BOMB DEFUSING ROBOT

A PROJECT REPORT

Submitted by

CHRISTOUS P K

NIDHISH MATHEW

SUJITH K S

THOMAS VARGHESE

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY (B.TECH)

in

COMPUTER SCIENCE & ENGINEERING

of

UNIVERSITY OF CALICUT

Under the guidance of

Ms. ASWATHY WILSON

DECEMBER 2010

Department of Computer Science & Engineering

JYOTHI ENGINEERING COLLEGE, CHERUTHURUTHY

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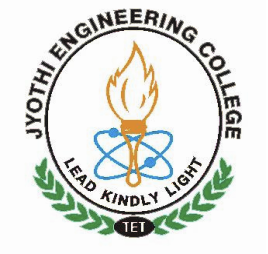

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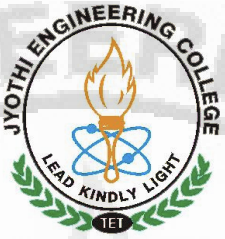

DECEMBER 2010

BONAFIDE CERTIFICATE

Certified that this project report **" ...BOMB DEFUSING ROBOT ..."** being submitted in partial fulfillment of the requirements for the award of degree of **Bachelor of Technology** of **University of Calicut** is the bonafide work of **" ...CHRISTOUS P K, NIDHISH MATHEW, SUJITH K S, THOMAS VARGHESE ..."**, who carried out the project work under our supervision.

Mr Muralee Krishnan C
HOD
Dept. of CSE

Ms Aswathy Wilson
PROJECT GUIDE
Asst. Professor
Dept. of CSE

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We take this opportunity to express our heartfelt gratitude to all respected personalities who had guided, inspired and helped us in the successful completion of this project.

First and foremost, we express our thanks to **The Lord Almighty** for guiding us in this endeavour and making it a success.

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Last but not least, we thank all our teaching and non teaching staffs of Department of Computer Science & Engineering, and also our friends for their immense support and help in all the stages for the development of the project.

ABSTRACT

When we first started working on this project, we had no experience of doing a robotics project. We had done a number of small projects of programming, databases, graphics etc. and had taken a course on Robotics, but we had no practical experience of any kind. .

A control signal is generated for starting or ending the video transmission and also the robot is equipped with a searchlight, which is used for night mode or where visibility is low. A control signal is generated by the application, which is sent to the microcontroller to switch the light on and off.

The robot that we have designed is guided by controls that take input from a human and perform certain actions based on these inputs.The robot that we have made is a command and control robot. This robot takes commands from the user in the form of control signals and performs the required action. The central idea behind this robot is to provide a line of defence to a bomb disposal squad against the life threatening risk, faced by them in the event of an explosion. It provides the squad a safe distance to dispose off a bomb, which he normally has to do with his bear hands.

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CHAPTER 1
Introduction

1.1 Overview

TheWireless Bomb Disposal Robot uses a control application, at the user end to control the robot remotely using Wireless technology. The bomb technician controls the robot using this application. Input from the user is transmitted serially over an RF link to the Robot, where it is received, identified and relayed to the appropriate module.

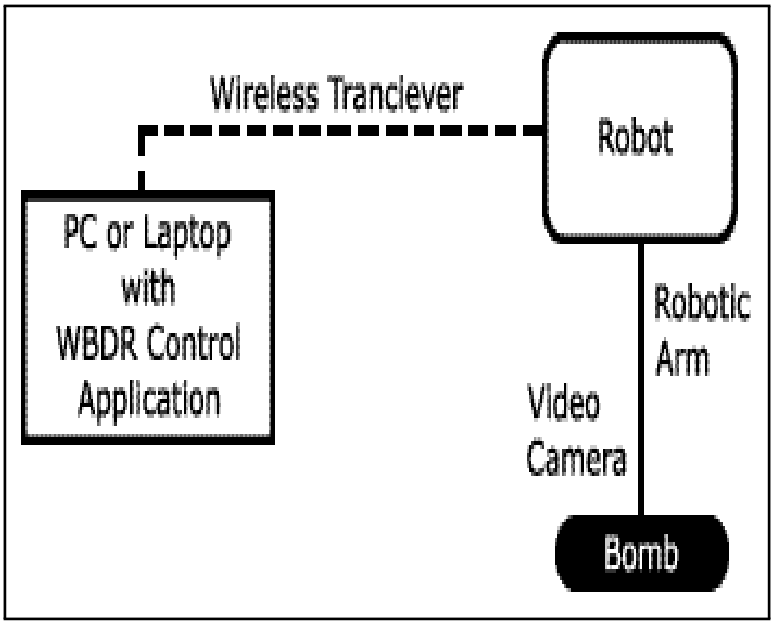

Fig. 1.1: Project Overview

1.2 Motivation and Technical Relevance

Everyday hundreds of trained personnel are either injured or lose their lives while defusing bombs. This can be reviewed by the countless number of news items appearing daily in newspapers around the world.The bomb disposal squad of INDIA has metal detectors and other equipment for bomb detection and disposal, but they have to risk their lives by approaching the bomb or the suspicious packet without any safety and precautions. Our robot provides an extra layer of protection to the bomb disposal squad by allowing them to check and analyse a suspicious packet before actually approaching it for disposal.

