FIRE FIGHTING ROBOT WITH GSM TECHNOLOGY AND GPS

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Abstract- Fire accidents have been occurring frequently these days, with or without the intervention of humans. Whatever may be the reason it is one of the reasons for a huge blow the mankind. Different losses would occur in the form of property, land, humans, and animals too. Nature is also losing its environmental balance. Before the fire gets Widespread, we have to inhibit it in the initial stages. With the use of current technology, we have developed a robot. In our work, we will give information about the design and construction of it. This Fire Fighting robot uses GSM technology. When the Robot detects a fire, it gives a message to the user by the use of GSM. This module also gives location details like longitude and latitude where the fire has occurred using GPS and sends messages to the fire department through the GSM module thereby making it possible for the fire department to take necessary actions.

1. INTRODUCTION

Nowadays, machinery and robotic design become important in helping humans. This Fire Protection Robot was designed to help people in any destructive burnt situation where this robot can extinguish burnt areas immediately using an autonomous system. This autonomous system will be designed using programming in Atmega48 and other additional circuits. In real life, a destructive burnt area often happens without our realization. Therefore, this type of robot will require high Demand in the market because of its usefulness to humans as well as the environment transmitting fire information to a cell phone using GSM modern. The objective of the project will be to design an SMS electronic Fire Protection Robot toolkit which can replace the traditional Fire Protection Robot. The toolkit Sends the fire and sends SMS to the owner of the house, The system is made efficient by SIM so that the SMS can be received by a number of device boards in a locality using techniques of time division multiple access. The AT commands are serially transferred to the modem. In return, the modem transmits the stored message through the wireless link. The microcontroller validates the SMS and then performs a specific task on the device.

our proposed project aims to develop an autonomous firefighter robot that can be used to extinguish fires through remote handling. The vehicle consists of a water tank along with a pump that can throw water when needed. The system uses an Atmega48 microcontroller for this purpose.

This robot is equipped with a single flame sensor used to sense environmental fire and feed the signals to the microcontroller in order to trigger the pump which sprinkles water in order to extinguish the fire. This robot implements the concepts of environmental fire sensing and proportional motor control. The motor driver is used for the bidirectional control of the motors equipped in the robot. Thus, the robot processes information from its various key hardware elements such as the flame sensor, the programming of the robot is done using the Embedded C

Fire Fighting Robot

2. PROBLEM STATEMENT

There are many possibilities a fire can start in an industry or in any remote area. For example, in cotton mills, garments, fuel storage, 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 aim here is to design a FIRE DETECTOR AND EXTINGUISHER ROBOT using an embedded system. A robot capable of fighting a simulated household fire will be designed and built. It must be able to autonomously navigate through a modeled floor plan while actively scanning for a flame. The robot can even act as a path guider in normal cases and as a fire extinguisher in an emergency. Robots designed to find a fire, before it rages out of control, can one day work with firefighters greatly reducing the risk of injury to victims. The project will help generate interest as well as innovations in the fields of robotics while working toward a practical and obtainable solution to save lives and mitigate the risk of property damage.

Actuation of the robotic system such as robots is based on two major solutions:

1) *Electric.*
2) *Hydraulic.*

Electric actuation is typically used for unmanned ground vehicles. It is worthy to note that electric actuators have the advantages of reduced cost and their easiness of usage and control. However, a number of disadvantages appear when using electric motors with mechanical reduction devices. First of all, due to the quasi-rigid connection between the motor and its payload, without developing a specific control algorithm or adding supplementary mechanical components, it is difficult to produce the stiffness changes needed for safety.

3. *PROPOSED SYSTEM*

1. *Given the robotic solutions currently available.*

2. *There are several possibilities of fire in any remote area or in an industry.*

3. *In worst cases scenario, fire causes heavy losses both financially and by taking lives, Robotics is the best possible way to guard human lives, a Fire Fighting robot is designed and built with an embedded system.*

4. *It is possible of navigating alone on a model floor while actively scanning flames of fire. The robot could be used as a path guide in emergencies*

5. *The robot is designed in such a way that it Searches for fire and tries to extinguish it.*

OBJECTIVE

The main objectives of a Fire Fighting Robot are:

i. To study a robot that can search, detect and extinguish burnt areas immediately and develop a program using Atmega48 to control the movement of the robot. Besides, learn how to connect the microcontroller and GSM modem.

ii. To design the robot that includes the flame sensor to detect the fire and then send a notification by Short Message Service (SMS).

iii. To analyze how the robot performance to detect the angle of the burnt area in front of the robot and detect the burnt area in 0m ~ 1m in radius.

