

FPGA based Robot used for Defense for India

Meenal D. Matale, Prof Dr. M.P Satone

Student, Professor

Department of Electronic & Telecommunication

K.K Wagh college Of Engineering

Corresponding Author's E-mail: mps.eltx@gmail.com

Abstract

There is a big problem of the terrorism faced by each country. The terrorism is of many kind and the main reason for this activities is not same. The soldiers of the countries have more responsibilities on them to save citizens. The Indian government have many problems as there are more cross border terrorism activities taking place. There are various uneven ground present in India where it is difficult for the soldiers to reach. One of the solution to all these problems is to have a robotic system, which will help the soldiers to reach those places where it was difficult task.

Many techniques have been developed in the robotics, but still there are not as effective as per the detection of terrorist activities. This paper gives an overview of the past few techniques in this field and presents a real-time system by which the robot will follow the object and videos will be send to the server. This technique is based on the Papilio Spartan3 FPGA and Android will be used by the soldiers for seeing the live videos.

Keywords: Papilio, Spartan3, FPGA, Android

INTRODUCTION

The impact of technology, particularly in communication technology combined with

increase in the globalization, which result in the movement of people across borders means that terrorism in the 21st century

has increase. The increase in this movement of people have resulted in move problems of the security of the country. The increase in the population and the weaker borders security is very dangerous [1].

Robotic applications are required in today's industrial world. In such a condition robotics have developed using various technologies. FPGA has the advantage over microcontroller due to its hardware based parallel architecture. Motors are one of the part of the Robots and controlling them with FPGA is difficult. The application is proposed wireless using FPGA [1].

The FPGA robot which uses the FPGA as Papilio Spartan3 is been developed by the Xilinx. It has I/O of 48 lines, USB with dual channel, JTAG programmer which is integrated, 4 power supplies, and a power connector. External hardware can be added directly using the provided "Wing" slots.

The stepper motors are electric motors that are used in safety applications such as auto, medical devices, and surgical robots which are very important application. The FPGA is used in digital control for stepper motors [4]. The motor is been used for the

camera to move in the required direction to capture the video.

The Zigbee is a low data rate, power, and cost wireless networking protocol which is based on the IEEE 802.15.4 standard for wireless personal area networks (WPANs) [1]. It supports the frequency band of 2.4 GHz for worldwide [6][4]. The Zigbee is used to communicate between the server and the robot wirelessly. Zigbee transmitter and receiver is been used in the project.

The ultrasonic sensor will move in the direction of right, left and scan the values. If the object is detected there will be action to follow the object in two ways that is automatic and manual way.

PROPOSED SYSTEM

The system contains following main components:

A. Robot Side Unit:

The Robot will have the wireless camera, the ultrasonic sensor which will calculate the various values and according to it the robot will detect the object. The values then will be saved and it will follow the object once detected. The object which is detected is two ways that is automatic or by the manual way.

B. Server side unit:

The real time videos which will be taken by the robot those videos will be given to the server. The videos will be saved in the server and these videos will be then used by the android application. The server will be present in the control room.

C. Android unit:

The android phone of the soldiers will have the application. Each and every soldiers will have the username and password. And region will be selected and the videos will be seen. The control action will be done in two automatic or manual.

D. System Overview:

The block diagram shows the proposed system.