The central idea behind this robot is to provide a line of defence to a bomb disposal squad against the life threatening risk, faced by them in the event of an explosion. It provides the squad a safe distance to dispose off a bomb, which he normally has to do with his bear hands.

We have designed it as an assistant robot to the bomb disposal squad but there are a number of other applications of this robot. It can be used by:

Police: In hostage situations-as a spy robot

Military: For reconnaissance missions

Fire: To provide video feedback of the site for analysis

1.3 Synopsis

When we first started working on this project, we had no experience of doing a robotics project. We had done a number of small projects of programming, databases, graphics etc. and had taken a course on Robotics, but we had no practical experience of any kind.We had to do a lot of research, mainly on the Internet, looking for the blueprints of robots already designed Jyothi

1.4 Progress of project

This section is to be included in the final Interim report. The details of progress from the initiation of the project to the present status is to be mentioned here. You could use a bar chart as defined below.

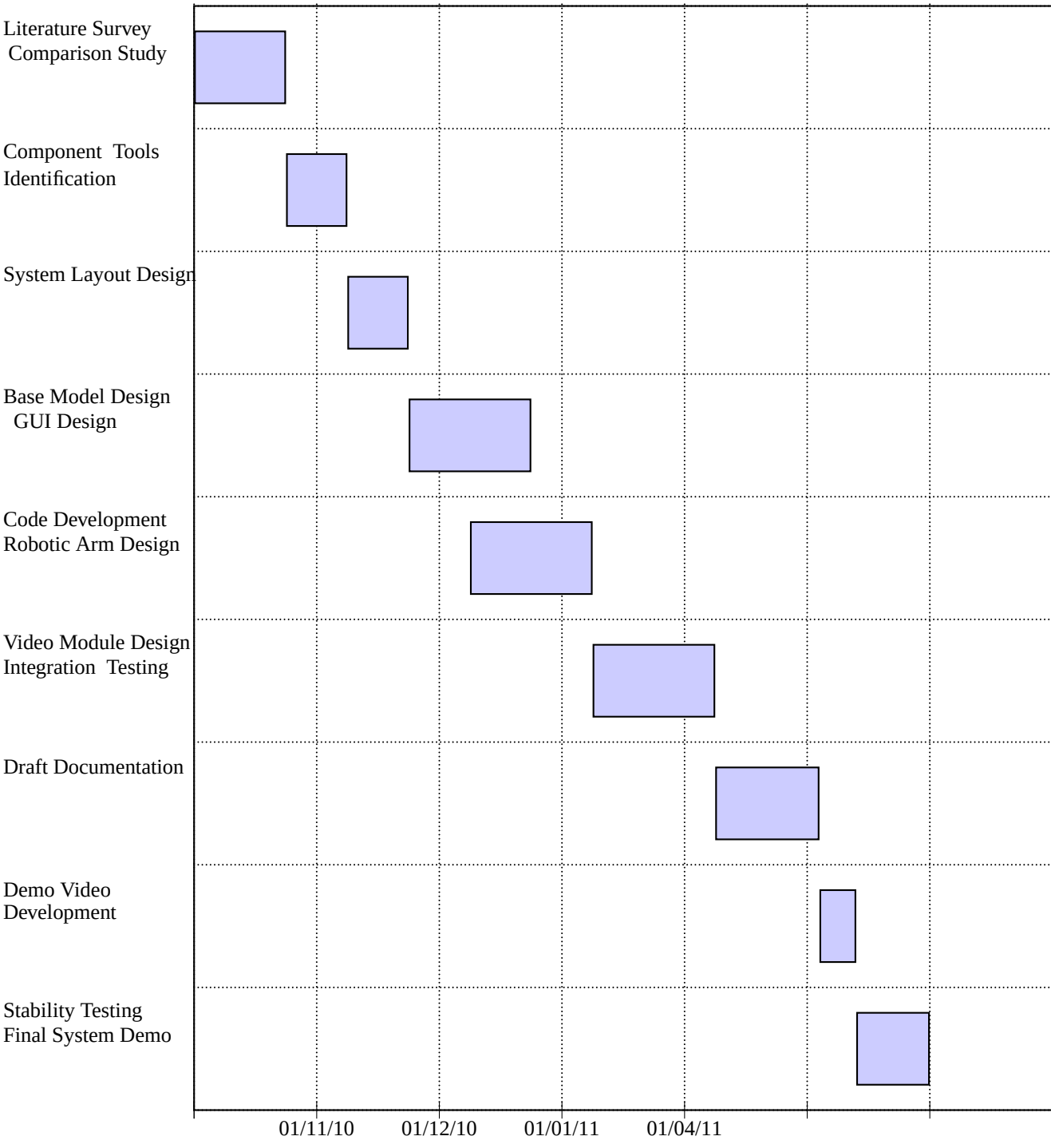

Fig. 1.2: Progress Plan

1.5 Member roles and responsibilities

By cosidering the skills of members each are assigned some roles and responsibilities. The following is a table showing the team roles and responsibilities.