HARDWARE REQUIREMENT

1. *ATmega48 microcontroller*

The microcontroller is at the core of every embedded module. Hence, great care must be exercised in choosing the right microcontroller without compromising on functionality.

Fig 1:- ATmega48 microcontroller

2. *DC MOTOR*

DC means Direct Current. It is named by the connection of the field winding the armature. It converts the electrical power to mechanical power. The main working principle of the motor is based on the principle of the current-carrying conductor is placed on the magnetic field and a mechanical force experienced by it which causes it to rotate with respect to the original position
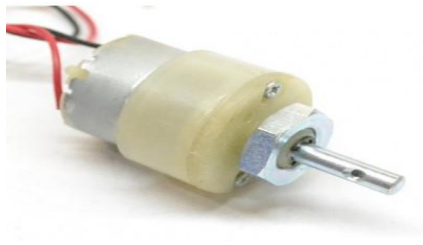

Fig 2:- DC Motor

3. *GSM*

GSM stands for Global System for Mobile Communication. It is used for transmitting mobile voice and data services which will operate at different frequency bands. It uses Time Division Multiple Access (TDMA) used for communicating the information.

Fig 3:- GSM

4. *Flame Sensor:*

A sensor that is most sensitive to a normal light is known as a flame sensor. That's why this sensor module is used in flame alarms. This sensor detects flame otherwise wavelength within the range of 760 nm – 1100 nm from the light source. This sensor can be easily damaged by high temperatures.

Fig 4:- Flame Sensor

SOFTWARE REQUIREMENTS:

1. *CVAVR cross compiler*

Code Vision AVR is a C cross-compiler, Integrated Development Environment, and Automatic Program Generator designed for the Atmel AVR family of microcontrollers.

The program is designed to run under the Windows 95, 98, Me, NT 4, 2000, and XP operating systems.

The C cross-compiler implements nearly all the elements of the ANSI C language, as allowed by the AVR architecture, with some features added to take advantage of the specificity of the AVR architecture and the embedded system needs.

The compiled COFF object files can be C source-level debugged, with variable watching, using the Atmel AVR Studio debugger.

2. AVR Studio Programmer

AVR Studio is an Integrated Development Environment (IDE) for writing and debugging AVR applications in Windows 9x/ME/NT/2000/XP/VISTA environments. AVR Studio provides a project management tool, source file editor, simulator, assembler, and front-end for C/C++, programming, emulation, and on-chip debugging. AVR Studio supports the complete range of ATMEL AVR tools and each release will always contain the latest updates for both the tools and support of new AVR devices. AVR Studio 4 has a modular architecture that allows even more interaction with 3rd party software vendors. GUI plug-ins and other modules can be written and hooked to the system.

3. Embedded C

Embedded C is extensive and contains many advanced concepts. The range of modules covers a full introduction to C, real-time and embedded systems concepts through to the design and implementation of real-time embedded or standalone systems based on real-time operating systems and their device drivers. Real-time Linux (RTLinux) is used as an example of such a system. The modules include an introduction to the development of Linux device drivers. Embedded C covers all of the important features of the C language as well as a good grounding in the principles and practices of real-time systems development including the POSIX threads (pthreads) specification.

METHODOLOGY

Software Process:

The software process is the set of activities and associated results, which produced a software product. Example: Waterfall process model, Spiral model, and Evolutionary model. The "Waterfall" process model has been followed for the development of this project. This model is one of the best process models. There are several variations of this model.

This process is best only when all the requirements are known in advance. This process is easy to understand by system developers as well as users. And this process model is more visible, as it produces deliverables at the end of the end phase.

