Black box system

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ABSTRACT

The occurrence of the natural disaster is a big loss for human life and property. Here we introduce an embedded system called black box which has a water level sensor that helps in the rescue mission. The black box system is an embedded system with two sections, one section in user side for interacting with the user and another section is in authority side to track the location of the user and to provide the service. Our system is trying to avoid the problems created due to natural disasters. Hence it was concluded that Black box system ensures the maximum safety of mankind and infrastructure.

Keywords— Embedded system, Microcontroller, GSM, Data modem

1. INTRODUCTION

The occurrence of the natural disaster is a big loss for human life and property. Cause of natural disasters like flood, earthquakes, tsunami etc. cannot be stopped. But using some techniques we are able to protect mankind and the infrastructure. In black box system design, we introduce a new embedded system using the microcontroller AT mega 328. Here we have water level sensors in the black box system which helps in the rescue mission. If any disaster like flood occurs sensor senses the water level, whenever it exceeds the threshold value the black box system gets on and further the alert message is sent to the authority. The system is provided with a mobile charger, a light and a hooter. Black box system is powered with a solar panel. Thus this project is used for the real-time purpose for saving lives and property. A GSM wireless communication technology is used in the system, thus no network issues arise.

2. RELATED WORKS

[1] This system is used to detect and control the water level of the water tank. The system first senses the amount of water in the tank by the water level detector and then adjust the state of the water pump. If the water is empty in the tank then it is level 1 and if water is full in the tank then it is at level 9. The water pump automatically turns on and start filling, if the water level is 1 and stop filling the water when the level reaches 9. Between 2 and 8 there is no change. The system consists of a water level sensor, digital logic processing unit and seven segmented display unit.

[2] An IOT based flood monitoring and artificial neural network based flood prediction are designed with the aim of enhancing scalability and reliability of flood management system. The main aim of the system is to monitor the humidity, temperature, pressure, rainfall, river water level and to find their temporal correlative information for flood prediction analysis. The IOT is deployed for the data connection from the sensor and communication over Wi-Fi and ANN approach is used or the analysis of the data in flood prediction.

[3] This system consists of two components: hardware components and software components. Hardware components are a microcontroller, communication device and a sensor. The software components involve a database, application programming interface web-based and mobile based. It uses an IOT based approach. The system will monitor the potential drainage usually occurs flooding and share the information in real time to people nearby. For this, the data collected by the water level sensor will store in the database before it sends to the last output which is the end user. We create API for the manipulation of data such as for access the data that need to proceed and also transfer the data if need cross-platform within a different domain.

[4] The system contains an embedded data acquisition module that can be placed in a remote area in order to collect environmental data such as the amount of rainfall, waterfall and image periodically. The collected data are then sent to the server on a database and processed to determine early warning if flood in the area based on historical data. A web application and mobile application have been designed and developed for the user to view measured data. Moreover, the mobile application is capable of receiving a push notification of a warning message of potential flooding.

3. BLACK BOX SYSTEM

The black box system is an embedded system with two sections, one section in user side for interacting with the user and another section is in authority side to track the location of the user and to provide the service.

The embedded system consists of the ATMEGA 328 microcontroller, which is a32 bit microcontroller. A GSM module, battery charger, solar panel, alert system, button, LCD, data modem and also simple transistor based water level indicator is attached with it. The working is based on sensors water level detection. Whenever a flood happens the water level will start to increase. The water level indicator which detects the water rise and gives alert to the user when the level reaches beyond the threshold value. The user can press the button to send the location to the authority. If he or she is not able to press the button the black box system automatically send the location using GSM module. So the authority can track the isolated location and can provide rescue. Also, a data modem which is attached in the system is responsible for sending the alert message to the nearby control station

4. SYSTEM ARCHITECTURE

4.1 ATMEGA 328(Arduino)

The Arduino is a sophisticated computer that can be programmed to sense and control the physical world around us. It can be used as a dedicated computer for industrial automation or to control a robot. It can take input from a variety of sensors connected to its input pins. It can process the information locally or can send data to another computer for remote computation. The processed information can then be used to make a decision and or control motors or other actuators connected to the board's output pins.
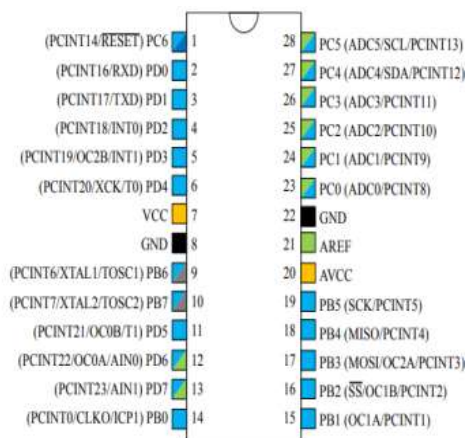

Fig 1: Pinout a diagram of ATMEGA 328

4.2 Data modem

A modem is a hardware device that converts data between transmission media so that it can be transmitted from computer to computer. The goal is to produce a signal that can be transmitted easily and decoded to reproduce original digital data. Modems can be used with any means of transmitting analogue signals from light emitting diodes to radio. a common type modem is one that turns the digital data of a computer into a modulated electric signal for transmission over telephone lines and demodulated by another modem at the receiver side to recover the digital data.

4.3 Liquid crystal display

LCD is the technology used for displacing notebooks and other smaller computers. Like light emitting diode and gas plasma technologies, LCDs allow displays too much thinner than the cathode ray tube technology. LCD consume much less power than LED and gas displays because they work on the principle of blocking light rather than emitting it

4.4 Solar Power

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaic, indirectly using concentrated solar power or a combination. Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into electric current using the photovoltaic effect.