1.1: Team Organization

Name	Role/Responsibility
Thomas	Leader
Christous	Designer
Nidhish	Debugger
Sujith	Programmer

Thomas Varghese: He is responsible for controlling the development of our project,making appropriate planning to meet the deadline and also coordinating the group members.

Christous P K: He is responsible for designing the robot model,necessary circuits and GUI interface.

Nidhish Mathew: He is responsible for debugging the program and also for prepairing the project report and presenting the robot model for final presentation

Sujith K S: He is responsible for microcontroller programming, wireless interfacing and also in transferring the circuits from handwritings to digital form

Roles and responsibilities are assigned to each member by considering their ability to fulfil their roles and field of interest.

1.6 Layout

TheWireless Bomb Disposal Robot uses a control application, at the user end to control the robot remotely using Wireless technology. The bomb technician controls the robot using this application. Input from the user is transmitted serially over an RF link to the Robot, where it is received, identified and relayed to the appropriate module Jyothi

Chapter 2 presents the relevant documents referenced during the initial survey of the project concept.

Chapter 3 includes the hardware and software requirements for the project in its details.

Chapter 4 gives an overview of the design and analysis phases of the project work. Include module breakup system design and control flow diagrams.

Chapter 5 Includes the block diagrams of the pc side and robo side.

Chapter 6 Includes the figures at the time of implementation.ie the robotic base,the GUI interface and it also includes the limitations.

Chapter 7 gives an overview of testing that we have done and the limitations that we currently have.

The last chapter, Chapter 8 summarizes the work done in this semester (Interim or Final). Give a concise description of the challenges faced and possible improvements or alternative schemes to implement similar projects.

CHAPTER 2
Literature Survey

2.1 Documentation

For studying about our project and the exciting projects we had gone through many similar projects . It is through this literature survey we conclude our project requirements.

2.1.1 Papers & related works

A number of projects with similar functionalities can be found. For Example the British Police have a bomb disposal robot, the Israeli Army have it and it is also being used by bomb disposal squads and a number of states of USA. The main paper that we had referred for the study of our domain area is Bomb disposal robot project done by the department of computer engineering of Sir Syed University of Engineering and Technology University Road, Karachi 75300 January 2005

2.1.2 PackBot bomb-defusing robot

iRobot, the company that makes cleaning robots Roomba and Scooba, have also designed robots that don't care how many Dorito crumbs are on your kitchen floor. No, the PackBot has more important things to worry about than how disgusting and unpresentable your apartment is. It's a bomb defusing robot, and if it doesn't do its job it's safe to say that whatever area it's in will be a hell of a lot messier than it was beforehand.

2.1.3 PackBot Tactical Robot

PackBot was first used by US ground troops in Afghanistan in 2002 to help clear caves and bunkers, search buildings and cross live anti-personnel minefields. They were used again in 2003 in Iraq in urban warfare scenarios, as well as in vehicle searches. By 2007, more than 800 PackBot robots were delivered to users worldwide and are in operation in Iraq, Afghanistan

and around the world. PackBot uses a unique propulsion system developing a road speed of up to 14 km/h. The system is characterized by distinctive ”flippers” which offer continuous 360 degrees rotation and negotiation of rough terrain and obstacles such as stairs, rocks, logs, rubble and debris. The platform can climb grades up to 60 percent and survive submersion in water up to two meter deep. It is built to survive drop from two meter height, on a concrete surface, or being thrown through a window or tumbling downstairs. The 18 kg robot can be carried in a backpack, and deployed in a few minutes. The PackBot chassis is integrated with a GPS receiver, electronic compass, orientation and temperature sensors. The robot is controlled by an integral Pentium based computer. It uses a modular payload system offering standard (USB, Ethernet) communications and networking. The control station uses laptop PC or eyepiece displays and hand-held controller. Wide angle (fisheye) or close-up images are displayed for orientation with all operating parameters.

2.1.4 Advantages Of Proposed System

When comparing with the system that was mentioned in our base paper ,our system is equiped with a arm with a cutter. so our system is able to diffuse the bomb at the site itself. And the design of the arm of our system is in such a way that we can easily locate the target clearly and pecisely.The design of the arm is such a way that it can diffuse the bomb which is placed in a lower level or in a higher level. And also we have designed our system in such a way that we can modify or develop the system later. Another main advantage is that we can control our robot via computer. The graphical user interface that we have designed gives the user an easy interface for operating the system. And the camera that we are using in the robo side is a high resolution camera so we are able to get a good quality online video transmission .And we are using a separate power source for the wireless camera ,so the life time of the robot gets increased .

CHAPTER 3

System Requirements Specification

3.1 Software Requirements

Following are some of the software support that are needed for the fulfilment of our project

- MICROSOFT WINDOWS XP
- EXPRESS SCH
- HITEC C COMPILER
- MPLAB
- VISUAL STUDIO
- MICROSOFT VISUAL BASIC 6.0

3.2 Hardware Requirements

Following are some of the hardware that are required for the implementation and fulfilment of our project.

