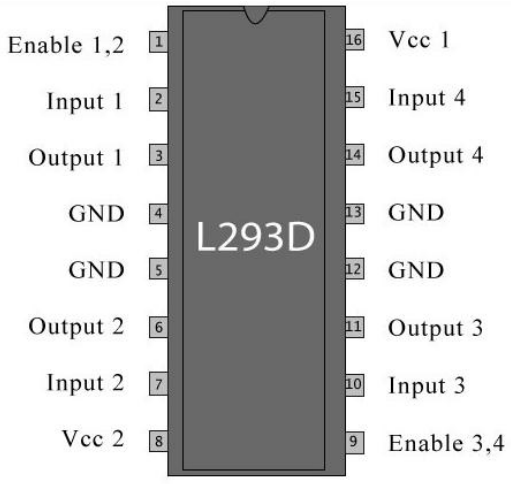

Fig5. Pin Diagram

There are 4 input pins for l293d, pin 2,7 on the left and pin 15 ,10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs

provided across the input pins as LOGIC 0 or LOGIC 1. In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

d. SERIAL COMMUNICATIONS

A universal asynchronous receiver/transmitter (UART) is a block of circuitry responsible for implementing serial communication. Essentially the UART acts as an intermediary between parallel and serial interfaces. On one end of the UART is a bus of eight-or-so data lines (plus some control pins), on the other is the two serial wires RX and TX.UARTs do exist as stand-alone ICs, but they're more commonly found inside microcontrollers. You'll have to check your microcontroller's datasheet to see if it has any UARTs. Some have none, some have one, and some have many.

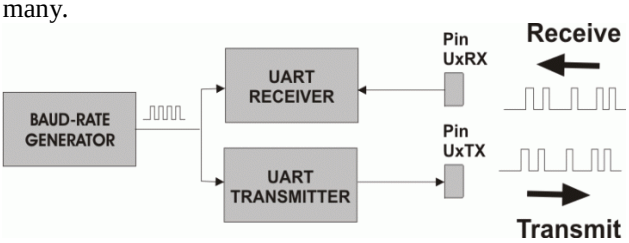

Fig6. UART Simplified Block Diagram

Figure shows a simplified block diagram of the UART module. The UART module consists of the three key hardware elements: Baud-rate generator, asynchronous transmitter, and asynchronous receiver. If a microcontroller doesn't have a UART (or doesn't have enough) the serial interface can be **bit-banged** - directly controlled by the processor. This is the approach Arduino libraries like Software Serial take. Bit-banging is processor-intensive, and not usually as precise as a UART, but it works in a pinch.

e. MICROCONTROLLER

AT89S51 Microcontroller Features:

Compatible with MCS®-51 Products
4K Bytes of In-System Programmable (ISP)
Flash Memory – Endurance: 10,000
Write/Erase Cycles
4.0V to 5.5V Operating Range
Fully Static Operation: 0 Hz to 33 MHz
Three-level Program Memory Lock
128 x 8-bit Internal RAM
32 Programmable I/O Lines
Two 16-bit Timer/Counters
Six Interrupt Sources
Full Duplex UART Serial Channel
Low-power Idle and Power-down Modes

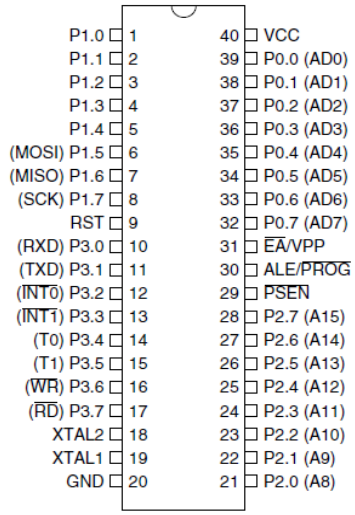

Fig7. Pin Diagram

a. ALGORITHM

Before programming the AT89C51, the address, data and control signals should be set up according to the Flash programming mode table. To program the AT89C51, take the following steps.

[7] Input the desired memory location on the address lines.
[8] Input the appropriate data byte on the data lines.
[9] Activate the correct combination of control signals.
[10] Raise EA/VPP to 12 V for the high-voltage programming mode.
[11] Pulse ALE/PROG once to program a byte in the Flash array or the lock bits.
[12] The byte-write cycle is self-timed and typically takes no more than 1.5ms. Repeat steps 1 through 5, changing the address and data for the entire array or until the end of the object file is reached.