Visibility is one of the process characteristics that are looked for by project managers while selecting a process model for any project.
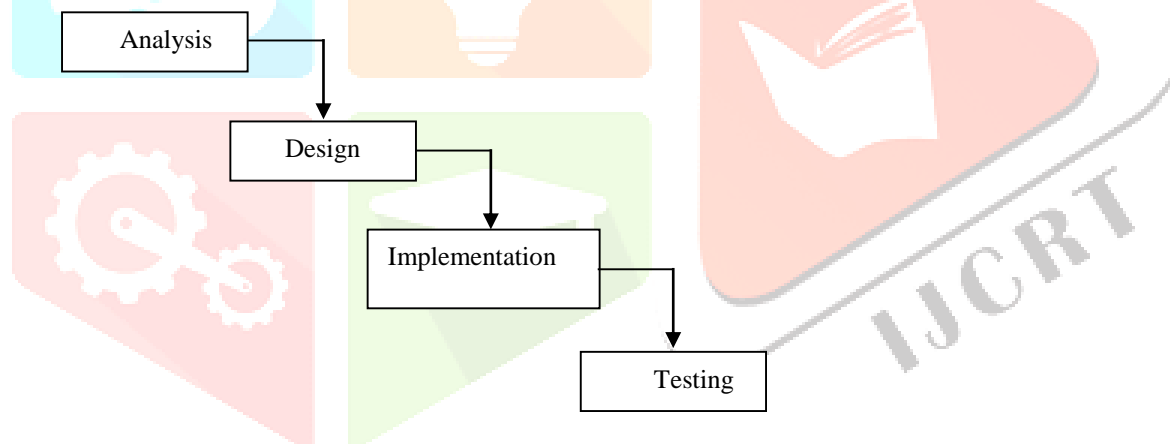
To practically implement the above features, the arrangement of various devices in our system is as shown in the following block diagram

The waterfall process model has five phases.

(1) Analysis

The system's services, constraints, and goals are established by consultation with system users.

(2) Design

The systems design process partitions the requirements to either hardware or software systems. It establishes the overall system architecture. Software design involves representing the software system functions in a form that may be transformed into one or more executable programs.

(3) Implementation

During this stage, the software design is realized as a set of programs or program units.

(4) Testing

The individual program units or programs are tested. Then they are integrated and tested as a complete system to ensure that the software requirements have been met. After testing, the software system is delivered to the customer.

Purpose of Design:

The main objective of this project is to develop a ground vehicle for firefighting

Design Features:

➢ The system makes use of gsm and GPS technology for the transmission of SMS with location longitude and latitude
➢ The system is microcontroller- based.
➢ The robot runs left, right, back, and front a robot with an automatic mode
➢ The appropriate code makes the respective robot act accordingly.
➢ The system should monitor fire and extinguish it.

