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IOT Based Smart Robot

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Abstract: This paper presents a software design and a hardware implementation of a smart robot based on IOT application. This smart robot has several features; wireless access, surveillance during alarming situation and human body thermal detection for retrieval from dangerous zones. Besides this, the robot can detect seismic movement by monitoring ground vibration. The robot transmits Passive Infrared sensor and accelerometer sensor data to the users via internet. The robots movement is controlled via internet using am IOT based application. This robot is easy to handle, has wide area of applications and is cost effective.
Keywords: IOT, Sensors, Microcontroller, Human body thermal detection, Vibration sensing.

I. INTRODUCTION

IOT and Robotics is trending in today's world, taking technology to an entirely different level. The concept of the internet of robotics thing, where intelligent devices can monitor events, collect sensor data from a variety of sources, use the received data and artificial intelligence to determine the best course of action, and then act accordingly to take real action in the physical world. The robot is intelligent in a way that it has embedded monitoring or sensing capabilities, it can also use collected data as well as leverage intelligence. In other words it can analyze data from the events that it monitors, can access collected data, and choose the best possible action for real time application.
This project will result in a robot that can move with an instruction from devices based on IOT applications and can go to areas with critical conditions and environment.

II. LITERATURE REVIEW

R. Sureshkumar, R. Pathamuthu, ANDROID MOBILE PHONE CONTROLLED ROBOT USING INTERNET OF THINGS, International Journal of Pure and Applied Mathematics.
Nowadays, smartphones are becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods. Bluetooth is mainly used for data exchange; add new features to smart phones. Bluetooth technology and other similar techniques, with dramatic increase in Smart phone users, smart phones have gradually turned into an all-purpose portable device and provided people for their daily use. The work behind our Paper is to provide easier robot's hardware architecture but with efficient computational platforms so that robot's designer can focus on their research and tests instead of Bluetooth connection infrastructure. We present the implementation of our approach, where data collection is implemented as an Android mobile application and further analysis of the collected data is done in order to Control the vehicle and we can analyze the all control like Vibrations then any obstacles finding at the time we can easily to control our vehicles. The paper is designed to develop robot using Bluetooth technology for remote operation. The robotic vehicle will execute commands by Bluetooth on mobile transmitted to the robot. Then Vibrations occur at the time indicate then we controlling easily then Airbag system will open same time we can avoiding Accidents. Then Ultrasonic sensor is used easily for obstacle detecting and indicating easily. We can easily get the overall Vehicle Controls via Blue tooth Using Android Smart phones.
Outcome: The objective of the paper is to realize the smart living, more specifically the home lighting control system using Bluetooth Technology. Robot and smart phones is a perfect match, especially mobile robots. As phones and mobile devices are each time more powerful, using them as robot for building robot with advanced features such as voice recognition. Android Bluetooth - enabled phones and blue tooth module via HC-06 and communication among blue tooth devices. The smart living will gradually turn into reality that every consumer can control their vehicle from remotely and through wirelessly

Tajim Md. Niamat Ullah Akhund, Nishat Tasnim Newaz, Low-Cost Remote Sensing IoT based Smartphone Controlled Robot for Virus Affected People, ROMBOMECH journal.
This modern era is the era of IoT and Robotics. In current times the whole world is suffering from the Covid-19 pandemic. This paper represents an IoT based Robot that will help the virus affected people. This robot will be able to collect data from virus affected people and send those data to a cloud database. The collected data can be analyzed from the cloud platform. The robot is designed as a low-cost device and can be controlled via smartphones. Bluetooth sensors, temperature sensors, and other sensors are used to collect data from the patient and to control the robot. Wi- communication is used to send the collected sensor data to cloud database. The prototype is successfully worked and showed good results.
Outcome: This robot worked successfully during our test. By touching the smartphone screen, it can move 360 degrees. Goes to an abstruse place or a virus affected people and collects data from there. Also, it sends the data to a cloud database that can be accessed from anywhere in the globe. This can be used to make a report about the remote place and virus affected people. From the server, this data can be downloaded in many formats to analyze and use in future.

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Tasneem Mohammed Yousif Wael Elmedany, Smart Mobile Robot Design with Real Time Applications, Research Gate, May 2017

This paper presents a software design and hardware implementation of smart mobile robot with real time applications. The presented mobile robot has several features; it has indoor and outdoor tracking systems, and smart detecting system that can detect different types of explosive gases. Besides that, the robot can analyze and display the percentage of the temperature, humanity and gases results in order to identify the danger points. The robot has an alarming system by sending instant notifications and reports to users. The robot can be controlled indoors using Bluetooth application or outdoors using GPRS and TCP/IP Protocol. Also, it provides a live video streaming using high resolution IP Camera. The prototype has been tested experimentally and the results are analyzed and discussed.

