Eye Ball Control Stair Climbing, Gas Detection Fire Extinguisher Bot with BCI and IOT

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Abstract— Now a days, fire accidents can be observed everywhere around us. Sometimes it even leads to disasters. Especially construction sites and fire-crackers manufacturing places and shops are more prone to these type of fire accidents. Human involvement in these types of places even leads to loss of lives. In this paper we are going to discuss about a robot which is multi-functional and had a multi-control (can be controlled in many ways). This robot can be controlled using eye-ball movement and even with BCI (brain computer interface) and even with smart phone using Bluetooth or Wi-Fi. It can be used in nights as a watcher bot in construction sites and fire crackers shops, which continuously monitors all the information around it and upload it to a website using IOT. This robot can climb the stairs using "triple wheel architecture". This robot can detect LPG and smoke, using sensors attached to it and continuously uploads the information to a required website or controllers' phone. If any gas leakages or smoke was found around it, it immediately alerts the persons by raising alarm or by sending a message to the controllers' phone. By using a personalized application, we can control the bot using hand gestures and can see the gas readings around robot, by which we can assume the danger and react accordingly. The additional feature of this robot is, it had a launcher by which it can launch fire extinguisher pellets, which releases CO_2 when touched to ground. This feature helps in reducing loss in fire cracker shops as water is not used here. The live telecast can be given using the personalized application, by which the person controlling the bot can sense the surroundings, and fire or launch the extinguisher pellets. The extinguisher pellets used here are completely non-dangerous and can even put off the fire in less than 2 minutes. It can be employed in construction sites and cracker shops which reduces the life threat to humans.

Keywords: Robot, Climbs Stairs, Gas Detection (LPG and smoke), Eye Ball Detection Control, BCI, IOT, Fire Extinguishers, Live Telecast, Extinguisher Pellets

I. INTRODUCTION

Now a day's robotics is playing a key role in humans' life. Almost all the dangerous operations are carried out by machines. Even we can observe machines or robots in many industries and mines. The use of robots increases the accuracy of the work, as the parallax errors observed in humans can be avoided. The involvement of humans in dangerous works like mines and atomic plants may cause threat to lives, as any small mistake may lead to dangerous catastrophes. So, involvement of robots in these fields may result in good changes. The paper which is going to be presented deals with the robot which can be installed as the watcher bot in industries and fire cracker shops. Especially many fire accidents can be observed in crackers shops which leads to a great loss in property and other aspects too. When this bot is installed in a shop or construction site and if any fire accident happens, it immediately alerts the controller by message and raises an alarm to alert the surrounding persons. Then this bot can be controlled by using a smart phone or eyeball control to move to the direction where the fire is raising. If the fire raises in the closed place a personalized application is used to send the live telecast from the bot to the controller and also the gas levels around the robot. Then the robot is moved to the required place and the extinguisher pellets are launched using pellet launcher, in which dry ice is used to reduce the fire instead of water. Using water as fire extinguisher can lead to some loss in cracker shops. So, dry ice is used to reduce the fire and reduce the loss.

II. RELATED WORK

Up to now the existing system consists of fixed smoke sensors at a particular place and if any fire raises over there then the sprinklers will get switched on by releasing water like spray. But in all the cases this type system doesn't work properly, if sensors are fixed in one room and fire raises in another room it can't detect and also the sprinklers are also fixed in a position and even if they can't reach out the firing place it even causes problem. The sprinklers also releases water and even water causes some loss in the cracker industries and shops.

A. Disadvantages of Existing System:

1) Fixed at a single place
2) Releases water
3) Can have a fixed range for sensors
4) Can have a fixed range for sprinklers

III. PROPOSED SYSTEM

The proposed system is a movable robot which can be controlled by smartphone – Bluetooth combination or eye-ball control or brain computer interface, which can be able to sense the LPG or smoke using sensors embedded into it. The robot is programmed such that it is continuously moved all over the place like a watch-bot. It is used to sense the gas values around it. The values are continuously monitored and uploaded to the website or the personalized application which is used by the controller. As soon as the robot senses fire or smoke it immediately raises the alarm to alert the surrounding persons and it also alerts the controller by sending the message. Whenever the controller had seen the message, he can start controlling the bot by using the smart phone or eye-ball controller or BCI. The system also gives live telecast by which the controller can react accordingly. The proposed system can also climb the steps. This can be performed with

the help of the special triangular architecture arranged in a special way such that, this system overcomes all the disadvantages of the existing system. Here heavy load DC motors can be used to make the system climb the steps and stepper motor is used to make the system make its turnings. The final model of the base of the system looks like
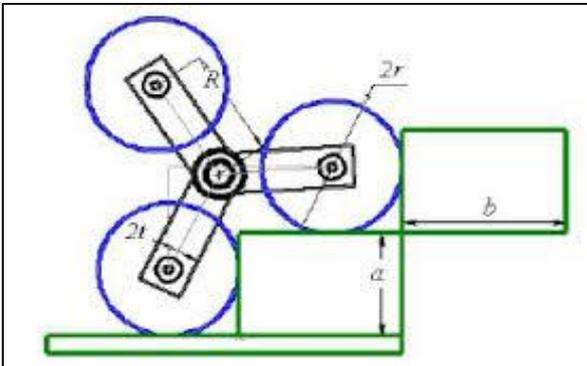