- PIC16F877A
- MAX232
- ENCODER-HT12E
- DECODER-HT12D
- IC7805
- STEP DOWN TRANSFORMER
- DC MOTOR

- 12V DC BATTERY
- RF CAMERA
- TV TUNER CARD
- DIODES
- RESISTORS
- CAPACITORS

3.3 Description

3.3.1 IC 7805

7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

3.3.2 CAPACITOR

A capacitor (formerly known as condenser) is a device for storing electric charge. The forms of practical capacitors vary widely, but all contain at least two conductors separated by a non-conductor. Capacitors used as parts of electrical systems, for example, consist of metal foils separated by a layer of insulating film. A capacitor is a passive electronic component consisting of a pair of conductors separated by a dielectric (insulator). When there is a potential difference (voltage) across the conductors, a static electric field develops across the dielectric, causing positive charge to collect on one plate and negative charge on the other plate. Energy is stored in the electrostatic field. An ideal capacitor is characterized by a single constant value, capacitance, measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them. Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass, in filter networks, for smoothing the output of power supplies, in the resonant circuits that tune radios to particular

frequencies and for many other purposes.

3.3.3 DC MOTOR

A DC motor is an electric motor that runs on direct current (DC) electricity. In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

3.3.4 DIODE

In electronics, a diode is a two-terminal electronic component that conducts electric current in only one direction. The term usually refers to a semiconductor diode, the most common type today. This is a crystalline piece of semiconductor material connected to two electrical terminals.[1] A vacuum tube diode (now little used except in some high-power technologies) is a vacuum tube with two electrodes: a plate and a cathode. The most common function of a diode is to allow an electric current to pass in one direction (called the diode's forward direction), while blocking current in the opposite direction (the reverse direction). Thus, the diode can be thought of as an electronic version of a check valve. This unidirectional behavior is called rectification, and is used to convert alternating current to direct current, and to extract modulation from radio signals in radio receivers. However, diodes can have more complicated behavior than this simple on-off action. This is due to their complex non-linear electrical characteristics, which can be tailored by varying the construction of their P-N junction. These are exploited in special purpose diodes that perform many different functions. For example, specialized diodes are used to regulate voltage (Zener diodes), to electronically tune radio and TV receivers (varactor diodes), to generate radio frequency oscillations (tunnel diodes), and to produce light (light emitting diodes). Tunnel diodes exhibit negative resistance, which makes them useful in some types of circuits.

3.3.5 VISUAL STUDIO

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It can be used to develop console and graphical user interface applications along with Windows Forms applications, web sites, web applications, and web services in both native code together with managed code for all platforms supported by Microsoft Windows, Windows Mobile, Windows CE, .NET Framework, .NET Compact Framework and Microsoft Silverlight. Visual Studio includes a code editor supporting IntelliSense as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a forms designer for building GUI applications, web designer, class designer, and database schema designer. It accepts plug-ins that enhance the functionality at almost every levelincluding adding support for source-control systems (like Subversion and Visual SourceSafe) and adding new toolsets like editors and visual designers for domain-specific languages or toolsets for other aspects of the software development lifecycle (like the Team Foundation Server client: Team Explorer). Visual Studio supports different programming languages by means of language services, which allow the code editor and debugger to support (to varying degrees) nearly any programming language, provided a language-specific service exists. Built-in languages include C/C++ (via Visual C++), VB.NET (via Visual Basic .NET),Csharp ,etc. Support for other languages such as M, Python, and Ruby among others is available via language services installed separately. It also supports XML/XSLT, HTML/XHTML, JavaScript and CSS.

3.3.6 MPLAB IDE

MPLAB Integrated Development Environment (IDE) is a free, integrated toolset for the development of embedded applications on Microchip's PIC and dsPIC microcontrollers. The current version of MPLAB IDE is version 8. It is a 32-bit application on Microsoft Windows and includes several free software components for application development, hardware emulation and debugging. MPLAB IDE also serves as a single, unified graphical user interface for additional Microchip and third-party software and hardware development tools. Both Assembly and C programming languages can be used with MPLAB IDE v8. Others may be supported through the use of third-party programs. MPLAB IDE v8 does not support Linux, Unix or Macintosh operating systems

3.3.7 PIC microcontroller

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1640. Originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Programmable Interface Controller". PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability.

3.3.8 Resistor

A resistor is a two-terminal passive electronic component which implements electrical resistance as a circuit element. When a voltage V is applied across the terminals of a resistor, a current I will flow through the resistor in direct proportion to that voltage. This constant of proportionality is called conductance, G. The reciprocal of the conductance is known as the resistance R, since, with a given voltage V, a larger value of R further "resists" the flow of current I as given by Ohm's law: I=V/R.Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel-chrome). Resistors are also implemented within integrated circuits, particularly analog devices, and can also be integrated into hybrid and printed circuits.

3.3.9 Step-Down Transformer

A step-down transformer, as evidenced by the high turn count of the primary winding and the low turn count of the secondary. As a step-down unit, this transformer converts high-voltage, low-current power into low-voltage, high-current power. The larger-gauge wire used in the secondary winding is necessary due to the increase in current. The primary winding, which doesn't have to conduct as much current, may be made of smaller-gauge wire.