Outcome: In this paper smart mobile robot with real time applications has been presented and results are discussed. The Smart detector mobile robot is having the scope to protect the environment from danger situation and improve safety in business matters and see such organizations internationally as our entry point to our target market because in today's competitive marketplace, maintaining a high level of process and plant safety is a critical concern. Manufacturers can reduce costs by minimizing damage to equipment and eliminating incidents that impact people and the environment. At the same time, they can maintain a positive image as a company that is aware of its corporate responsibility and acts accordingly.

Tasneem M. Yousif, Aysha K. Alharam, ROBODEM Remote Monitoring System Using Web/Mobile Applications, WOTBD 2015.

This paper presents a remote monitoring system using website and mobile application for detecting explosive gases. The ROBODEM (ROBOT Detection Explosive Materials) system aims to develop a remotely controlled explosive gas detection system handled by a LEGO Mindstrom NXT robot. The main controller has been designed using Arduino UNO microcontroller. This robot comes with an IP camera for live video streaming, Gas detection system using MQ6 and MQ5 sensors, as well as GPS receiver for live tracking. This robot can be controlled either indoor using Bluetooth or outdoor using the Internet. The system provides information regarding ROBODEM such as sensors results, current location of the robot, current time and date. This system produces an alarm and a popup window appears in the website if there is leakage of explosive gases. ROBODEM has a live tracking of the robot's path that shown in Google map. The prototype has been tested experimentally and the results are analyzed and discussed.

Outcome: Robot can be controlled by android mobile, or through websites, it can go through areas not accessible to humans, live tracking, video streaming can be done, which make it useful in extreme conditions.

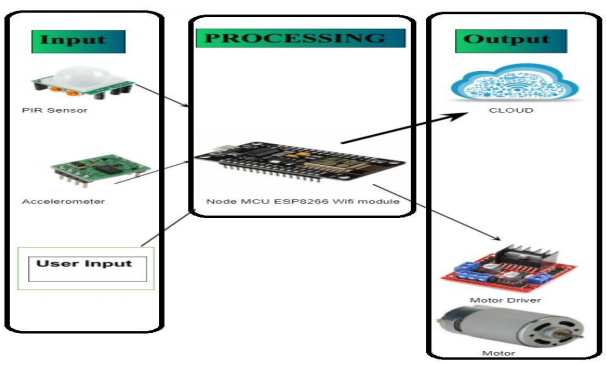
III. PROPOSED SYSTEM

The IOT aided robotic system can be defined as a wireless network that provides advance robotic services. It also makes use of advance information and communication technologies such as cloud computing, big data analysis that enables the robotic system to share information and use the large amount of data stored in the IOT cloud. In this proposed IOT aided robotic system we use sensors like PIR (Passive infrared sensor) and Accelerometer to detect vibration and human body thermal temperature.

IV. METHODOLOGY

The robot is basically electro-mechanical machine or device that is controlled either by computer program or with electronic circuit to perform variety of physical tasks. With the gradual development in technology scientists come up with new ideas and inventions of robots. In the today's life robot are becoming indispensable part of human life. The robotic technology also provides automation in hospital, office and factory. Besides automation this technology also used in Defense forces, Entertainment, Space exploration, Security systems and many dangerous mission executions. As the terror is always remains India's first enemy so, the robots are going to use for saving human life. Countries like India are still facing and confronting with regular threats from terrors.

Block Diagram of the Proposed System



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In defense areas, Robot are usually miniature in size so they are enough capable to enter in tunnels, mines and small holes in building and also have capability to survive in harsh and difficult climatic conditions for life long time without causing any harm. Military robots were designed from last few decades. But still there are some problems in earlier developed military robots.

We need four controls to alter the directions of motors. Two controls for each motor. Four digital pins of NODEMCU are used as controls.

Connect
GPIO-15 with Input-1 of l293d
GPIO-13 with Input-2 of l293d
GPIO-12 with Input-4 of l293d
GPIO-14 with Input-3 of l293d

To control the speed of motors, we are generating a PWM signal on GPIO-5 and GPIO-4 of NODEMCU ESP8266. Each l293d channel enable pin is supplied the generated PWM signal for controlling the motor rotation speed.

Connect
GPIO-5 with ENABLE-1 of l293d
GPIO-4 with ENABLE-2 of l293d

Vss of l293d is supplied +5 volts. Vs of l293d is supplied the motor operating voltage +12 volts in our case. Both the l293d and NODEMCU grounds must be common in order for circuit to work properly.

Sensor Module: The Sensor module consist of various sensors helps in the detection of metals, fire, harmful gases at remote areas. PIR (Passive infrared sensor) is used to detect human body which can be used in adverse situation and place. Accelerometer sensor is used to detect vibration.

NODEMCU is an open source firmware for the ESP32 and esp8266 Wi-Fi SOC and uses an on-module flash based SPIFFS file system. The firmware uses the Lua scripting language.

