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TOUCH SCREEN CONTROLLED DEFENSE ROBOT: A COMPREHENSIVE REVIEW

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ABSTRACT

Robots play a major role in many walks of life and are extensively used in the areas of defense, industries, medical and home appliances. They can carry out different risky jobs that cannot be done by human. The robot system can be built with the existing economic condition that can be used for different sophisticated robotic application. The control system consists of Touch screen and ZigBee modules, a microcontroller that collects and controls the robot. The system provides continuous visual monitoring through the wireless camera attached to the robot and sends continuous data to the control unit. The robotic arm fitted on the robot is employed for pick and place operations while the laser gun attached to the robot is utilized to hit the target object. The body of the robot consists of two wheels attached to geared motors. The robot is controlled through a Touch screen which is mounted on ARM9 via "ZIGBEE" device.

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KEY WORDS

Defense robot; ZigBee module; wireless camera; Touch screen; Laser gun

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INTRODUCTION

The defence robot is fully controlled by the touch screen and the commands from the touchscreen via ZigBee transmitter were received by the microcontroller. So this defense robot can be used in military applications[1].An automated defense robot building is planned, that has a laser gun attached, which is utilized for pointing laser rays to destroy the target object[1].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 [2].In the proposed system, a robot is developed that is controlled through mini ARM9 (S3C2440) instead of PC, since ARM9 is portable[2].This is specially designed defense robotic system to save human life and protect the country from enemies. This robot is attached with a robotic arm which is used to perform pick and place operations [3].These defense robots used in military are usually employed with the integrated system including gripper, cameras and sensors[3, 4].Robot is used to sense moving objects and metals hence this system is proposed with the help of low power ZigBee wireless sensor network to trace out the intruders and the robot will take the necessary action automatically [5].This is specially designed defense robotic system to save human life and protect the country from enemies. In the existing systems, personal computer using ZigBee protocol is used to monitor the mobile robot. The robot has a camera attached, with the help of which, the robot can be driven to remote places [6].The outcome of different activities can be monitored and displayed on ARM9 screen. A recent advancement in the technology has led everything in this world to go and connect to the Internet [7]. Using internet also the devices can be connected remotely. Either manually controlled or automatic controlled robots are developed in recent years [8]. Robots can also be used to sense bombs and fires and they can also be used to diffuse the bomb or cease the fire [9].

LITERATURE SURVEY

Application of radio frequency controlled intelligent military robot in defence

This robot can be used in defense and in real war field. It has a two barrel gun turret through which bullets can be fired. It has two cameras which rare used to send the real time videos and audios and which can rotate up and down, left and right up for safety. The robot is radio operated; self-powered, has back tracking facility, in case of

THE IIOAB JOURNAL
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loss of connection from the base station. For the aiming purpose and to view the road and the surroundings in which the robot is travelling, wireless cameras are installed. Radio frequency can be used to control the robot.

Table 1. The review report of the 10 latest papers

Refs	Mode of control	Robot using Android application	Technology used	Mode of vision	Interface used	Sensors and defense used	Robot with Pick and Place
[1]	Remote Control	Implemented	--	--	GUI	--	Implemented
[2]	Remote Controlled	--	Cloud Technology	Computer Vision	--	Light follow	--
[3]	--	--	Radio frequency	Camera	--	Backtrack Facility /Gun	--
[4]	--	--	Wireless	--	ZigBee	Fire & Humidity	--
[5]	--	Smart Phone	Wireless/RF	Camera	--	Bomb detection	--
[6]	--	Smart Phone	Image processing/ Wireless	--	ZigBee	--	--
[7]	Master/ Slave	--	Wireless	--	ZigBee	--	--
[8]	Automatic and Remote	--	--	--	--	Bomb Detector	--
[9]	--	--	Wireless	--	ZigBee	Non-Holonomic	--
[10]	Remote	--	--	Camera	--	Bomb Detector	--
Proposed System	**Automatic**	**--**	**Wireless**	**Wireless Camera**	**ZigBee**	**Gun/ Obstacle**	**Implemented**

7th sense: a multipurpose robot for military

Thus aim is to provide a robotic system that can combat in wars and other military purposes. This system is the first of several such programs that are looking at revamping the infantry soldier's gear. It basically has two modes. One mode is the automatic mode and the other mode is user control mode. The automatic mode uses face recognition technique to combat intruders. In certain unavoidable circumstances the control comes to user who can control the operations of the robot from remote location using a computer. One of the main advantages of our system is that the mode switching can be done very fast without any delay. It also helps to provide medical aid for needy.