3.3.10 TV Tuner Card

A TV tuner card is a computer component that allows television signals to be received by a computer. It is a kind of television tuner. Most TV tuners also function as video capture cards, allowing them to record television programs onto a hard disk.

3.3.11 Windows XP

Windows XP is an operating system that was produced by Microsoft for use on personal computers, including home and business desktops, laptops, and media centers. It was first released to computer manufacturers on August 24, 2001,[3] and is the most popular version of Windows, based on installed user base. The name ”XP” is short for ”eXPerience.” Windows XP was the successor to both Windows 2000 and Windows Me, and was the first consumer-oriented operating system produced by Microsoft to be built on the Windows NT kernel and architecture. Windows XP was released for retail sale on October 25, 2001, and over 400 million copies were in use in January 2006, according to an estimate in that month by an IDC analyst. It was succeeded by Windows Vista, which was released to volume license customers on November 8, 2006, and worldwide to the general public on January 30, 2007. Direct OEM and retail sales of Windows XP ceased on June 30, 2008. Microsoft continued to sell Windows XP through their System Builders (smaller OEMs who sell assembled computers) program until January 31, 2009. XP may continue to be available as these sources run through their inventory or by purchasing Windows 7 Ultimate, Windows 7 Pro, Windows Vista Ultimate or Windows Vista Business, and then downgrading to Windows XP.

3.3.12 IC 7805

Microsoft Visual Basic 6.0 has been used for the development of the graphical user interface application. It integrates the video feedback from the robot and generates the appropriate signals required for controlling the movements of the robot.And this signal is send to the serial port for the transmission to the robot.We have used some controls inside the vb form such as The standard communication control has been used for serial communication between the microcontroller and the application.VB Skinner Pro2 Control has been used to provide features of the GUI of the control application

3.3.13 MAX232 Level converter

The serial port works on voltage levels of the RS232 format, which are different from the TTL (0 and +5) voltage levels. The MAX232 level converter has been used for inter-conversion between these voltage levels

3.3.14 433 MHz RF Transmitter

It is an ideal for remote control applications where low cost and longer range is required. The transmitter operates from a 1.5-12V supply, making it ideal for battery-powered applications. The transmitter employs a SAW-stabilized oscillator, ensuring accurate frequency control for best range performance. Output power and harmonic emissions are easy to control, making FCC and ETSI compliance easy.

3.3.15 433 MHz RF Receiver

It is an ideal for short-range remote control applications where cost is a primary concern. The receiver module requires no external RF components except for the antenna. It generates virtually no emissions, making FCC and ETSI approvals easy. The super-regenerative design exhibits exceptional sensitivity at a very low cost.

3.3.16 Encoder

The encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information which consists of N address bits and 12-N data bits. Each address or data input can be set to one of the two logic states. The programmed addresses or data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The HT12A additionally provides a 38kHz carrier for infrared systems.

3.3.17 Decoder

The decoders receive serial addresses and data from a programmed series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. This series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bits of address information.

3.3.18 Microsoft Visual Basic 6.0

Microsoft Visual Basic 6.0 has been used for the development of the control application. It integrates the video feedback from the robot and generates the appropriate signals required for controlling the movements of the robot.

CHAPTER 4
Design And Analysis

4.1 Module breakup

According to the analisis that we have made about the work to be done for the completion of this project.we plan to divide the entire work in to four modules. The following table shows the modular division of our project and its description.

4.1: Module Description

Module	Description
GUI MODULE	graphical user interface designed in VB
TRANSCEIVER MODULE	module for transceiver functions
ROBOTIC MODULE	consists of robotic base and arm design
VIDEO TRANSMISSION MODULE	responsible for on-line video transmission

GUI Module : Refers to the Graphical User Interface. It is a pure software application through which we control our robot. This application is designed in visual basic, and it is capable of providing graphical interface for the user to control the movement of the robot vehicle, movement of its arm and also for displaying the received wireless video transmission.

TRANSCEIVER Module : This module deals with the transmission and reception process. ie, the circuits that are required for the transmission of signals at the pc side and the circuits that are required for receiving of signals at the robo side.

ROBOTIC Module : It is in this module the robotic vehicle containing a movable arm with a cutter is designed and implemented. ie, integrating the circuits and the required hardware for the final built.

VIDEO TRANSMISSION Module : why this module is made separated from the robotic module was , this module have no relationship with the other modules. The only work we have to do in this module is to fix the wireless camera with the robotic arm and interface its receiver at the pc side for displaying the video signal in the application that we have made.

4.2 System Design

The following figure represents the over-all block diagram of the project.

