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INDUSTRIAL DISASTER CONTROL SYSTEM USING HANGING ROBOT

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Abstract - *Industrial disasters are increased in number causing more damage to human as well as industries. This project is proposed to detect the abnormal changes in the industries that causes damage so that we can prevent it at the earliest stage. Here we design a hanging robot model system for monitoring the industries continuously. The hanging robot travels over the rope path controlled from the base station. The sensors like gas, temperature, LDR senses and sends the information continuously to the base station. In case, if any unexpected sensor values are received, the alert is sent to the authority persons and the buzzer is produced. When the buzzer sound is produced, the fire extinguisher placed in the ground unit is turned on. Thus preventing the industries from occurrence of causing more damage.*

Key Words*: *Arduino UNO, Actuator, Hanging robot, Sensors, Zig-bee.

1. INTRODUCTION

Robots all have different kinds of structure designed to achieve the assigned task more effectively and efficiently. In our project we propose a hanging robot for monitoring the industries continuously without human interruption. The hanging robots can move from one place to another place through the rope path with the help of motor rotation with respect to forward and reverse direction. These hanging robots are controlled by passing commands through Zig-bee pair. The sensors like gas, temperature, LDR are used to measure the gas level, temperature level and the light intensity level of the environment respectively. If the gas value and temperature value increases than the normal value, then alert signal is automatically sent to buzzer and the authority persons. The light dependent level is measured using LDR sensor in case of fire. With the help of microcontroller, the gas, temperature and fire sensor values will be continuously observed. If the fire (light) is detected, the RF transmitter connected to the microcontroller sends the signal to the RF receiver in the ground unit. When the RF receiver receives the signal, it automatically presses the actuator to emit the spray which acts as the fire extinguisher. This prevents the industries from the damage that may arise due to abnormal changes in the environment. Thus the hanging robots are designed mainly to prevent the industries from severe damage. The reasons for the disaster are found earlier using the hanging robots and thus prevents the industrial damages.

2. LITERATURE SURVEY

Unmanned aerial vehicles or drones require advanced planning and navigation algorithm s to enable them to safely move through and interact with the world around them. This paper presents an extended potential field controller enables an aerial robot, or drone, to safely track a dynamic target location while simultaneously avoiding any obstacles in its path [1]. High-voltage inspection robot can detect and identify various obstacles while it is walking long the high-voltage line and plan specific bypassing strategy for different types of obstacles. In this paper vision-based obstacle recognition algorithms are studied based on visual sensors specifically for the unique features of 500kv high-voltage wire [2]. Pipeline is an efficient way to transfer oil, water and gas but recently many plants pipeline became old so wired robots were considered to inspect but they require heavy power supply so adapting wireless robot is meant to be better solution. A robot that supports image transmission with outstanding mobility was developed. This robot can withstand many tough condition in pipeline and safety various requirements. In this experiment it is clear that robot can be driven as wireless communication then collects some images and other signals successively [3]. In industries, measuring the parameters of machines is still a tedious process which is carried out by human personnel. This paper mainly focuses on the remedial measures made to reduce human interaction with machines by using industrial monitoring robot [4]. The development of a mobile robot for autonomous installation and removal of aircraft warning spheres on overhead wires of electric power transmission lines [5]. A mobile robot based on novel line-walking mechanism is proposed for inspecting power transmission lines. The novel mechanism enables the centroid of the robot to concentrate on the hip joint to minimize the drive torque of the hip joint and keep the robot stable when only one leg is hung on line [6]. An approach based on visual tracking using particle filtering where the equations of motion of the object are included in the filtering algorithm. A robotic solution method for interaction of an industrial robot and a free swinging object [7].

Limb mechanism robot are used to detect Grid-Like structure and Hooking area join compliance by using foot forcing sensor [8]. A robot which is equipped with Hybrid camera approach real time estimation of the pose of particular target object visual servoing in industry [9].

