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Wireless Fire Extinguisher with Automatic Sensor

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Abstract *— Robots have been widely used to perform variety of tasks which reduces the manual work specifically in remote areas where human accessibility is unimaginable. There are many possibilities a fire can start in an industry or in any remote area. For example, in cotton mills, garments, fuel storages, etc., electric leakages can lead to huge damage. Also it's a worst case scenario, causing heavy losses not only financially but also destroying areas surrounding it. Robotics is the emerging solution to protect human lives and their wealth and surroundings. The main objective of our project is to design and develop the Robot which work on its own i.e. sensing the infrared light automatically and then extinguish the fire without any human intervention. A Robot capable of fighting a simulated household fire will be designed and built. Robots designed to find a fire, before it rages out of control, can one day work with fire fighters greatly reducing the risk of injury to victims.*

Keywords-IR Sensors, Micro-controller, User friendly, Automated Robot

I. INTRODUCTION

Technology is the word coined for the practical application of scientific knowledge in the industry. The advancement in technology cannot be justified unless it is used for leveraging the user's purpose. Technology, is today, imbibed for accomplishment of several tasks of varied complexity, in almost all walks of life. The society as a whole is exquisitely dependent on science and technology. Technology has played a very significant role in improving the quality of life. One way through which this is done is by automating several tasks using complex logic to simplify the work. The increase human machine interactions in our daily lives has made user interface technology progressively more important. This project, which is our endeavor to design a Fire Fighting Robot. Comprises of a machine which not only has the basic features of a robot, but also has the ability to detect fire and extinguish it. The need of the hour is to make a device which can detect fire, even if it is small and take the necessary action to put it off.

1.1. Motivation

1.1.1. Reason behind Choosing Microcontroller Based System: In this project, we have designed system by using microcontroller because microcontroller based system are less bulky and also easily transferable. It requires less power. So the system becomes cheap. It requires less space, easy to install, so can fitted easily in the robot.

1.1.2. Robotics has gained popularity due to the advancement in many technologies of computing and Nano technologies. So, we proposed to design something that can make human life easier and comfortable.

1.2. Problem definition

Many house hold item catch fire when someone is either sleeping or away and that lead many hazardous conditions if the fire is not putted off in time. So, we work as an electronics engineer is to design and build system that can automatically detect and extinguish fire.

1.3. Objective

The objective of this project is to build a fire fighter robot that sense the Infra-red light and automatically moves in the direction where the fire has occurred and extinguish it.

1.4. Existing system

The objective of this project is to avoid human intervention so that in the absence of human the robot must extinguish fire to protect important documents, files, etc. in laboratories, office, home.

II. RELATED WORK

Today, there are a number of robotic arms used in robotics research, many with unique features and design criteria. In this section, brief of some recent widely-used and/or Influential robotic arms is given.

Few popular systems are:

In a GSM based Fire Fighting Robot, the robot is equipped with four thermistors/flame sensors that continuously monitors the temperature. If the temperature increases beyond the pre-determined threshold value, the buzzer sounds to intimate the occurrence of fire accident. A warning message will be sent to the personnel in the industry and to nearby fire station with the gsm module provided to it. After extinguishing the fire, the robot comes back to its original position.

In a Fire Fighting Robot using LDR uses mono-stable NE555 and fan driver. The fire is extinguished with the help of fan. Its working is based on the phenomenon that the resistance of the LDR decreases as the intensity of light falling on it increases. The intensity of light and heat governed the speed of fan. But as the fan tried to extinguish the fire, the intensity of light decreased and hence the robot started to move without extinguishing the fire. The main problem in this mechanism that could not be overcome is that it cannot be driven by batteries.

So we decided to implement a mechanism which is automatic, driven by the rechargeable battery.

III. Literature Survey

We researched a lot and after a lot of considerations we decided to implement the automatic fire extinguishing robot mechanism. While doing the same we searched many websites on the internet and came up with the implementation methodology and circuit diagram for the same. When the fire occurs in a house, the fire extinguishing robot will be able to sense the flame and move to the fire location. After fire location is locked and flame distance is measured, water is being pumped out from the water tank and the fire is extinguished completely. Sang-Uk Park et.aI [3] developed a system that uses a High Speed Downlink Packet Access (HSDPA) network to transmit images, showing the view from a fire fighting robot. Tong Feng et.aI [4] presents an ultrasonic obstacle avoidance system used for fire-fighting robot. To meet the need of obstacle detection in hostile fire field under heavy smoke and high temperature condition, the transducer, STC circuit and anti-jamming processing are specially designed. Avanzato et.aI [5] designed an autonomous mobile that navigates through a maze searching for a fire, detects the candle's flame, extinguishes the flame and returns to a designated starting location in the maze.

After going through all these papers, we came to a conclusion to do a project on building a fire-fighting robot which is automatic. The robot consists of a IR-Sensor in four directions to detect fire and after sensing the fire the robot automatically travel towards fire to extinguish.

IV. Components

4.1 IR-Sensor:

Sensors used to detect the fire uses infrared receiver and a comparator LM358. Fire emits high amount of IR light. Comparator LM358 works on 5V DC with 2 comparator's in one 8 pin package. Inverting pin of the comparator is connected to the IR receiver as the IR light increases the voltage increases. Non-inverting terminal is set to a fixed voltage for comparison using a potentiometer. Normally when there is no fire, voltage at non-inverting terminal is higher so the output is high. When the fire breaks out, the IR light increases which will increase the voltage at inverting pin and output of comparator will go low. This output of comparator is interface to the microcontroller at I/O ports.

4.2. Microcontroller (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 Indus-try-standard 80C51 instruction set and pin out. 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 Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. 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. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

4.3. Microcontroller (AT89c2051):

The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2K bytes of Flash programmable and erasable read-only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C2051 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

The AT89C2051 provides the following standard features: 2K bytes of Flash, 128 bytes of RAM, 15 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, a precision analog comparator, on-chip oscillator and clock circuitry. In addition, the AT89C2051 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port and interrupt system to continue functioning. The power-down mode saves the RAM contents but freezes the oscillator disabling all other chip functions until the next hardware reset.

4.4. DC Motor:

A DC motor is an electric motor that runs on direct current (DC) electricity. DC motors were used to run machinery, often eliminating the need for a local steam engine or internal combustion engine. DC motors can operate directly from rechargeable batteries, providing the motive power.

4.5. DC Motor Driver IC (L293D):

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors. To simplify use as two bridges, each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz.

L293D is a typical Motor driver or Motor Driver IC which allows the 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 motors with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).

V. Conclusion

The conclusion is to provide security of home, office, laboratories, factory and building which is important to human life. We develop an intelligent multi-sensory based security system that contains fire fighting system in our daily life. We design the fire detection system using sensors in the system and program the fire detection and fighting procedure using sensor based method.

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