E. LCD DISPLAY

It is a flat plate display that uses the light modulating properties of liquid crystals. It is available to display arbitrary images which can be displayed or hidden such as preset words, digits and 7-segment display as in a digital clock. It is an electronically modulated optical device made up of any number of segments controlling a layer of liquid crystals and arrayed in front of a light source.

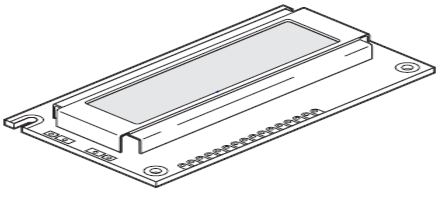

Fig.8 LCD Display

[13] RESULT

Thus the testing for detection humans alive was conducted for a distance 2 meters and the sensor was successful in detecting the human.

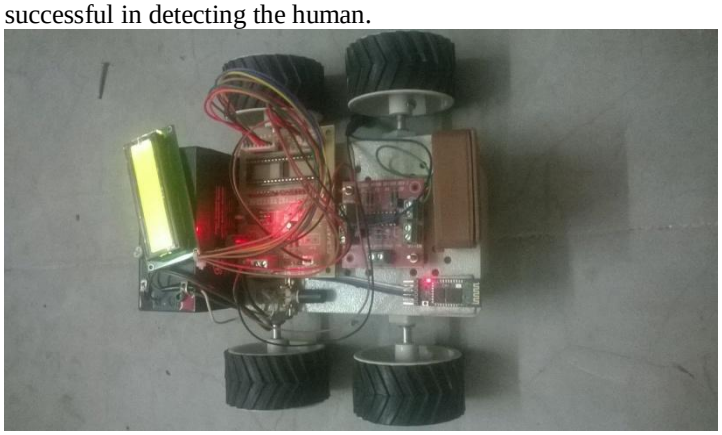

Fig8. Prototype

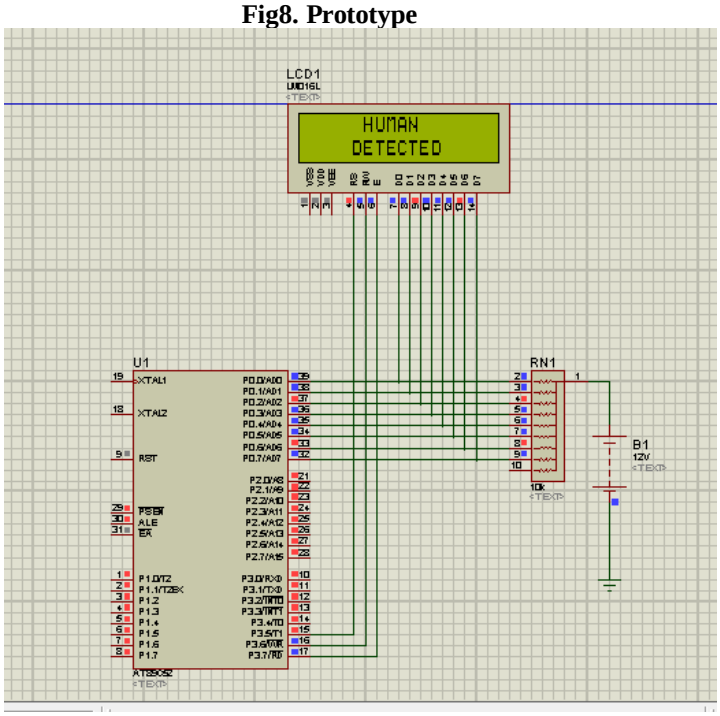

Fig9. Final output circuit

Furthermore the test for detecting humans alive under rubbles of buildings is to conducted.

[14] CONCLUSION

A sensitive life detection system using Thermal radiation for locating human beings buried under hidden various barriers have been designed. This technique stands better rather than searching in depth to the core to obtain relevant information and diagnosing it. This method proves to be an efficient solution and less time consuming and can be implemented with an ease of build.

In future, depending upon the development of technology, we can enhance the system so that it will able to detect dead victims buried under the respective rubble. Then rescuer will desire area with more number of victims alive. Eventually, our system can save more lives.

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