Wireless control of pick and place robotic arm

In few places where humans cannot touch metallic objects or suspected objects (Bombs) this project can be used. The remote operations can be controlled using android application .It has a transmitting and receiving end. . The main advantage of this robot is to avoid extra pressure on the suspected objects. The android application device transmitter acts as a remote control that has the advantage of adequate range, while the receiver end Bluetooth device is connected to the microcontroller to drive DC motors via motor driver IC for necessary operation.

Development of a robotic arm for dangerous object disposal

This project is being carried out to detect the deadly act such as bomb and dangerous unsuspected objects this results in loss of number of lives. Hence this paper proposes the development of a robotic arm for dangerous

THE IIOAB JOURNAL
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object disposal. Using integrated development environment, robotic arm was developed. Microcontroller programmed with integrated development environment software is used. This device has a camera which transmits the captured video to a television set. The system is activated by a remote control thereby providing a line of defence to human lives and preventing loss of proven and tested personnel.

Quality of connectivity guarantee of ZigBee based wireless mobile sensor network

Cases such as environmental monitoring exploration security service the senor networks are being used. In this paper motion planning and connectivity of multiple robots is based on the sensor networks which are distributed in a ZigBee. In a rescue task it changes dynamically, where the robots need to keep connectivity between other robots. This method enables the mobile robot to be controlled under non holonomic constraint which is related to the quality of communication as a real time and real world application.

Mobile robotic system for search mission

Robots are being used increasingly since it has multiple features like it can be controlled through smart phones, avoid obstacles, diffuse bomb and perform critical tasks. This project is being used for rescue and search mission. This robot is controlled wirelessly using RF technology and it uses ultrasonic sensors to detect obstacles. It is equipped with a camera to provide multidirectional view can send video stream wirelessly to the device. The places which cannot be reached by the human can be accessed by this robot.

A study of IOT enabled smart store

It is usually found that the store owners find it difficult to refill the store periodically. To make the store smart the proposed system uses Internet of Things (IOT) technology. With the smart phone the store owner will get the notification about their stocks and the various requirements of the store. Hence it will be easy for the store owner to refill the store. Various options can be selected by the customer based on their need. The current status of the store and the products available can be known using the Smart Store App.

Eagle O: a semi-autonomous robot

Autonomous robots have many applications in manufacturing industry, space exploration, defence research, etc. A semi-autonomous robot can be build using this project. A key characteristics of this robot it follow light source for navigation purpose and captures physical data in real time mode. . The other goal behind this project is to develop a model for space exploration robots. It is very unlikely this robot can be operated in the space

Implementation of an in-campus fire alarm system using ZigBee

A centralized wireless fire control system using wireless sensor network technology is developed to protect huge area, like a college campus or an industrial park. The five danger prone zones of the campus is connected with a central control room through a ZigBee communication interface such that in case of any fire break in any of the building, a direct communication channel is developed that will send an immediate signal to the control room. Multi hoping technique is adopted for the effective transmitting of the signal in case if any of the emergency zone lies out of reach of the central node. The system developed is implemented in Atmega32 with temperature and fire and humidity sensors.

Real-time indoor surveillance based on smart phone and mobile robot

Image processing techniques, fuzzy theory, wireless communications, and Smartphone are integrated to a wheeled mobile robot (WMR) for the purpose such as real-time object recognition, tracking and indoor surveillance. Command signals are transmitted using ZigBee technology between web camera, wheeled mobile robot and the base computer [10]. The Webcam is used to capture its surroundings of WMR. Hue-Saturation-Value (HSV) colour space is used for classification of colours. Experiments show that the proposed control design and system integration of the wheeled mobile robot works well in indoor real-time surveillance. The WMR is applied to surveillance usage, it can be controlled remotely by a smart phone via WIFI and perform indoor patrol and monitor its surroundings

THE IIOAB JOURNAL
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PROPOSED METHODOLY

Looking at the **Table-1** the proposed system methodology are asfollowing:

ARM7 LPC2148

The LPC2148 microcontroller is 32 bit, 64 pin operating at 3.3V, 12 MHz crystal for system clock and 32 KHz crystal for RTC. Internal MUC has 512 KB flash memory and 40KB static RAM. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate.