Fig. 1: triangular assembly

The architecture was designed such that it forms an equilateral triangle if all the wheels centers were joined. This brings the system the capability to switch to the top wheel when there is an obstacle objecting the front wheels way. This makes the whole arrangement to climb the next step and the process repeats until all the steps are climbed or completed.

IV. IMPLEMENTATION

This project mainly consists of Arduino Uno microcontroller board (ATMEGA328P), Bluetooth module (HC-05), Bluetooth enabled Smart phone, eye-ball control, BCI, robot with Triangular arrangement, DC motors, pellet launcher

A. Arduino Uno

Microcontroller will act as the brain of the robot. The robot movement will be decided by the microcontroller. In this system we will be using microcontroller named Arduino UNO which contains ATMEGA 328P microcontroller chip. The microcontroller is programmed with the help of the Embedded C programming. Arduino has it own programming burnt in its Read Only Memory (ROM). C program is very easy to implement for programming the Arduino UNO.

B. Bluetooth Module (HC-05)

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. This is a highly qualified module with Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz 5 International Journal of Pure and Applied Mathematics Special Issue radio transceiver and baseband. It uses CSR Blue core 04External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). This module inter connected to smart phone, by receiving instructions from smart phone transfers them to microcontroller and there by the functioning starts.

C. Eye-Ball Control

Eye-ball control is also used to control the robot s it is a simple controlling process even without knowing about the architecture. This module consists of IR sensors which detect the motion of the eye-ball and thereby sends control to the microcontroller unit via Bluetooth and there by controlling the bot. it looks like a covering for the eyes and even it can be designed as a beautiful shades.

D. BCI

Brain-computer interface (BCI) is a collaboration between a brain and a device that enables signals from the brain to direct some external activity, such as control of a cursor or a prosthetic limb. The interface enables a direct communications pathway between the brain and the object to be controlled.

E. Gas Sensors

The sensors are embedded into the system or robot which are able to detect the LPG and smoke. The separate sensors are available to detect the gas values around the robot.

F. DC Motors

DC motor is designed to run on DC power. The two models of pure DC designs are the ball bearing motor, which is (so far) a novelty and Michael Faraday's homopolar motor (which is uncommon),. By far the most common DC motor types are the brushless and brushed types, which use internal and external commutation respectively to create an oscillating AC current from the DC source Motor Driver (L293D) Motor driver IC is used to control the dc motors. It is also interfaced with the microcontroller and the circuit

G. Extinguisher Pellets

Use of water as an extinguisher is not a bad idea but it sometimes causes some loss especially when dealing with fire crackers or paper shops. So, in order to avoid that, DRY ICE is the only way. Here DRY ICE pellets are used in order to stop the fire and the launcher used in the bot are used to launch the pellets and these pellets release CO2 into air by putting off the fire without creating any loss to the products.

H. Power

The power can be provided to Arduino uno with the external power sources by adapters and USB connection. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Terminal wires from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.
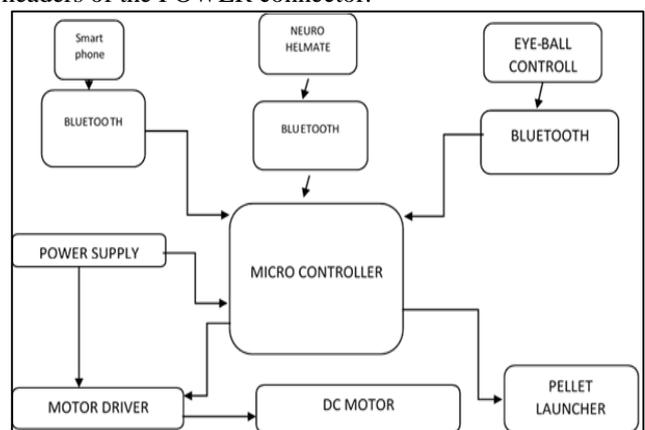

Fig. 2: Block Diagram

I. Extinguisher Pellets

Dry ice, sometimes referred to as "cardice", is the solid form of carbon dioxide. It is used primarily as a cooling agent. Its advantages include lower temperature than that of water ice and not leaving any residue. It is useful for preserving frozen foods where mechanical cooling is unavailable

Here dry ice pellets are used as extinguisher in order to reduce the loss incurred in the usage of water.

