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An Intelligent Bionic Person for Bomb Detection and Diffusion using Internet of Things (IoT) in Military Application

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Abstract:

The bomb detection and diffusion system is presented and technology used in this proposed system produces a powerful device for military field and related sectors. The way of analyzing the Robotic technology takes more risk and time to safeguard the expert's life. Accurate and timely discovery of bombs, energetic resources and their associated composites would give precious information to military personnel's in wide range of military operations. This prototype robot can able to move across suspected explosive area and monitored by camera. This unit is used to identify the obstacles, metal and transferring applicable information regarding this to control station. By using GPS tracking system, suspected bomb location was identified and information will be communicated to the control station then immediately the robot tracks the bomb and dispose it on time. Once the input is received from the user, the data is transferred to the receiver via Bluetooth module and all collected data's can be stored in cloud through IoT technology for further future recommendations.

Keywords: Arduino Nano board, Bomb, Buzzers, ThingSpeak, Cloud computing, Database.

1. INTRODUCTION

Today's IOT innovation is being accepted for a wide range of regulating applications, including clinical, security, automotive, modern undertaking, smart urban communities, and numerous others. It was seen as a new and revolutionary makeover.

The Internet of Objects (IoT), also known as the Modern Internet, has been described as a global basis for the digital society, enabling advanced benefits through the interconnection of (physical and virtual) things based on existing and developing interoperable data and communication improvements. The IOT organization can be related with a large range of uses and regulators.

So, with the help of the IOT innovation DEFENSE framework, you can get a development guard device such as a BOMB-displacing ROBOT. As we all know, removing bombs is a major task for people, and there is always the fear of misfortune or loss of life if a human makes a mistake. This is why mechanical technology innovation can provide a solution to this problem, and with the help of it, mechanical technology innovation can provide a solution to this issue.

2. LITERATURE SURVEY

S.Keerthana, AR.Vellaiyan [1] proposed by detecting the metal and verified with wireless camera whether it is a hazards object. If so, robotic arm dispose the bomb safetly. This project is simulated by using proteus.

Anisha cotta, Rajat Desai [2] proposed to improve the defense and safety to the militaryand bomb squad. The bomb technician controls the robot at control site Bluetooth module is used to transmit and receives the data from the site

to control unit and control unit to the site. DC motors for the elbow and the gripper of the robotic arm.

Chaitrali Jadhav, Shamli Gibile [3] proposed an android application to control whole system. The commands from android application are received by wifi device and microcontroller. Android application also involves in commands for robotic arm. Night vision camera is used to record accurate data from the site.

Saurabh Mahowadiwar, Priti pai [4] proposed serial communication with robot using Bluetooth technology. Bluetooth is connected to robot and commands are given throughandroid application.

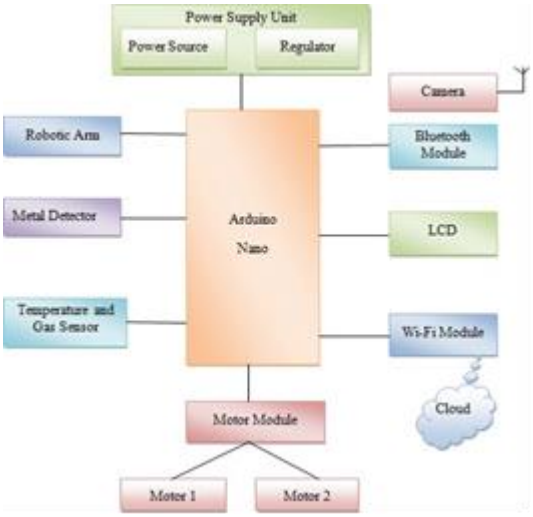
Abhilash.V, PK.Mani [5] provided that wheeled robot get controls from the bomb squad experts using mobile phone. Android application is used to control robotic arm. Blynk application is used.

