A Multi-function Robot for Military Application

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Abstract: With the development of technology, scientists and researcher has now come up with the invention of robots. These robots help to make human life much easier especially in dangerous area. One of the concern areas of today is the military. Military robots are used to take the risky job which is difficult to be handled manually by human. These robots take the job as the assistant of a soldier. Today, many military organizations take the helps of military robots to take risky jobs. These robots used in military are usually employed with the integrated system, including video screens, sensors, gripper and cameras. The military robots also have different shapes according to the purposes of each robot. In other words, these robots have helped military organizations in many ways.

Keywords—Fire and Alive Human Detection, GPS Modem, Landmine Detection, Sensors, Surveillance, image processing, facial recognition.

I. Introduction

There are losses of many soldiers due to landmines. There are many hazardous objects in crowded areas .So there is always a threat of bomb being detected. During disastrous situations, it is difficult to determine the presence of alive humans. To tackle these problems, previous research work has focused only on one module. There is research work taking place on landmine detection. There are various techniques used to detect landmines like Ground Penetration Radar (GPR), Thermal image of buried landmines, Metal detector. To place and pick the hazardous objects, robotic arms have been used. The robotic arms also have facility of cutter. For detecting alive humans, different techniques have been introduced .Oxygen sensor have been used to detect the presence of alive human .The purpose of our project is to detect landmines, fires and alive humans. Our main purpose is to develop a multipurpose Warfield robot. Thus we will be developing a smart, innovative multipurpose Warfield robot.

1.1 Existing System There is research work done for detecting landmines, fire and alive humans. But, the existing system focuses only on one module.

1.2 Proposed System Our system is focusing on developing a robot capable of detecting landmine, fire and alive humans. Thus our system will perform multiple functions and hence is an intelligent multipurpose Warfield robot.

II. Literature Survey

We are no longer truly surprised when machine artifacts outperform humans in new domains. There are many advantages of these robots as compare to human soldier. One of the most important things about these robots is that they have the capability to perform missions remotely in the field, without any actual danger to human lives. This shows a great impact of military robots. These robots are sturdier and more capable of with-standing damage than human. Therefore they give greater chances of success in dangerous environment. Whenever, a robot is shot down, the military simply roll out a new one. The military robot is the autonomous robot that consists of a wireless camera that humans are able to monitor via a computer as a spy.

Complete autonomous robot which can perform varieties of tasks is still under development. Therefore researches all over the world work towards the design and development of such robot, so as to simplify our works in various fields.

In order to take the best course of action on our multifunctional military robot we have researched various papers that use different technologies to control these bots. Let us discuss some of them broadly.

Dr. S. Bhargavi[2] has researched an intelligent combat robot designed specifically for war field. Protection has been provided from enemies. Whenever enemies appear in front of the robot it will fire the laser gun. This remote operation is provided by user sitting at one place. A wireless camera is mounted on the robot. A real time video is transferred to the user pc and whenever enemies are present in front of the robot then user can shoot enemy by laser gun which is operated remotely.

Dhiraj Singh Patel[3] has designed a paper that represents a robot operated by mobile. It has a camera that spies every movement of the enemy and is control by mobile. So it is mainly applicable in the military field and is also preferable for police work. The DTMF (Dual Tone Multi Frequency) technology is used. Using this technology the robot is controlled using mobile but the range of communication is unlimited. The mobile network should be efficient for this purpose. In this paper work a mobile is

attached with the robot and another mobile is handled by the user. The robot is completely handled by this mobile. For processing, initially mobile user makes a call to another mobile which is attached with robot. Due to calling if a key is pressed a tone corresponding to the key pressed is heard at the other end known as DUAL TONE MULTIPLE FREQUENCY (DTMF).[3]Then the robot will receive tone with the help of phone stacked in the robot. At the other end the tone is processed by microcontroller by using DTMF decoder. This sends a command to the motor driver IC which then drives the robot.