The processing of the extracted data from the sensors includes denoising, preprocessing and thresholding .The IOT technology enables the integrated system to calculate this features that are not easily observable by the robot. Once the data collected from the sensor gets to the cloud, software processes it and then might decide to perform an action, such as sending an alert or automatically adjusting the sensors or devices.

V. RESULT

Finally this system achieved following features as output:

A. It can go to areas with critical conditions and environment.
B. Receive and transmit data using IOT.
C. Move the robot by instructions received from the device based on IOT application.

VI. CONCLUSION

This robot is fully IOT controlled and has high speed data communication with the help of the Internet. It has very sensitive sensors and IOT instruction based robot movement. The robot detects human body movement based on thermal radiation detected from the body and ground vibrations, for example, footfalls. This robot could be very useful in many applications.

VII. FURTHER MODIFICATION

A. Adding more sensors to enhance application.
B. We can switch to motors that can provide multi-directional movement.
C. Using caterpillar track instead of wheels for better mobility.
D. Adding a camera to live stream videos for surveillance purposes.

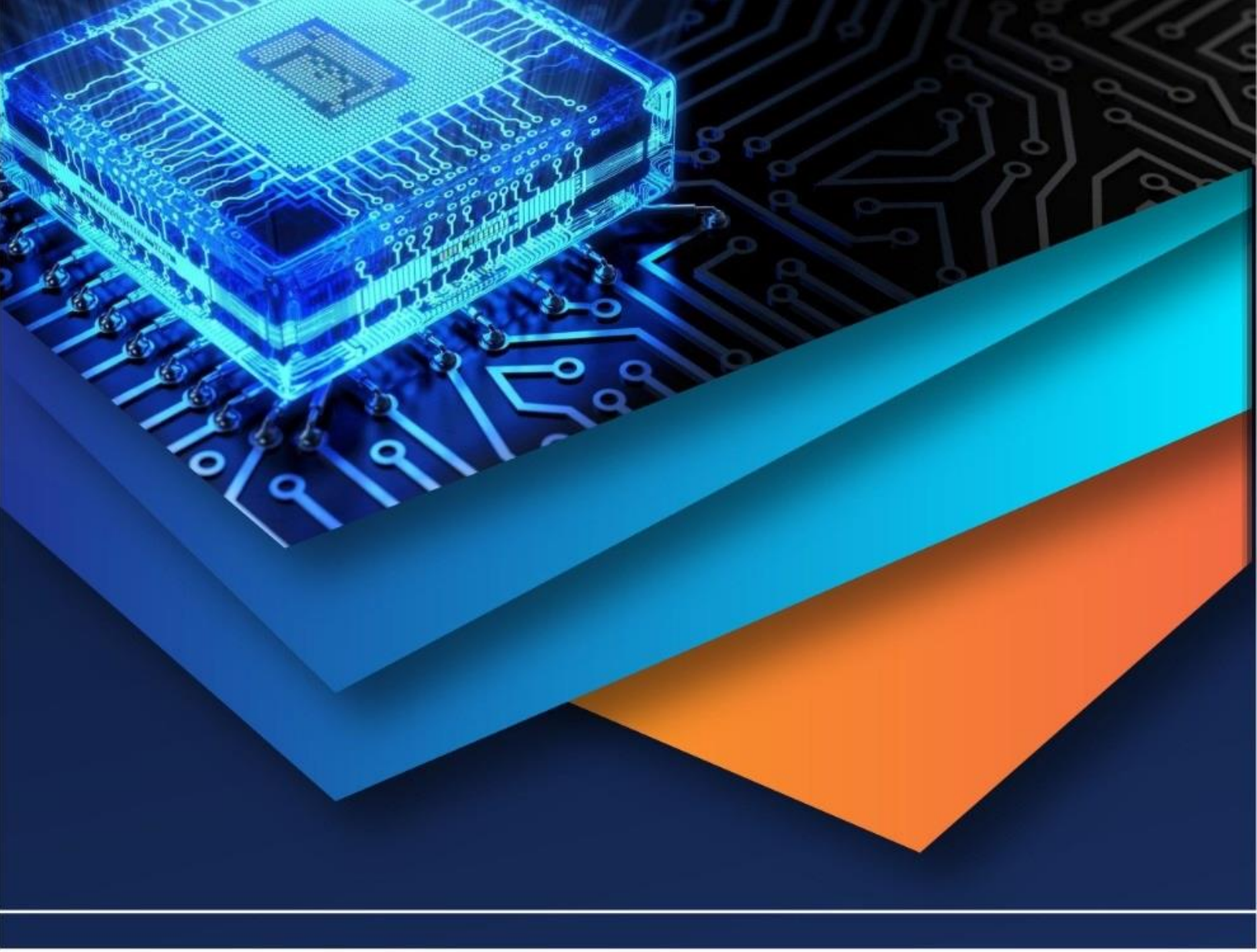
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