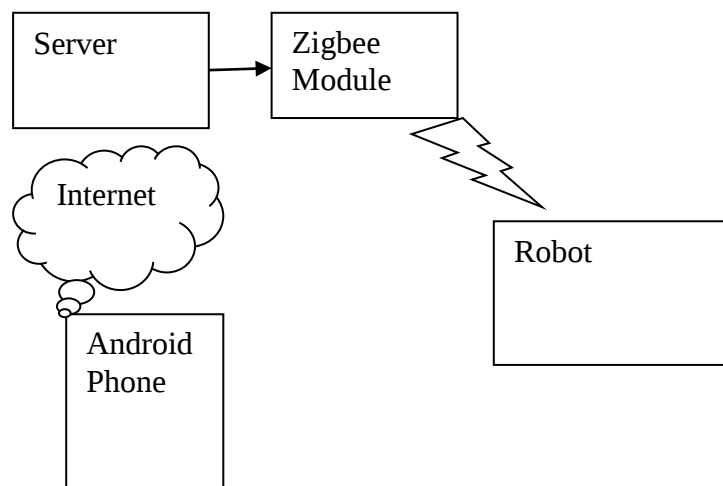


Fig1. Block Diagram of Proposed System

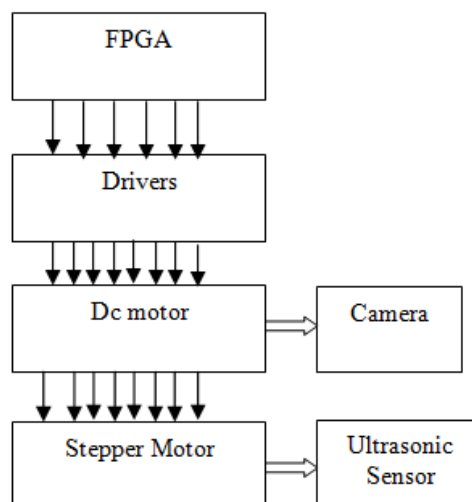


Fig2. Robot unit

Fig.1 shows the overall block diagram of the proposed system. The three units that are the server side unit, the robot and the android phone are present. The server and the robot unit will communicate with each other through the wireless communication unit Zigbee. The server and the android phone will communicate with each other by the internet connection.

Fig.2 shows the robot unit which has the Papilio Spartan3 FPGA which will be connected to the drivers present for the movement of the robot. The drivers will be connected to the D.C motor and the

movement will be that way. The ultrasonic sensor is present which will take the values all the time the robot will move. The object when detected the action will be given by the server or the soldiers through the android application. The action will be in two ways one automatic and the other manual.

RESULTS

The proposed system has the android application design for the soldiers. The snapshots show the application design for the soldiers.

i. First window:

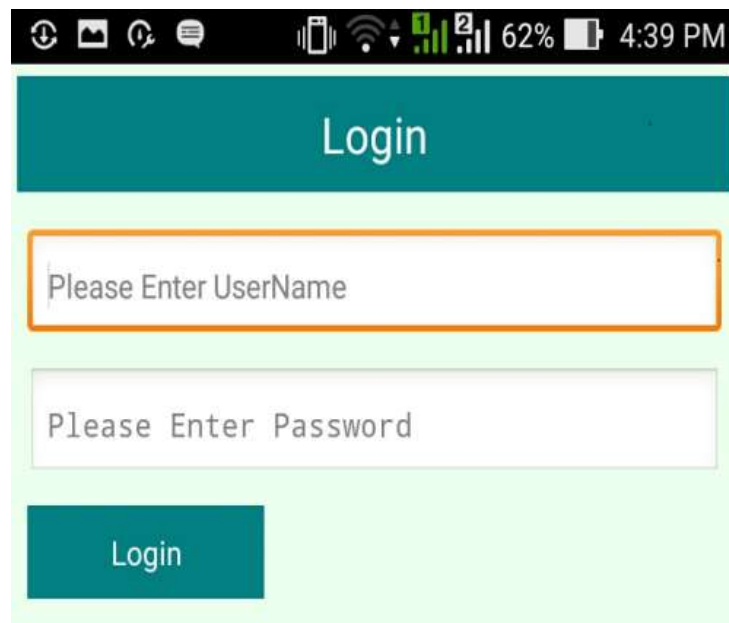


Fig3. First window of the application

In the first screen we have the login window. Each soldier will have his own username and password.

ii. Second window:



Fig4. Second window of the application

In the next region the region where the soldiers are present are been given for the selection.