ARM9 S3C2440

ARM9 S3C2440 is designed to provide hand- held devices for general application with low power and high performance. It has speed of 400 MHz with RAM of 64 MB. Flash memory capacity is 1 GB. It has special features like audio I/O, camera, USB and Ethernet. Its Operating supply is at 5V and it supports Windows and Linux.

Zigbee

ZigBee is a low-cost, low-power, wireless protocol defined in IEEE standard 802.15.4 (2003 version) for low-rate WPANs. It is highly secure, reliable and easy to install. Data transmission rates vary from 20 kilobits/second in the 868 MHz frequency band to 250 kilobits/second in the 2.4 GHz frequency band.

L293D driver

L293D driver is a 16 pin Motor Driver IC which allows DC motor to drive in either direction. It can supply a maximum current of 600mA per channel. In the proposed system two L293D are used.

PIR sensor

Passive Infra-Red Sensor is used for detecting moving objects. Its operation is based on infrared technology. It operates with high sensitivity, high reliability and ultra-low voltage operating mode. This sensor is used to detect presence of intruders in the secure zone.

Inductive proximity sensor

Inductive proximity sensor is used to detect metallic targets. The main components of the inductive proximity sensor are coil, oscillator, detector and the output circuit. Any metallic target in the coil's magnetic field absorbs some energy which affects the oscillator field. Once the oscillation amplitude of the disturbance reaches a threshold value, the sensor is triggered. This sensor is used to detect presence of explosives.

Wireless camera

Camera mounted on the robot section has linear transmission distance of 50 - 100M. The operating voltage level of transmitting unit is 9V DC and the current level is 300mA.It has resolution up to1280 x 480 pixels. This is used for broadcasting live information to control unit for necessary action to be taken.

THE IIOAB JOURNAL
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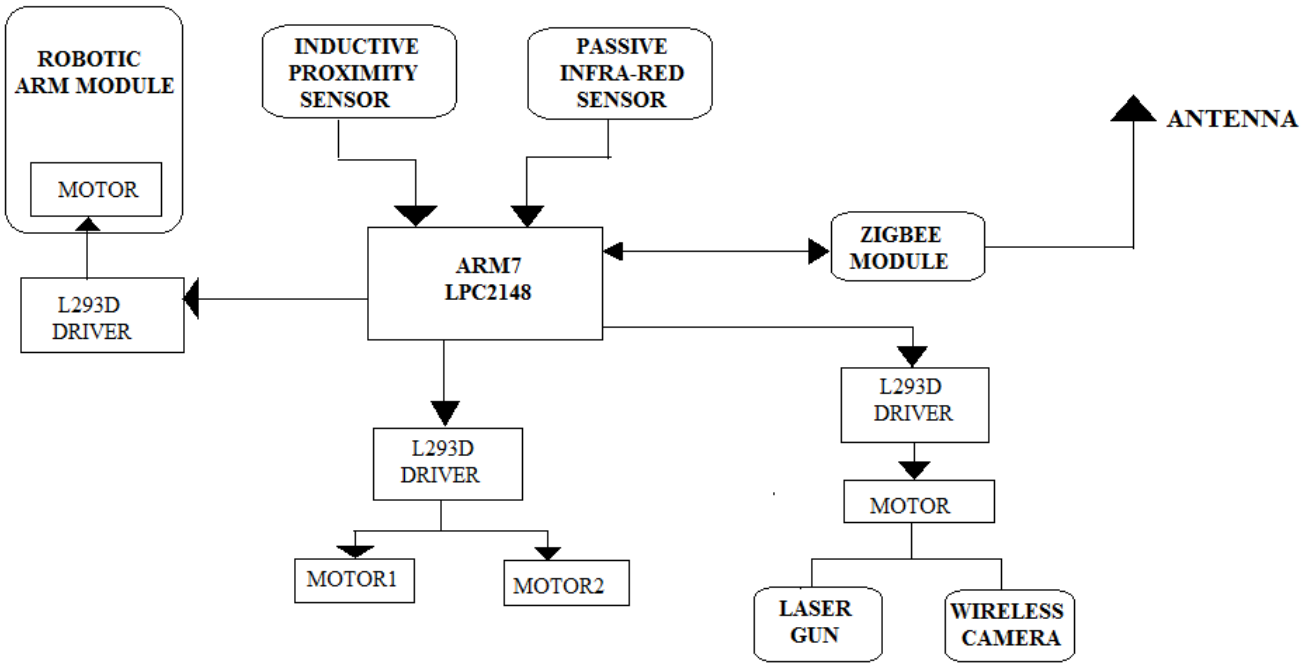