3. PROPOSED SYSTEM:

In the proposed framework, the two fundamental parts mechanical arm and the body are constrained by specialists through Bluetooth. Camera is utilized to confirm whether the item is dubious. Camera is for video input so administrator can work all the more effectively. The activity of robot is constrained by utilizing remote module so it can give more scope of activity. Gained information is put away in cloud utilizing Wi-Fi module for the further interaction.

4. BLOCK DIAGRAM:

Figure 4.1 Block diagram of the proposed system



When the suspicious material is identified with the help of metal detector sensor that material is verified by experts through camera[15]. The gained data send to data centre through wifi module[17]. To identify the bomb nature like temperature and other features additional sensors like temperature and gas sensor are attached[16]. If the bomb is detected with the help of gripper picking, placing and cutting functions can be done. The commands for the arm and robotic vehicle received from android application. The android application involves commands like forward, backward, right and left to control the robotic arm. The data are gained in data can be view through things peak.

At the point when the dubious material is related to the assistance of metal finder sensor. That material is checked by specialists through camera. The acquired information ship off server farm through Wi-Fi module. To recognize the bomb nature like temperature and different highlights extra sensors like temperature and gas sensor are joined. On the off chance that the bomb is identified with the assistance of gripper picking, setting and cutting capacities should be possible. The orders for the arm and automated vehicle got from android application. The android application includes orders like forward, in reverse, both ways to control the mechanical arm. The information are acquired in information can be see through thingspeak.

HARDWARE DESCRIPTION:

Arduino Nano

The Arduino Nano is a single- board microcontroller analogous to ATmega328p. It provides the similar specification and connectivity of Arduino Uno board, but comparatively lower than the Arduino Uno board. It has 14 digital I/O pins (plus 6 can PWM O/P pins) and 8 analog input pins.

It operates in 5volt operating voltage. It can be accessed through a type-b micro USB port and also through a 9v battery.

Figure 5.1 Arduino Nano

NODE MCU- ESP8266

Node MCU (Node Micro Controller Unit) is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266, Wi-Fi, SoC from Espressif Systems and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added. That settles on it an astounding decision for the Internet of Things (IoT) ventures, everything being equal.

Figure 5.2 Node MCU

Bluetooth module HC05

In terms of hardware and communication, email is rapidly displacing the cable connection. It is designed to take the place of link associations. To communicate with the devices, the HC-05 uses sequential correspondence. It is typically used to connect small devices such as cell phones to trade records over a short-range distant connection. The 2.45GHz recurrence band is used. The information exchange rate can vary up to 1Mbps and is within a 10 metre range. The HC-05 module may operate on a 4-6V power supply. It maintains baud rates of 9600, 19200, 38400, and 57600, among others. It's possible that it'll be used in Master-Slave mode, which means it won't send or receive data from outside sources.

Figure 5.3 Bluetooth module HC05

Inductive Proximity Sensor

This metal sensor is an inductive sensor, which means it generates current when metal comes close to it. This sensor could be a non-contact electronic sensor that detects the location of metal objects. The detection range is based on the identification of such a metal.

Items made of ferrous metals, such as iron and steel, have a wide detecting range, whereas nonferrous metals, such as aluminium and copper, can reduce the detecting range by 60%. An inductive sensor is sometimes referred to as an inductive closeness switch since the yield of an enlistment sensor has two possible expresses.

The inductance of the circle varies with the texture inside it, and because metals are obviously more effective transmitters than other materials, the current flowing through the circle expand when metal is present. Detecting hardware that sign pass loyal another gadget at any moment metal is detected is frequently used to identify this adjustment.

