Raspberry Pi Based Bomb Detection Robot with Live Steaming and Tracking Controlled With Internet

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Abstract:

In the present day scenario we are facing many threats by bomb blasts so our project is to prepare an unmanned robot which will detect the bomb it will not only detect the bomb but also shows position of bomb by using gps module and the position of bomb will intimated to the specific person through internet. We are interfacing camera to control the robot. Here we are using metal detector to detect the bomb because we know that any bomb contains some concentration or percentage of metal elements. The global positioning system (gps) is the only fully functional global navigation satellite system (gnss). The gps uses a constellation of between 24 and 32medium earth orbit satellites that transmit precise microwave signals, which enable gps receivers to determine their location, speed, gps was developed by the united states department of defence This project is much useful for mines detection and surveillance applications.

Index Terms:

Robot, smart phone/ pc, metal detector, wifi dongle, wifi router, raspberry pi, ARM 11, gps navigator, live video.

Introduction:

The project is aimed at evaluating the performance of an operating system on an embedded system. Before delving into its implementation, an introduction is needed to the parts involved in the project. The whole report is centered around the field of embedded systems and the use of Linux to run applications on them. Hence an introduction to Embedded Systems and using Linux as an OS in them is provided.

The rapid growth of industry and advancement of technology has resulted in reduction of human efforts, the main reason for which being machines!! Machines are playing an important role in our life. A machine might be anything, be it a cell phone or a bike or even a robot. Robots have found an increasing demand in a wide range of applications in our life. Their use in defense has increased by the day. Our paper includes one such instance of how a bot can be of use to human race in general. Robots ensemble human beings in many ways be it looks or functioning, but previously robots were not controlled by computer programs or electronic circuitry. Back then they were built using principle of mechanics improving over time with the coming of electronic age. In today's world, robots find use in various places be it to detonate buried bombs or in industrial applications or even robotic components used in children's toys.

The complexity of computer software depends on how difficult the robot's tasks are. In this project we use internet to establish communication between the user and a bomb detection robot. This is a reliable connection and a continuous tracking and video feedback is available to control the bomb detection robot. Due to the use of internet, there is no limitation on range or distance between the user and the bomb detection robot. Internet robotics has opened up a completely new range of real-world applications namely tele-surgery, tele-manufacturing, tele-training, tele-surgery, traffic control, health care, space exploration, disaster rescue etc. and the list is supposed to increase further in the coming years.

In previous projects, many researchers have developed a system for automatic control using ZigBee, GSM or Wi-Fi modules. Almost all systems are wired, but now we have tried the same by the use of internet. The papers we have referred to convey the use of following techniques: In Wi-Fi Robot for Video Monitoring & Surveillance System, the proposed robot motion will be controlled with PWM techniques using a Microcontroller and Bidirectional DC Bridge for Motor Driving. It is proposed to address the low cost, efficient, high speed processing & control hardware for the self-navigating robotics application. Design and Implementation of a Robotic Vehicle with Real-Time Video Feedback Control via Internet paper illustrates on an approach to control a bomb detection robot using internet as communication medium between user and robotic vehicle.

Conventionally wireless robots have the drawbacks of limited working range, limited frequency range and limited control. But internet can overcome these limitations with the help of DTMF decoder IC and a preprogrammed microcontroller IC that control the movement of the bomb detection robot according to output sent from DTMF decoder.The main motivation of the project is the current law and order situation in India and throughout the world. Everyday hundreds of trained personnel in military are either injured or lose their lives while detecting bombs. This can be reviewed by the countless number of news items appearing daily in newspapers around the world. So to eradicate such accidents at boarders I bought this concept.

Existing System:

In this existing method mainly the persons who live in boarders nothing but military people if they want to know at which place bomb is present available .In that case they have to search for the bomb and if time is up that causes danger for the people available at that place so for finding the bomb directly without any persons help this proposed method have came in to existence.

Disadvantages of Existing System:

In existing system, for detection of mines/bombs person use to go with bomb detector and it is so risky thing. This process may kill the person. While coming to my proposed method a robot is going in the place of person and it will provide live streaming and it also tracks the position of the robot.