V. WORKING PRINCIPLE

In this design, a moving robot model is proposed. In this a DC motor is connected to the triangular architecture which consists of three wheels. The dc motor is controlled by smart phone or eye-ball control or BCI. There are four controls to move forward, backward, right or left and remain neutral. While neutral there is no power connection to DC motor. When in forward position battery power is connected to motor, hence it moves forward. When it is to move in backward motion, the terminals are reversed make the motor to rotate reverse direction, the left and right controls can be done by controlling both wheel in the opposite direction. When it is moved forward three wheels moves but when it gets obstructed the wheel on top goes forward and by then the system climbs the step. Hardware of this project consists of Arduino UNO, Bluetooth module, heavy load DC motors, triangular architecture and a motor driver IC to make the robot move and climb stairs and also the sensors and pellet launcher which are used to reduce the fire and also eye-ball detection and BCI are used to control the robot. The robot also consists of gas sensors which are used to detect the gases like LPG and smoke. The Bluetooth module is connected with the Arduino UNO board for the connection with the user. The Bluetooth module is used for controlling and monitoring the surrounding conditions and particular motor and reaches the board and process accordingly and the output of the Arduino goes to the motor driver IC and it controls the particular motor. Whenever fire was detected the alarm gets raised and alerts the persons and also the person staying outside can control it easily as live telecast can be done using personalized application. This allows the controller to launch the pellets in the required direction which are used to reduce the fire.

Our proposed project consists of the following three sections: a) Input section b) Microcontroller section c) Output section In our android application base Bluetooth controlled robotic car, the user interacts with the system with a smart phone. In this method user must be present within in range (¡ 15 meters) to control the system. In future we would try to extend the range using Internet of Things (IoT). Based on users input data to the Arduino board then the corresponding pin of Arduino goes to high state and switches the motor driver ic in the on mode. The corresponding motor works as per the input data. Here in this project the user (android application) is the input section. This device is connected with the Arduino board (microcontroller section) by the means wirelessly i.e. Bluetooth module. The system can now be connected with the motors (output section) to be controlled via wireless connectivity and controlled by user in his own comfortable ways.

A. Integrated Development Environment

Integrated development environment Arduino is open source physical processing which is base on a microcontroller board and an incorporated development environment for the board to be programmed. Arduino by taking a few inputs like switches or sensors, controls a few multiple outputs like lights and engine and others. Arduino program can run on Windows, Macintosh and Linux operating systems (OS) opposite to most microcontrollers frameworks which run only on Windows. Arduino programming is easy to learn and apply to beginners and amateurs. Arduino is an instrument used to build a better version of a computer which can control, interact and sense more than a normal desktop computer. Arduino is an open-source physical processing stage focused around a direct microcontroller board, and an environment for composing programs for the board. Arduino can be utilized to create interactive items, taking inputs from a diverse collection of switches or sensors, and controlling an assortment of lights, engines, and other physical outputs. Arduino activities can be remaining solitary, or they can be associated with programs running on your machine (e.g. Flash, Processing and Maxmsp.) The board can be amassed by hand or bought preassembled; the open-source IDE can be downloaded free of charge. Focused around the Processing media programming environment, the Arduino programming language is an execution of Wiring, a comparative physical computing platform.

VI. ADVANTAGES OF THE PROPOSED PROJECT

1) Can be moved from place to place
2) Wireless
3) Stair climbing
4) Live telecast
5) Shows the gas values
6) Alarm
7) BCI and eye-ball control
8) Launches dry ice pellets

VII. CONCLUSION

The proposed system can be employed as watcher bot in many industries, construction sites and fire cracker shops and manufacturing places, there by continuously monitoring the surroundings. Even it can be used in the places where the fire gets on. The plus point for this robot is stair climbing nature which can be obtained by using triple wheel architecture, by which this bot can easily be used even in construction sites without human involvement. The controlling options like smart phone control, eye-ball control and BCI are used to control the bot in a wireless way and also to control the bot in any conditions. The live telecast through personalized application is an added advantage, such that the controller can control it even without seeing the bot. The embedded gas sensors are used to detect gases like LPG and smoke and transmits the values though the personalized application. This enables the controller even in dark conditions where the gas leaks, camera doesn't work. The pellet launcher included in this uses pressure to launch the dry ice pellets to the place where the fire gets on. The dry ice used here reduces the loss incurred by using water. For example, if any fire happens in fire crackers shops or manufacturing units, if water is used as

an extinguisher it increases the loss as the fire crackers gets wet. In these cases extinguisher pellets can reduce the loss and put off the fire easily.

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