Ankita patel[4] invents a paper on the basis of touch screen which control multifunctional spy robot. For the sake of long distance communication Zigbee network is used. This work system include microcontroller for collecting data from various places and accordingly movement of robot can be controlled in the direction of the robot. This paper consists of geared motors which includes two wheels attached to it. The motor starts with the help of relay and going to control touch screen. The signal is sent from the touch screen and is executed by the microcontroller at the receiver section. It includes components like gripper, camera, video screen and sensors. The methodology of this paper is divided into two sections. Hardware and software implementation. At hardware development various component are used such as touch screen sensor, zigbee, LCD, intelligent robot. In software implementation microcontroller is preferred. A microcontroller has the ability to use large amounts of memories such as RAM, ROM. It also has its own ports i.e. I/O port, timer. All these components are embedded on a single chip. At hardware section touch screen, tuner card, antenna, zigbee technology are used. At programming section USART communication, analog to digital convert programming and LCD character module programming are prefer. All the programming is done in C Programming Language preferably.

Dr. M. Meenakshi[5] presents a paper which includes validation of vision based autonomous robotic system for military application. Sum of Absolute Difference (SAD) algorithm is used here. This paper verifies the implementation of proposed image processing algorithm on the basis of image subtraction. The developed algorithm is validated in real time by change based moving object detection method [5]. So this type of work has effectively taken the main role in the application of detection of mines in the war field. This autonomous robot presents a novel vision based technique for obstacle identification and path planning on the principle of image processing algorithm. Whatever images are clicked by wireless camera undergo the process of

using Sum of Absolute Difference (SAD) algorithm and then the obstacles are identified.

III. Proposed System

Key components to be used for the construction of this multifunctional military robot are:

Microcontroller ARM 7

The ARM7 is a low-power, general purpose 32-bit RISC microprocessor macrocell for use in application or customer-specific integrated circuts (ASICs or CSICs). Its simple, elegant and fully static design is particularly suitable for cost and power-sensitive applications. The ARM7's small die size makes it ideal for integrating into a larger custom chip that could also contain RAM, ROM, logic, DSP and other cells. Enhancements The ARM7 is similar to the ARM6 but with the following enhancements:

1. Fabrication on a sub-micron process for increased speed and reduced power consumption.
2. 3V operation, for very low power consumption, as well as 5V operation for system compatibility.
3. Higher clock speed for faster program execution. Applications The ARM7 is ideally suited to those applications requiring RISC performance from a compact, power-efficient processor. These include: Telecomm GSM terminal controller Datacomm Protocol conversion Portable Computing Palmtop computer Portable Instrument Handheld data acquisition unit Automotive Engine management unit Information Systems Smart cards Imaging JPEG controller Feature Summary
4. 32-bit RISC processor (32-bit data & address bus)
5. High performance RISC 17 MIPS sustained @ 25 MHz (25 MIPS peak) @ 3V.
6. Low power consumption 0.6mA/MHz @ 3V fabricated in .8µm CMOS.
7. Fully static operation ideal for power-sensitive applications.
8. Fast interrupt response for real-time applications.
9. Virtual Memory System Support.
10. Excellent high-level language support.
11. Simple but powerful instruction set.

PIR sensor

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors.Key

features of the ePIR Motion Detection Zdots SBC include:

1. Complete, fully functional motion detection SBC including Fresnel lens – Comes pre-programmed with motion detection software.
2. Small form factor—25.5 mm x 16.7 mm.
3. Wide 5 m x 5 m, 60 degree detection pattern.
4. Sensitivity control via simple hardware configuration.
5. Advanced serial (UART) based configuration and interface.
6. SLEEP mode for low power applications.
7. No temperature compensation required.
8. Minimal components ensure highest possible Mean Time Between Failures (MTBF).
9. Application code can also be modified to support custom solutions.

GSM module

From the below circuit, a GSM modem duly interfaced to the MC through the level shifter IC Max232. The SIM card mounted GSM modem upon receiving digit command by SMS from any cell phone send that data to the MC through serial communication. While the program is executed, the GSM modem receives command 'STOP' to develop an output at the MC, the contact point of which are used to disable the ignition switch. The command so sent by the user is based on an intimation received by him through the GSM modem 'ALERT' a programmed message only if the input is driven low. The complete operation is displayed over 16×2 LCD display.

Fire Detector

Fire detectors sense one or more of the phenomena resulting from fire, such as smoke, heat, infrared and/or ultraviolet light radiation, or gas.