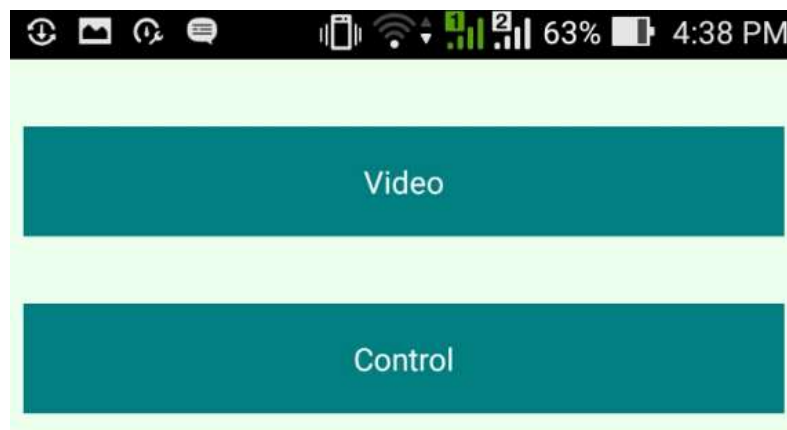
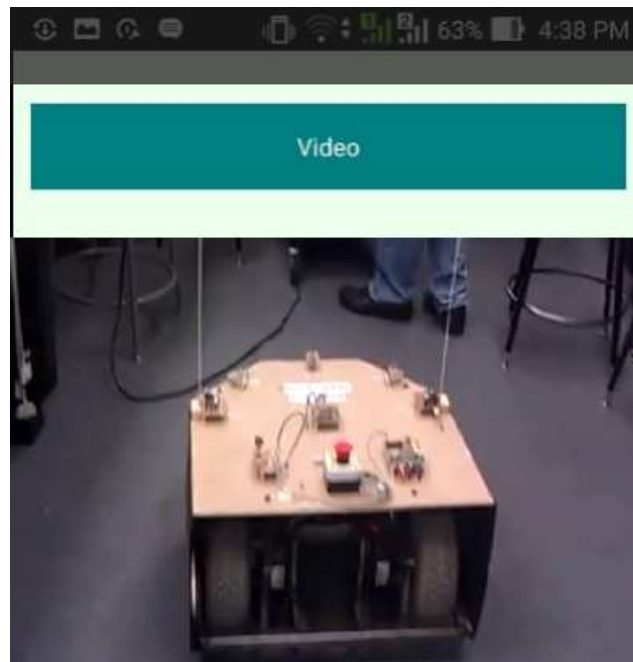


Fig5: Third window of the application

The selection of the regions when is done by the soldiers then the robot which belong to the region will be able to see the video capture by the robot. If required then the control action will be taken by the soldiers.



The forth window gives the video which is taken by the robot when the video option is been selected. The Robot will give the video which is been capture by the robot.

iii. Fifth window:

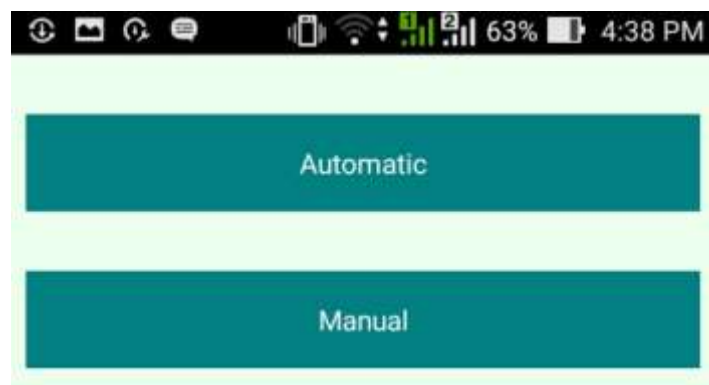


Fig6: Fourth window of the application

The controlling action can be done in two ways that is the robot will follow the object which the robot will detect. The manual once selected will give you option of direction left or right.

CONCLUSIONS

In this paper, the easy way to look after those areas where the soldiers cannot reach is proposed. The working of the robot and the detection of the object and following the object is done in two ways

which is the better option security wise. The Papilio Spartan3 FPGA which is developing by the Xilinx is giving the required results. The android application which is been developed for the soldiers is the easy way to look at all the regions where the soldiers cannot reach. The controlling action can also be done through the application.

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