Proposed System:

In the early stages of robotics, remote robots were controlled through a dedicated network, however, more recently, remote robots have been controlled over the internet, because of its use of a standard communication protocol and the fact that it is available almost everywhere . Remote robots controlled over the internet are called internet-based robots or internet robots. The first internet robots to be introduced were stationary remote robots operation in limited geographical region and subsequently, autonomous internet robots operating in a wider region were developed. Robots are increasingly being integrated into working tasks to replace humans especially to perform the repetitive task. In general, robotics can be divided into two areas, industrial and service robotics. International Federation of Robotics (IFR) defines a service robot as a robot which operates semi- or fully autonomously to perform services useful to the well-being of humans and equipment, excluding manufacturing operations. On the other hand, internet nowadays is becoming the center for everything. People tend to get online rather than doing household chores. Internet is now everywhere, compare to the last decades where internet is only wired, and people needs to be in front of the computer to access the internet but nowadays, internet is just at the tip of your finger. This is an advantage to introduce robot to household.
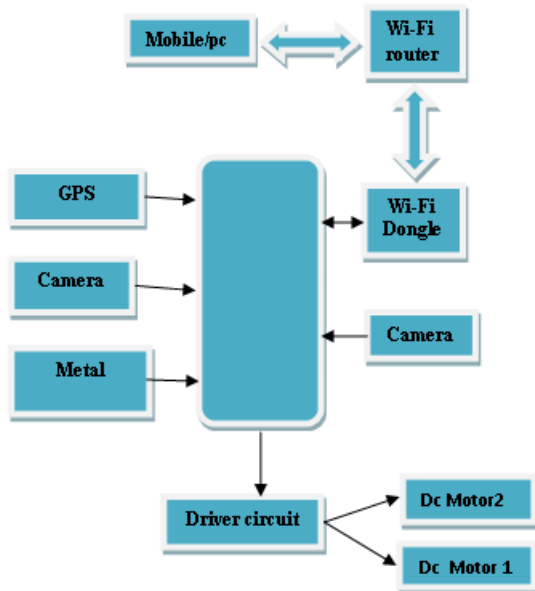
BLOCK DIAGRAM:

Fig1.Block Diagram

BLOCK DIAGRAM &DESCRIPTION:

The block diagram of the project consists of the following components.

- ARM 11
- CAMERA
- METAL DECTOR
- GPS
- WIFI ROUTER
- WIFI DONGLE
- L293D MOTOR DRIVER
- DC MOTORS
- POWER SUPPLY

Description:

My paper proposes a method for controlling a Robot with the internet. The mobile/pc and raspberry pi board is connected through internet. As the name suggests the robot applicable in military application that is detect the bomb. Robot can show visual image which is in front of it. It can also show the position of the robot. A signal is generated from the mobile/pc (through internet) which will be received by the raspberry pi board and the robot works according to the predefined program. The internet is act as communication media between robot and user. The program is written in the python language in the raspberry board. The different data will control the arm rotation. The robot can also made to implement the SLAM (simultaneous localization and mapping algos) to make it map the complete environment and then move autonomously after a certain periodic intervals to check everything. The purpose of this project is to control the robot from internet with live video streaming as a means of visual feedback. This project advantage is that with port forwarding it is possible for a person in a different country to see the robot and control it according to his needs, whereas many other projects require user to be at the station as there is no means of giving a visual feedback.It focuses on the difficult points of developing the GUI applications based on Qt/Embedded and the Linux drivers for various types of sensors in the Intelligent Monitoring System project, achieving the combination of Qt/Embedded and the Linux system programming. In this project, web server developed using HTML is used to make the user interfaced that will be displayed when the operator access the robotic arm via the internet to control it.

Raspberry Pi (ARM11):

The Raspberry Pi is a credit-card sized computer that plugs into your TV and a Keyboard. It is a capable little computer which can be used in electronics projects and for many of the things that your desktop PC does, like spreadsheets, word processing and games. It may also plays high definition video. Its capable of doing everything you'd expect a desktop Computer to do, from browsing the internet and playing videos, developing of programs in various languages i.e. java, C++ etc

USB Camera:

Camera plays a vital role in automation purpose. The camera is used for monitoring of a room from a remote place. Whenever the user clicks on to video button on loaded webpage, the corresponding room video will be

streamed on to webpage .For this purpose we use a MJPG streamer.

Metal detector:

A metal detector is an electronic instrument which detects the presence of metal nearby. Metal detectors are useful for finding metal inclusions hidden within objects, or metal objects buried underground. They often consist of a handheld unit with a sensor probe which can be swept over the ground or other objects. If the sensor comes near a piece of metal this is indicated by a changing tone in earphones, or a needle moving on an indicator. Usually the device gives some indication of distance; the closer the metal is, the higher the tone in the earphone or the higher the needle goes. Another common type are stationary "walk through" metal detectors used for security screening at access points in prisons, courthouses, and airports to detect concealed metal weapons on a person's body.

Global position system (GPS):

The Global Positioning System (GPS), also known as Navstar GP or simply Navstar, is a global navigation satellite system (GNSS) that provides geolocation and time information to a GPS receiver in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.[5] The GPS system operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS system provides critical positioning capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.

WiFi router:

Ethernet is a shared-media LAN, which means that all stations on the segment use a part of the total bandwidth.