3. PROPOSED SYSTEM

In this project, we propose hanging robot for industrial monitoring. The hanging robots can travel from one site to other site. The hanging robot is controlled by passing command through Zig-bee pair. With the help of microcontroller, the gas, temperature and fire sensor values will be observed and the information is continuously updated to the base station. If the sensor value for gas (CO2) and temperature increases, then the alert signal is automatically sent to the buzzer and authority persons. The light dependent level is measured using LDR sensor in case of fire. If the fire (light) is detected, the RF transmitter automatically sends the signal to the RF receiver in the ground unit. The receiver unit on receiving the signal presses the actuator to emit spray which acts as fire extinguisher. Thus the changes in the sensor values alerts the authority persons to take necessary action and incase of fire detection, the fire extinguisher is turned on. Thus the industrial damage may be minimized to a larger extent with this hanging robot.

3.1 Advantages

- Doesn't harm human lives.
- Suitable for precarious sites.
- Can automatically send the sensor information to more number of places using Zig-bee mesh network.
- Earliest detection of fire, emits spray (fire extinguisher) causing less damage.

3.2 Block Diagram

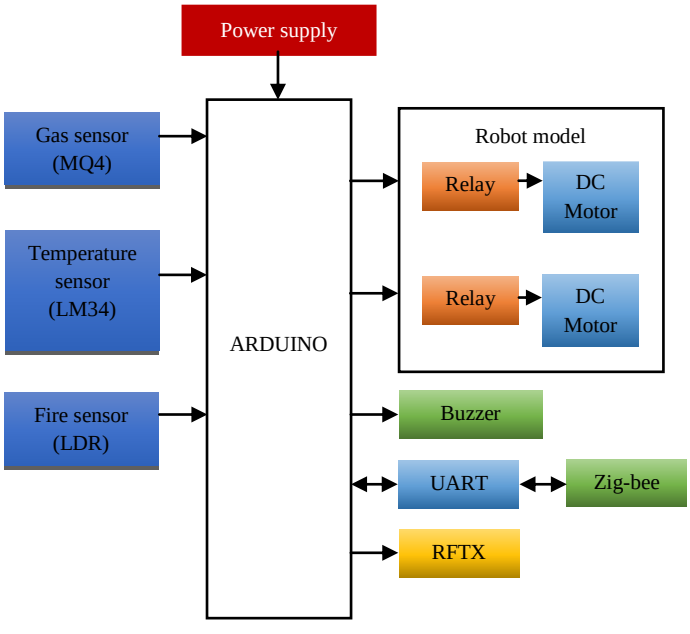

Fig -1: Transmitter unit

Fig -2: Receiver unit

Fig -3: Ground unit

3.3 Hardware Requirements

- Arduino Uno
- DC Motor
- Relay
- Buzzer
- Power supply
- Gas sensor
- Temperature sensor
- Fire sensor
- UART
- ZigBee
- Actuator
- RF TX and RX

3.4 Software Requirements

- Arduino IDE
- Embedded C
- Proteus

4. COMPONENTS OF THE SYSTEM

4.1 Arduino Uno

An Arduino is actually a microcontroller based kit which is used in communications and in controlling or operating many devices. It features the ATmega8U2 programmed as a USB-to-serial converter. The power for Arduino board is obtained by connecting it to a computer through USB or through a battery.

4.2 Relay

Relays are switches which consists of an electromagnet and also a set of contacts. The electromagnet is used to perform

switching mechanism in relays. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

4.3 DC Motor

DC motors were the first type widely used, since they could be powered from existing current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply or by changing the strength of current in its field windings.

4.4 Buzzer

A buzzer or beeper is a signaling device, the word "buzzer" comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped-down AC line voltage at 50 or 60 cycles. A Piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source.

4.5 UART

The Universal Asynchronous Receiver/Transmitter (UART) is used for serial communication. UART is also a common integrated feature in most microcontrollers. The data is transmitted as bits in sequence and at receiver end the bits are reassembled into original data. This method is cost effective than parallel transmission of data. Communication can be "full duplex" (both send and receive at the same time) or "half duplex" (devices take turns transmitting and receiving).

4.6 Zig-Bee

ZigBee is a mesh network specification for low power wireless local area networks(WLANs) that cover a large area. High data throughput is obtained with the help of ZigBee. ZigBee has low power consumption. It is powered by battery. ZigBee operates on the IEEE 802.15.4 physical radio specification and in unlicensed radio frequency bands, including 2.4GHz, 900MHz and 868MHz.