4.5 Mobile charger

A mobile battery charger circuit is a device that can automatically recharge a mobile phone's battery when the power gets low. These battery chargers also vary depending on the applications like a mobile phone charger, battery charger for vehicles, electric vehicle batteries chargers and charge stations

4.6 GSM

GSM (Global System for Mobile communication) is a digital mobile network that is widely used by mobile phone users in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and code-division multiple access (CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot.

4.7 Block Diagram

Block diagram is a diagram of the system in which the principal parts or functions are represented by blocks connected by lines that show the relationship of the blocks, they are heavily used in engineering hardware designs, electronic design, software designs. Block diagrams are typically used for higher level, less detailed descriptions that are intended to clarify overall concepts without concern for the details of information. Contrast this with the schematic diagrams used in electrical engineering which shows the implementation details of electrical components and physical construction.
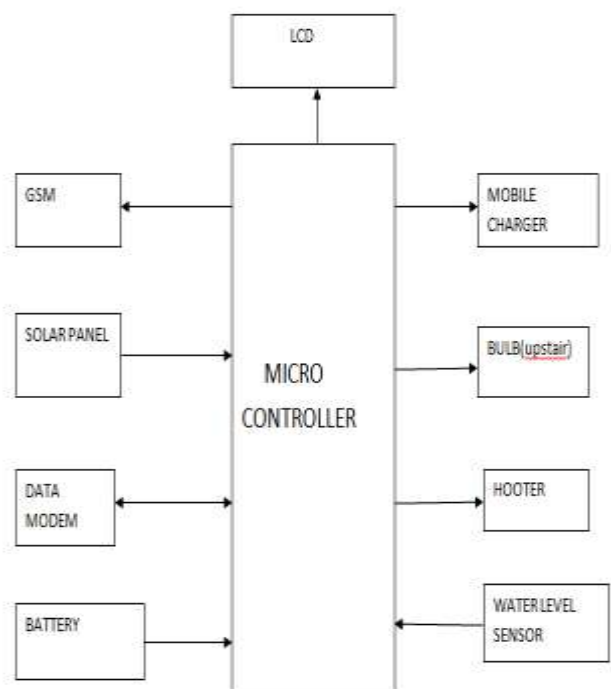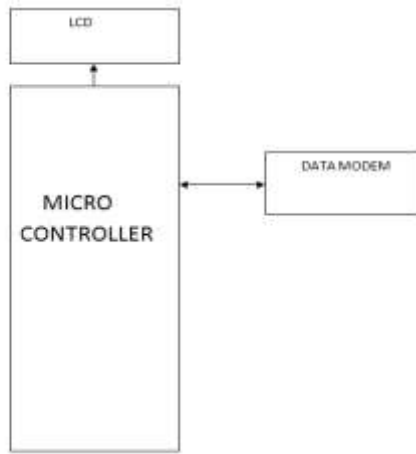

Fig. 2: User section

Fig. 3: A receiver section

4.8 Flow diagram

Flow diagram is a collective term for a diagram representing a flow or a set of dynamic relationship in a system. The term flow diagram is also used as a synonym for flowchart and sometimes as a counterpart of the flowchart.
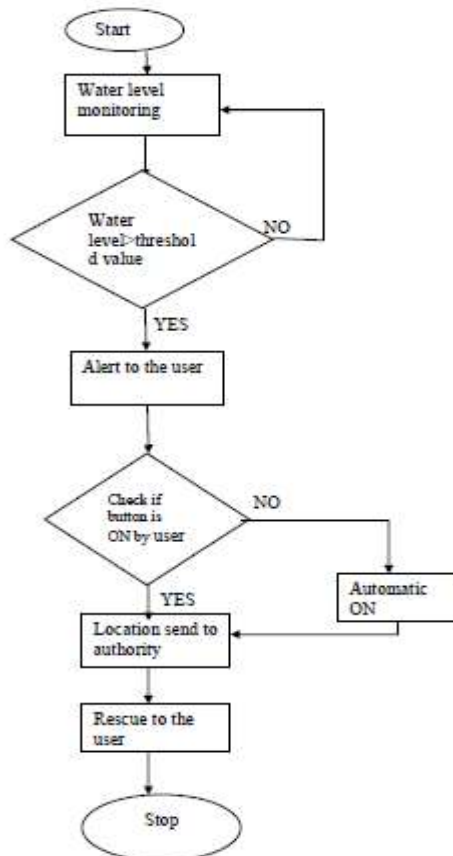

Fig 4: Flow diagram

5. EXPECTED OUTCOME

Our system is trying to avoid the problems created due to natural disasters. The latest problem that we faced was the flood. Many people were isolated in many places and they were unable to send their location to the authority because of the loss of interconnectivity and loss of power. Here comes the need for a black box system. By keeping this embedded system in the house, it is easy to send the location to the authority even when there is no network connection is available. Maximum protection and safety of the people is our main aim and we firmly believe that we can achieve that by implementing our project.

6. CONCLUSION

Black box system is trying to avoid the problems created due to the natural disasters. The latest issue that Kerala faced was flooded. People were isolated in many places and they were unable to send their location to the authority because of the loss of interconnectivity and power. By installing the product in the house, we can easily send the location to the authority even when there is no network connection. The solar panel provided helps to charge the mobile phones so that we are able to use mobile phones even when it's battery dead due to loss of electricity. Maximum protection and safety of the people is the main aim of the black box system and we firmly believe that we can achieve that by implementing our project. The implementation of the project controls the consequences caused due to the natural calamities like flood. Black box system ensures the maximum safety of mankind and infrastructure.

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