In dwellings, smoke detectors are often stand-alone devices. In non-domestic buildings, fire detection will typically take the form of a fire alarm system, incorporating one or more of the following automatic devices:

A flame detector is a sensor designed to detect and respond to the presence of a flame or fire. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line (such as a propane or a natural gas line), and activating a fire suppression system. When used in applications such as industrial furnaces, their role is to provide confirmation that the furnace is properly lit; in these cases they take no direct action beyond

notifying the operator or control system. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame.

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.
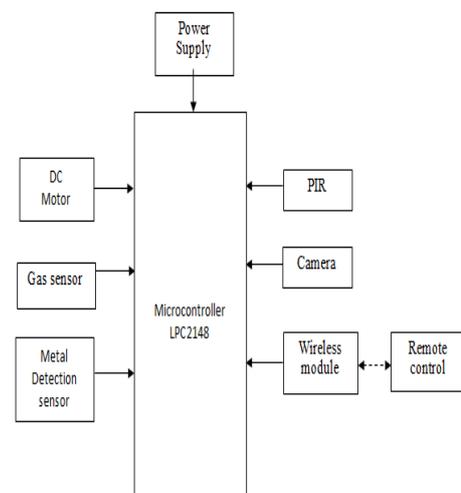

Figure 1. Block diagram for the proposed system.

Technology to be used

Image Processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-today life for various applications. Various techniques have been developed in Image Processing during the last four to five decades. Most of the techniques are developed for enhancing images obtained from unmanned spacecrafts, space probes and military reconnaissance flights. Image Processing systems are becoming popular due to

easy availability of powerful personnel computers, large size memory devices, graphics software's etc.

IV. Conclusion

The proposed system is aimed towards the welfare of our infantry and the surveillance of warzone areas to minimize the causalities to a great extent. It detects all metal objects like land mines using a metal detector. Our system will also be able to detect smoke and fire and take evasive action. It can measure infrared (IR) light radiating from objects in its field of view using the PIR sensor and thus detect any heat radiations emitting from humans or animals alike. The robot can be manually controlled but it will be able to take precautionary measures to protect itself and remain undetected. Hence, our system is sure to create a revolution in its own field and ensure complete support from people of different societies.

V. Acknowledgement

VI. References

[1] Military robots of the present and the future G ERALD M IES FANUC Robotics Deutschland GmBH, 73765 Neuhausena.d. F., German.

[2] Dr. S. Bhargavi "Design of an Intelligent Combat Robot for War Field" International Journal of Advance Computer Science and Application, volume 2, no.8, 2011.

[3] Dhiraj Sing Patel, "Mobile Operated Spy Robot" :International Journal of Emerging Technology and Advance Engineering, volume 3, special issue 2, Jan 2013.

[4] Ankita Patel, "Touch Screen Controlled Multipurpose Spy Robot Using Zigbee": International Journal of Advanced Research in Computer Engineering and Technology (IJARCET) ,volume 3, issue 4, march 2014.

[5] Dr. Meenakshi ,"Vision Based Robotics System for Military Application-Design Real Time Validation" :Fifth International Conferenec on Signal and Image Processing - 2014.

[6] Design and Implementation of Robot Motion with IR Wireless Camera [Review]Ujwala G. Meshram

[7] WIRELESS CONTROLLED ROBOT USING ARDUINO AND RF MODULE 1 Chirag Jain, 2 ReemaKadechkar, 3 SachinChaturvedi, 4 Susmita Pradhan1,2,3,4 Department of Electronics K. C. College of Engineering & Management Studies & Research, Thane.

[8] UNMANNED MULTI-FUNCTIONAL ROBOT USING ZIGBEE ADOPTER NETWORK FOR DEFENSE APPLICATION Premkumar.

[9] MULTI FUNCTIONAL DEFENSE ROBOT DhirajKajari, AkshadaYewale, Inderjeet Singh, HarshwardhanKavle 4 Department of Electronics &Telecommunication KCCEMSR, Thane, India.

[10] I.E.M.D. Goonethileke, "Wireless RF Based Surveillance Robot Controlled via Computer" :volume 7, Jan 2012

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