Depending on the type of Ethernet implemented, this total bandwidth is a 10 Mbps (Ethernet), 100 Mbps (Fast Ethernet), or 1000 Mbps (Gigabit Ethernet). In a shared Ethernet environment all hosts are connected to the same bus and compete with each other for the bandwidth. In such an environment packets meant for one machine are received by all the other machines. Thus, any machine in such an environment placed in promiscuous mode will be able to capture packets meant for other machines and can therefore listen to all the traffic on the network using the carrier sense multiple access with collision detect (CSMA/CD)mechanism like in Point-to-Multipoint communication. A switched Ethernet environment - in which the hosts are connected to a switch instead of a hub - is called a Switched Ethernet. The switch maintains a table keeping track of each computer's MAC address and delivers packets destined for a particular machine by sending it to the port on which that machine is connected.

Wifi:

Access point a WiFi stands for Wireless Fidelity. WiFi is based on the IEEE 802.11 family of standards and is primarily a local area networking (LAN) technology designed to provide in-building broadband coverage .Current WiFi systems support a peak physical-layer data rate of 54 Mbps and typically provide indoor coverage over a distance of 100 feet. WiFi is Half Duplex: All WiFi networks are contention-based TDD systems, where the d the mobile stations all vie for use of the same channel. Because of the shared media operation, all WiFi networks are half duplex. Channel Bandwidth: TheWiFi standards define a fixed channel bandwidth of 25 MHz for 802.11b and 20 MHz for either 802.11a or g networks.Radio Signals are the keys, which make WiFi networking possible. These radio signals transmitted from WiFi antennas are picked up by WiFi receivers, such as computers and cell phones that are equipped with WiFi cards

WiFi dongle:

A **dongle** is a small piece of hardware that connects to another device to provide it with additional functionality. In relation to computing, the term is primarily associated with hardware providing a copy protection mechanism for commercial software—in which the dongle must be attached to the system that the software is installed on in order for it to function. The term "dongle" is also associated with similar devices meant to provide additional forms of wireless connectivity to devices (such as Wi Fi or Bluetooth support), often over USB connections, as well as small digital media players and personal computers meant to plug directly into an HDMI input on a television

L293D Motor Driver:

The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

DC Motor:

The input to the base of the transistor is applied from the microcontroller port pin P1.0. The transistor will be switched on when the base to emitter voltage is greater than 0.7V (cut-in voltage). Thus when the voltage applied to the pin P1.0 is high i.e., P1.0=1 (>0.7V), the transistor will be switched on and thus the motor will be switched ON. When the voltage at the pin P1.0 is low i.e., P1.0=0 (<0.7V) the transistor will be in off state and the motor will be switched OFF. Thus the transistor acts like a current driver to operate the motor accordingly.

Power Supply:

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V or 5v is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

Bomb Detection Robot:

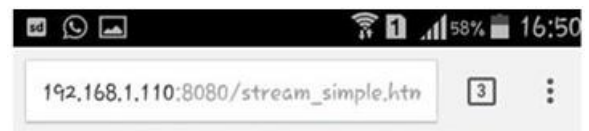**Fig2.Hardware Setup of the Robot**

Fig3.Live Video Streaming

Conclusion:

The design of "raspberry pi based bomb detection robot with live streaming and tracking" is a challenging task however several learning methods were described in theoretical analysis that provides solution for the point to point and control path motion

even in an unstructured environment. We are working on "raspberry pi based bomb detection robot with live streaming and tracking" with different locomotion methods as follows:

- Robot locomotion.
- Wireless video transmitter
- Mines detection
- tracking of robot

The goal of building "raspberry pi based bomb detection robot with live streaming and tracking" is a challenge and further research is needed to realize the full potential of safe and useful machines. "As per the present scenario, human dependencies on technology and future trends robots are going to be used as a perfect replacement for human being in all aspects of life"

FUTURE SCOPE:

A. Intelligent mobile robots

Intelligent mobile robots must often operate in an unstructured environment cluttered with obstacles and with many possible action paths to accomplish a variety of tasks. Such machines have many potential useful applications in medicine, defense, industry and even the home so that the design of such machines is a challenge with great potential rewards.

B. Multipoint Hand Posture Based Interaction:

The proposed work is part of a project that aims at the control of a robot based on hand gesture recognition. This goal implies the restriction of real-time response and the use of unconstrained environments. In this we present a new algorithm to track and recognize hand gestures for interacting with a robot. This algorithm is based on three main steps: hand segmentation, hand tracking and gesture recognition from hand features. For the hand segmentation step we use the colour cue due to the characteristic colour values of human skin, its invariant properties and its computational simplicity. To prevent errors from hand segmentation we add the hand tracking as a second step.

Tracking is performed assuming a constant velocity model and using a pixel labeling approach. From the tracking process we extract several hand features that are fed into a finite state classifier which identifies the hand configuration. The hand can be classified into one of the four gesture classes or one of the four different movement directions. Finally, the system's performance is evaluated by showing the usability of the algorithm in a robot environment.

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