Fig: 1. Architecture of robot unit

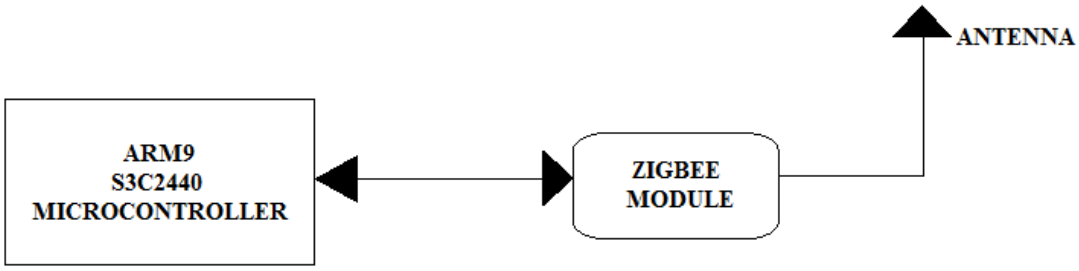

Fig: 2. Architecture of control unit

P1.24, P1.25,P1.26 is assigned to a variable SW1,SW2,SW3.P1.16 is assigned to COIL_A which is the stepper motor port .For the movement of the robot in forward and backward direction three functions are used which is delay (int), motor_cw() is a clockwise rotate function and motor ccw() is anticlockwise rotate function.

This software is used to burn the hex file from the Keil software on to the microcontroller. There are 5 steps before which we can burn the hex file on to the microcontroller. The entire project phases are shown in figure one by one**. Figure– 1** will indicate the architecture of the robot unit. **Figure– 2** will show architecture of only control unit. **Figure– 3** will show the snapshot of the Keil Software. **Figure– 4** will indicate the snapshot of the Flash Magic. The final figure, that is, **Figure– 5** will show the snapshot of the robot. This is the hardware model of the Project.

THE IIOAB JOURNAL
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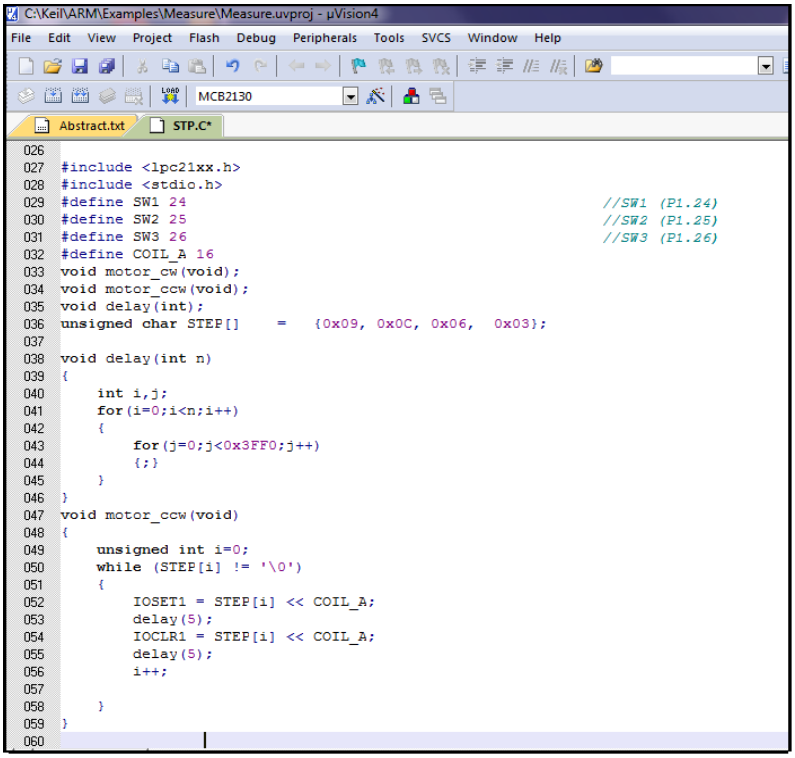