Figure 5.4 Inductive Proximity Sensor

Temperature sensor

The DHT11 is a humidity and temperature sensor that outputs digital data. DHT11 communicates with a microcontroller (e.g., Arduino) to produce a quick result. It is a low-cost humidity and temperature sensor that is dependable and stable over time. It measures the surrounding ambient air with a capacitive humidity sensor and thermistor and delivers a digital signal on the data pin (no analogue input pins are needed). It is quite simple to use, and libraries and sample code for Arduino and Raspberry Pi are available. This module simplifies the connection of a DHT11 device to a microcontroller by including a pull-up resistor for usage with the sensor. To use the sensor, only three connections are required: Vcc, Gnd, and Output.

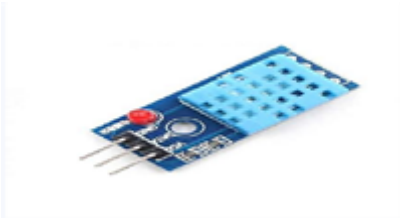


Figure 5.5 DHT11 Temperature and Humidity sensor

Gas Sensor

Gas sensors (also known as gas finders) are electronic devices that can detect and identify different types of gases. They are typically utilized to discriminate between dangerous and sensitive gases and to determine gas fixation. Gas sensors are used to detect gas spills in manufacturing lines and assembly offices, as well as smoke and carbon monoxide in residences. The size (portable and fixed), range, and detecting capacity of gas sensors vary widely. They are frequently required for a larger integrated structure, such as hazardous materials or security systems, and they're usually coupled with a noticeable caution or interface. Gas sensors must be adjusted more frequently than other types of sensors since they are constantly associating with air and other gases.

Figure 5.6 Gas Sensor

5.7 Wireless Camera

The video signals are captured from the image supplied by the remote camera's built-in antenna. With the help of the radio receiver, these signals are received on the client side. The radio receiver contains a tuner, which allows the client to tune the receiver for different stations.

5.8 LCD

LCD (Liquid Crystal Display) is a sort of level board display that use fluid jewels as its primary mode of operation. LEDs are commonly found in cell phones, televisions, computer screens, and instrument boards, and they offer a diverse variety of applications for customers and businesses. LCDs were a significant advancement over the technology they replaced, which included light-emitting diode (LED) and gas-plasma displays. LCD technology allowed for thinner displays than cathode beam tube (CRT) technology. LCDs require substantially less energy to burn through than work that is based on the principle of obstructing light rather than transmitting it. Whereas an LED emits light, the fluid jewels in an LCD produce an image with the help of a backdrop illumination.

Figure 5.8 LCD

5.9 Gripper Arm

Grippers are gadgets that empower robots to get and hold objects. At the point when joined with a communitarian (or 'cobot') modern robot arm, grippers empower producers to computerize key cycles, like investigation, gathering, pick and spot and machine tending. It's valuable to consider grippers like the human hand; they are situated toward the finish of the arm and their capacities permit you to consolidate the strength of an arm with the mastery of a hand. This mix opens up an immense scope with cobots, from stacking huge boxes to taking care of little, sensitive electronic segments.

Figure 5.9 Gripper Arm

5.10 Motor Driver

The L293D is a two-channel H-Bridge engine driver that can power two DC engines or a single stepper motor. Because the shield has two L293D engine driver chipsets, it can operate up to four DC engines independently, making it suitable for developing four-wheel robot stages. The shield includes four H-Bridges, each of which may deliver up to 0.6A to the engine. The shield also includes a 74HC595 motion register, which converts four Arduino advanced pins to eight bearing control pins on two L293D chips.

Figure 5.10 L293D Motor driver Module

5. THINGSPEAK:

Thing Speak is an IoT investigation platform that allows us to visualise and break down real-time data streams in the cloud. Thing Speak provides real-time representations of data sent in by client devices. It can run MATLAB code in Thing Speak, and it's ready to conduct an online evaluation and cycling of real data. In IoT frameworks, Thing Speak is frequently used for model showing. The Internet of Things (IoT) is a new trend in which a large number of installed gadgets (things) are connected to the Internet. These connected devices communicate with people and objects, and they occasionally provide detecting data.