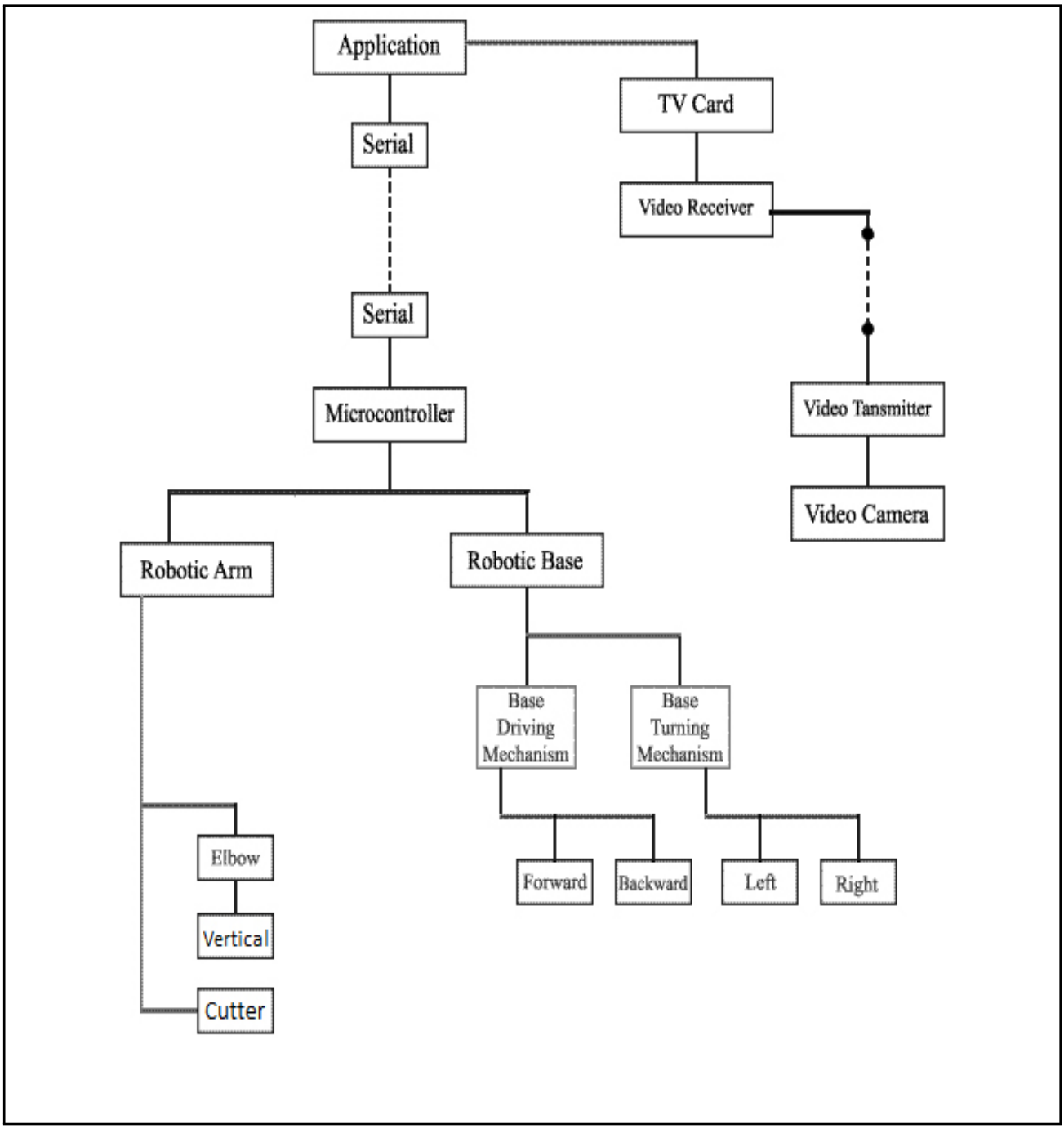

Fig. 4.1: Project Block Diagram

4.3 Control Flow Diagrams

The following diagrams illustrates how the control flow in different areas.