Block Diagram:
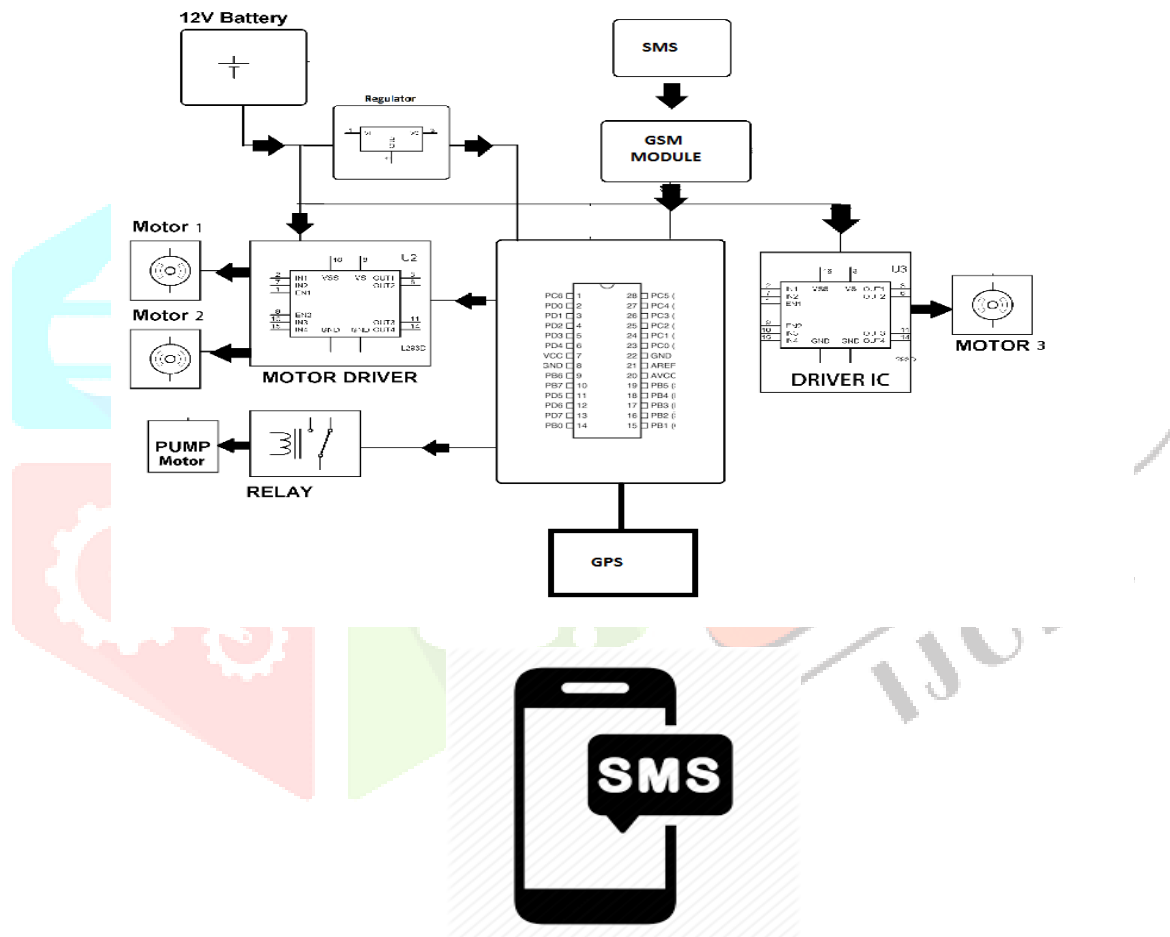
Receiver Section

Block Diagram Description

Whenever the supply is given to the kit through a 12V Battery the voltage regulators will step down the supply of 12V to 5V as per the requirement of the components in the kit. For example IR Sensor, GPS, fire sensor, etc.., these components require 5V, and coming to gear motors and GSM they require 12V supply respectively as per the requirement the supply power will be converted. The supply power will be passing through the serial port to all the components in the kit. Whenever the supply is given. A robot that will move forward. If any obstacles were observed by the IR sensor the robot will take another direction. The robot will be in motion until the fire is detected by the fire sensor. Once the fire is detected, the robot takes a step back and then the motion will be stopped. At that moment the pump motor and buzzer will be on. The pump motor sprinkles the water to extinguish the fire. "FIRE IS OCCURRED "a message is sent by GSM and location details from GPS are sent to the fire department.

CONCLUSION AND FUTURE WORK

As the saying goes "Necessity is the mother of all inventions", a need for software that would control processes and devices was recognized. The design approach used here has given satisfactory results and the microcontroller is sufficient for measuring the required parameters. The power consumption has been kept as low as possible and the measurements made by the device are quite reliable. Accordingly, a highly interactive user-friendly module-based embedded technology with microcontrollers was developed to solve the problem. The module which is developed will make the job of the process easier. The user module has resulted in reduced work of humans and also makes more comfortable. The module is, therefore functioning as a very good tool. Incorporating the future enhancement as specified earlier would make the software a perfect tool, which would help the user.

This project gives a detailed mechanism for the robot that continuously monitors, intimates the respective personnel, and extinguishes the fire. In the industry, if any fire accident occurs, there is a need for a person to monitor continuously and rectify it. In this process, if any time delay takes place irreparable loss occurs since it is a cotton industry.

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