Fig: 3. Snapshot of Keil software

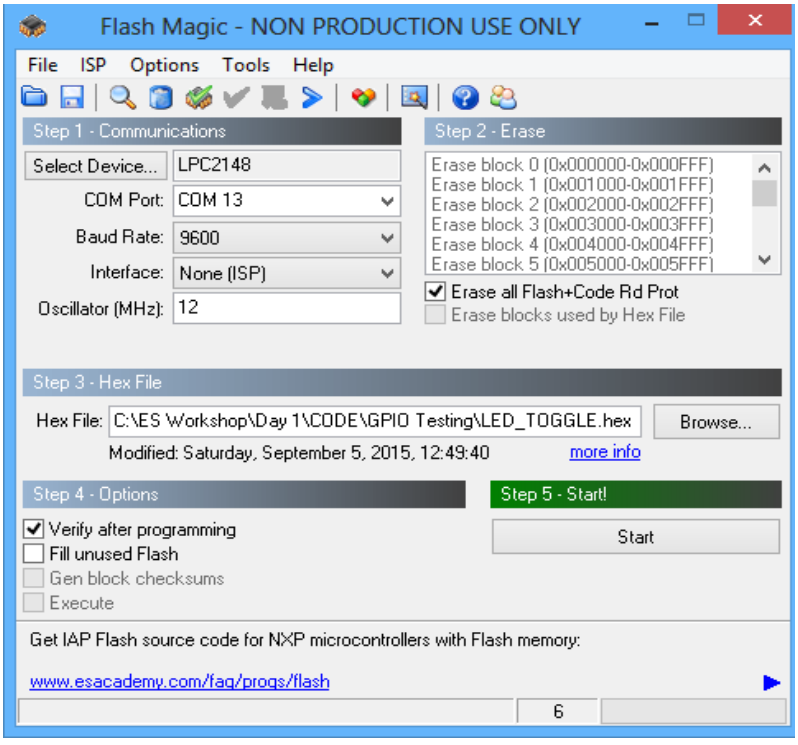

Fig: 4. Snapshot of flash magic

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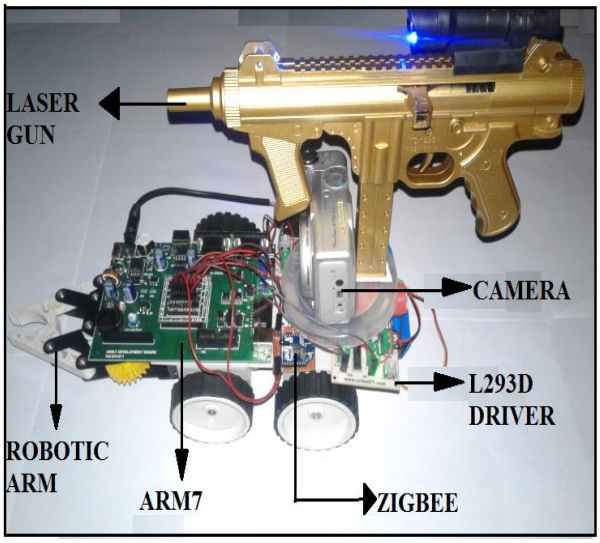

Fig: 5. Snapshot of robot

RESULTS

ARM9 is used as the control unit. Nine buttons are present on the screen of the control unit which is programmed to perform different events in the Robot section. Initially, "COM" button is selected to initialize the communication between robot and control unit. Various events can be triggered based on requirement. The user selects any command from the control unit. This signal is transmitted through the ZigBee module from the control unit. In the robot unit another ZigBee module is attached which acts as the receiver, it receives these signals and corresponding operations are carried out. When any moving object is detected by the PIR sensor, "Human motion Detected" message is displayed on the display screen. Similarly the messages "Obstacles Detected", "Pick and Place" and "Metallic objects Detected" message are found to be displayed. The target is aimed by using a Laser pointer gun. "SHOOT" function is activated by selecting the corresponding button in the display screen. Similar to the above activities, a number of other activities are possible like robot movement, laser triggering etc.

CONCLUSION

The proposed system gives an exposure to design a multifunctional defence robot. This robot has a widespread industrial, defense and home applications. The laser gun attached to the robot is an excellent substitute for the weapons carried by the soldiers. The Laser gun can be triggered with the help of wireless camera. It can be used in a hostage situation to pinpoint the exact location of terrorists with the help of wireless camera, saving many lives during rescue mission. Another application is home security system to sense movement of intruder through PIR sensor. In Industries, this robot can be used to pick and place objects that could be hazardous to human. The current range of operations is up to 100m and can be made more sophisticated. Laser gun found to be very accurate in pointing to the target.

CONFLICT OF INTEREST
Authors declare no conflict of interest.

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FINANCIAL DISCLOSURE
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THE IIOAB JOURNAL
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