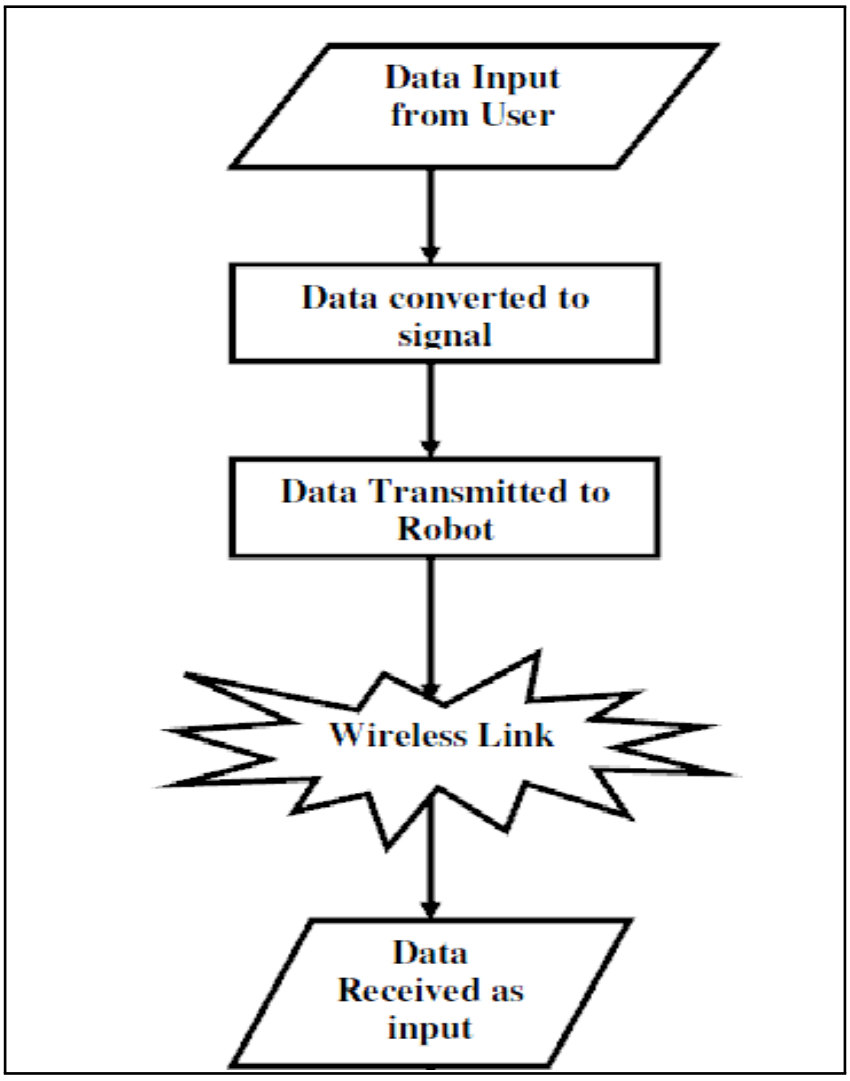

Fig. 4.2: Over All Flow Chart

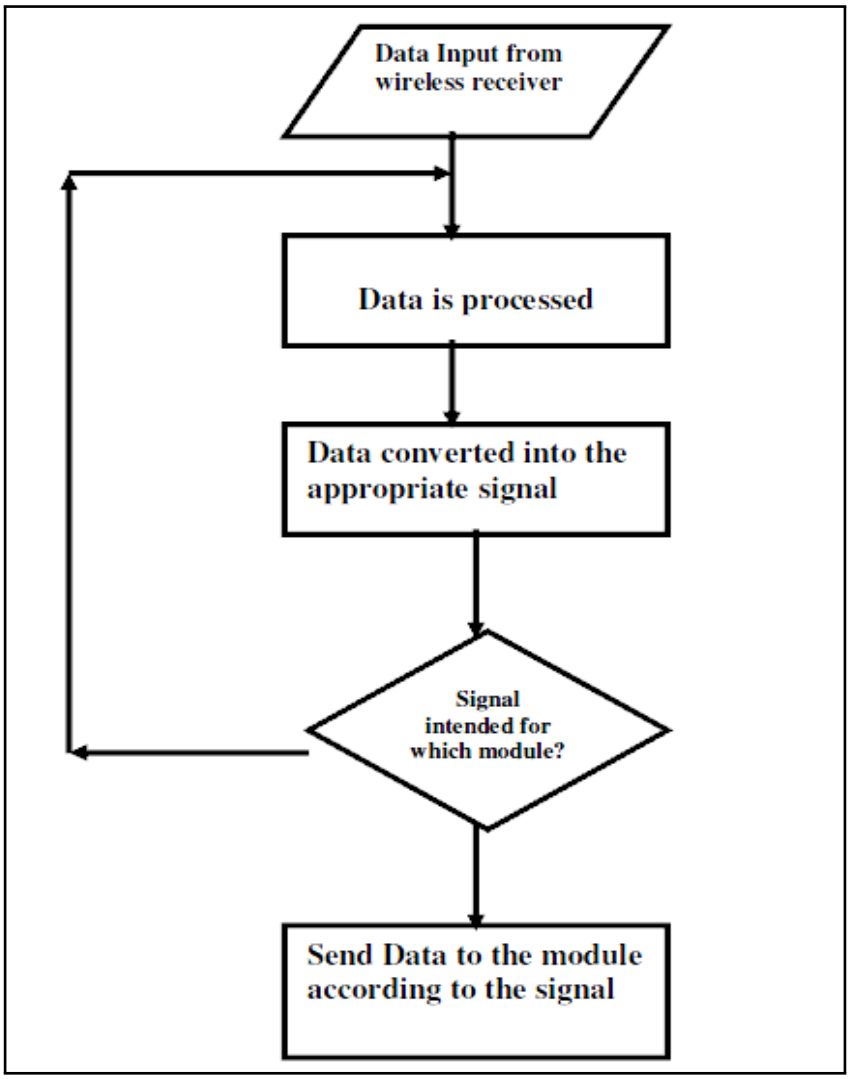

Fig. 4.3: flow chart of pic