4.7 RF TX and RX

RF transmitter and receiver are used to transmit and receive signals over 433MHz frequency. When logic zero is sent, no power is drawn by transmitter and carrier is fully suppressed. When logic one is sent carrier is fully on to about 4.5mA with a 3volts power supply. The information is communicated between transmitter and receiver. Transmitter and the receiver are duly interfaced to two microcontrollers for data transfer. It covers the range of 2-3 meters.

4.8 Gas sensor

Gas sensor is a chemical optical sensor utilizing the acidic nature of CO2 for detection. It consists of a gas-permeable membrane in which a pH-sensitive luminescence dye is immobilized together with a buffer and an inert reference luminescent dye. The internal pH of the buffer is changed when CO2 gas penetrates the layer. With this changes the luminescence of the pH-sensitive dye. Together with the inert reference dye internal referencing is made for detection of the luminescence lifetime of the sensor.

4.9 Temperature sensor

Temperature sensor is used to convert temperature value to an electrical value. Temperature sensor contains sensing element and with the help of conditioning circuits, the sensor will reflect the change of environmental temperature. In LM34 series output voltage is linearly proportional to the Fahrenheit temperature. Thus they are more advantageous.

4.10 Fire sensor

A fire sensor is used to detect the fire or light. The fire sensor responds instantaneously to the fire detection. On detecting fire, the alert is sent. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanism it uses to detect the flame.

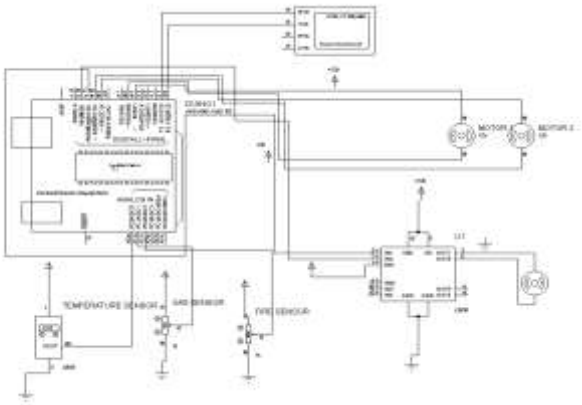

Fig -4: Circuit diagram

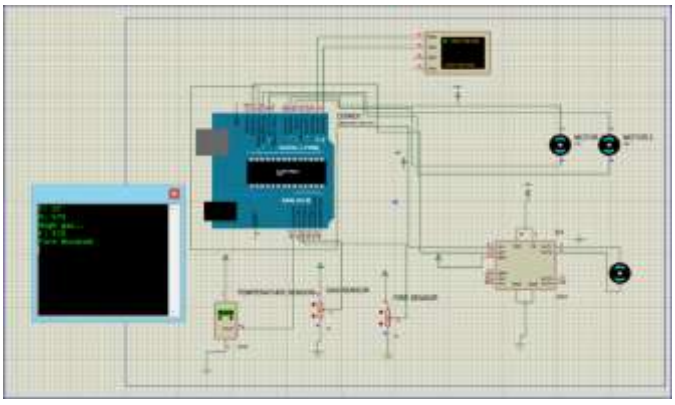

Fig: simulation output of hanging robot

Table -1: Observed values

Result values observed			
S.No	Measuring Parameters	Normal Range	Abnormal Range
1.	Temperature sensor	Room temperature	Above 100° C
2.	Gas sensor	1-150 ppm	Above 150ppm
3.	Fire sensor	0-300MΩ	Above 300MΩ

5. CONCLUSION

In industries to reduce manual overhead we have implemented a system using ZIGBEE in industry to monitor as well as to inform the responsible person to take appropriate measures. The hanging robot is a real-time monitoring system developed with simple hardware which simplifies the possibility of error free security system. Thus industrial monitoring robot used to monitor the abnormal conditions and parameters of the industry. A new RF for transfer of parameters from robot to base station. The actuator presses the fire extinguisher in case of fire detection in industries. Thus prevents the industries from severe damage.

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