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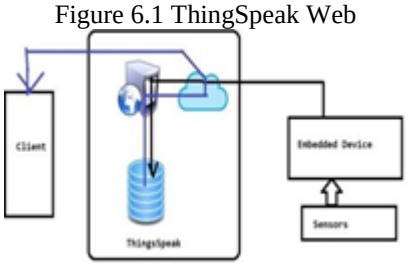
Figure 6.1 ThingSpeak Web



distributed storage and distributed computing assets any place the data is handled and dissected to acquire significant bits of knowledge. Modest distributed computing power and expanded gadget network is empowered this pattern. IoT arrangements designed for some, applications like natural perception and the board, wellbeing observing, vehicle armada checking, home computerization, modern mechanization and control.

On the left, we have the reasonable gadgets (the ―things‖ in IoT) that live at the edge of the organization. These gadgets gather genuine field data and contain things like wearable gadgets, remote temperature sensors, heart beat screens, and water powered pressing factor sensors, and machines on the plant floor

In the center, we have the cloud any place data from a few sources is gathered and broke down in genuine time, normally by an IoT investigation stage planned. The correct part of the chart portrays the calculation advancement identified with the IoT application.

By performing a recorded examination on the data, a specialist or researcher tries to incorporate knowledge into the obtained data. In this case, real-time data is fed from the IoT stage into a desktop programming environment, allowing the architect or researcher to demonstrate the calculations that will eventually run in the cloud or on the physical device. Every one of these elements is included in an IoT framework. Thing Speak is a cloud-based platform that allows users to quickly acquire and analyse data from web-connected sensors.

7. RESULTS AND DISCUSSION:

a. Output of the Proposed Model

Figure 7.1 Output of the proposed model

i. Controlling keys of the robot

S.No	Robot Movement	Key
1	Forward Movement	**A**
2	Backward Movement	**B**
3	Movement towards Left	**C**
4	Movement towards Right	**D**
5	Stop the Movement	**E**
6	Gripper Expands	**R**
7	Gripper Contracts	**G**

User gives the input to the application. It is transmitted through the Bluetooth module from the mobile application to control the movements of the robots.

Monitored Output

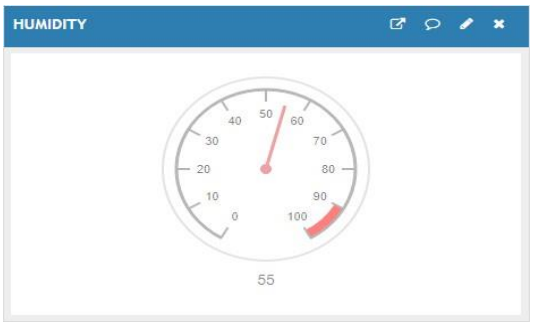


Figure 7.2 Output of the Relative humidity

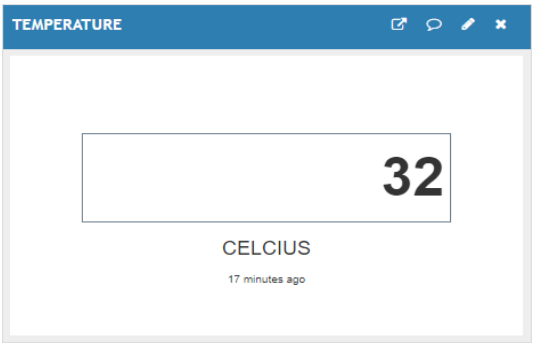


Figure 7.3 Output of the temperature

Figure 7.4 Output of the Gas sensor

The above figures show the humidity, temperature, and gas level by the sensors from the surrounding field and also buzzer ill alerts us when the bomb is detected by the detector.

Graphical View in ThingSpeak

The x-axis denotes the time or days and the y-axis shows the sensor readings at a specific instant. The information can be kept hidden or it very well may be made accessible freely. The recorded data is regularly seen by an individual anyway the progressions inside the express channel are frequently made by the proprietor of that individual channel.

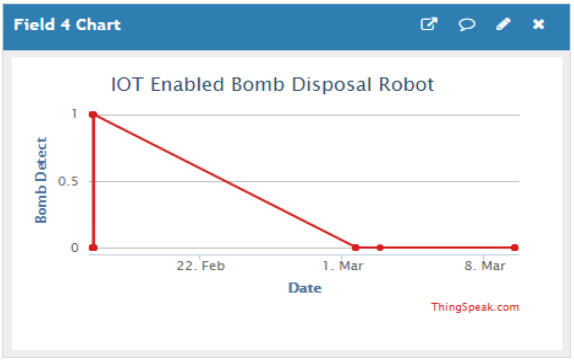


Figure 7.5 Metal detector graphical view

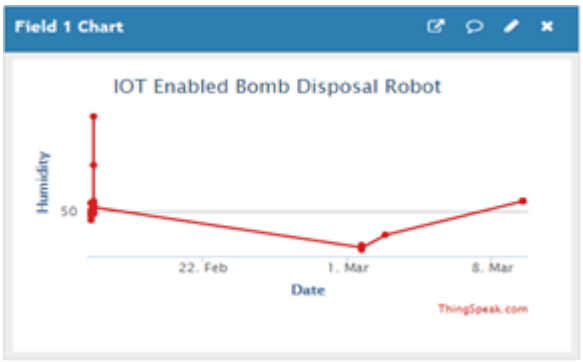


Figure 7.6 Graphical view of Humidity

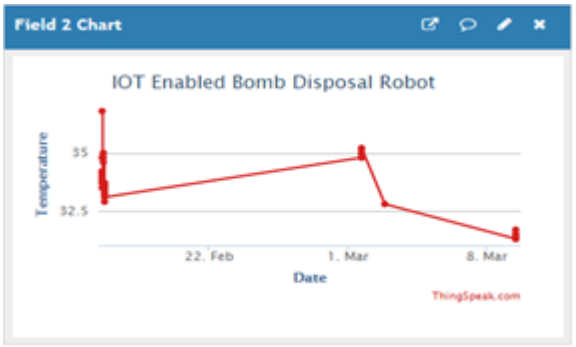


Figure 7.7 Graphical view of temperature

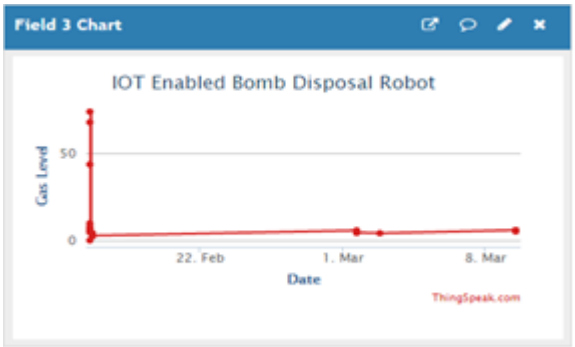


Figure 7.8 Gas detector graphical view

The above figures 7.5, 7.6, 7.7, 7.8 shows that the monitoring sensors output in graphical view. The reading will keep till the individual himself doesn't wish to work the data out.

8. CONCLUSION:

Accordingly proposed system manages the cost of openness to plan of straightforward robots which help military applications. Manual control is applied to distantly control the robot from control room. At whatever point signal cautions by distinguishing a metal, a remote camera fixed in robot is used to check whether it is a dangerous object. In the event that so the robotic arm is physically controlled to incapacitate the bomb securely and the attributes of bomb and other information are put away in cloud for future reference. By utilizing this innovation we can recognize the bomb as right on time as could really be expected and being destroy it effectively with the goal that we can without much of a stretch save the existence of human. In this way planned robot could supplant bomb disposal crew in military and police.

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