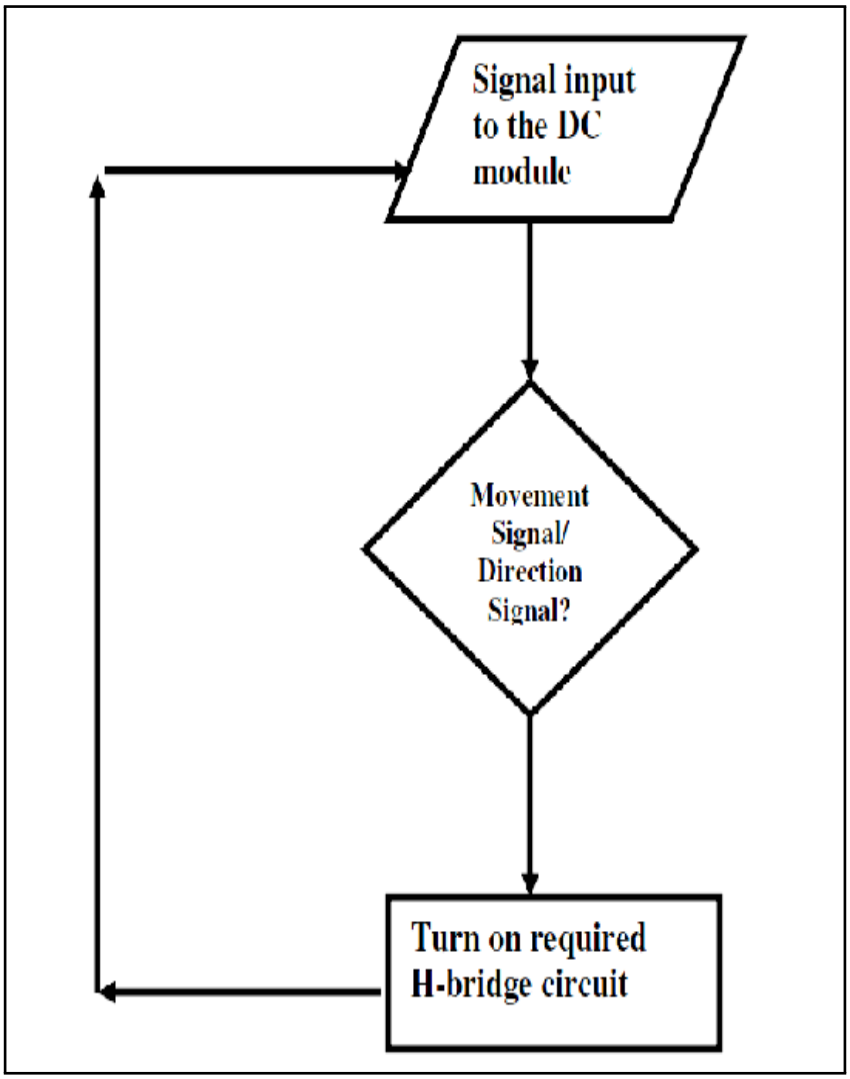

Fig. 4.4: Control Flow Of DC Motor

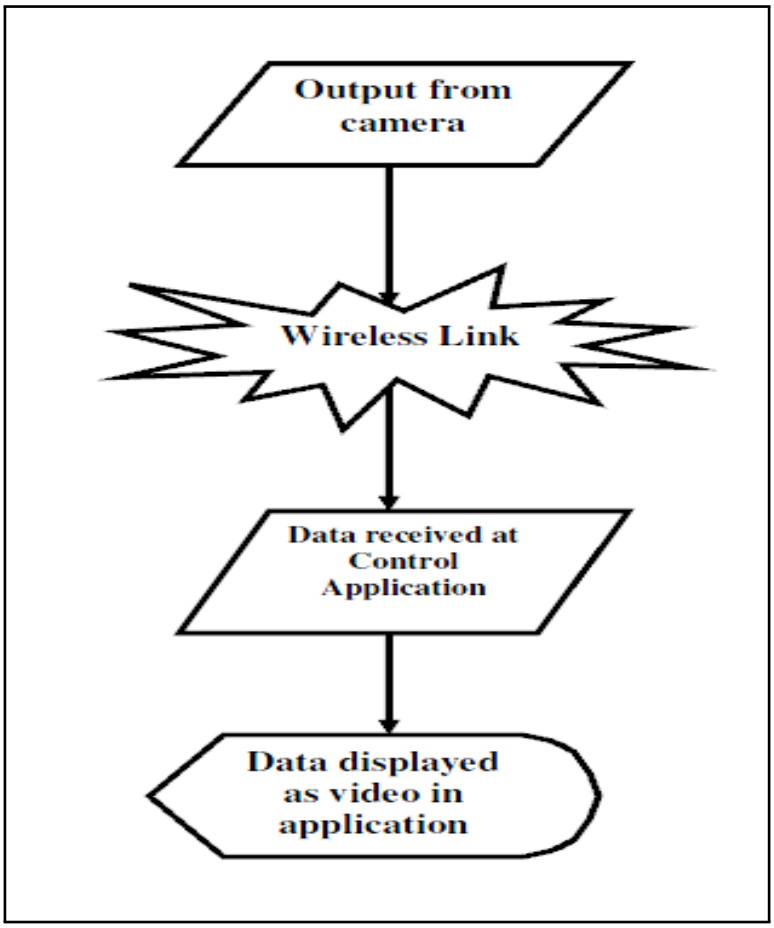

Fig. 4.5: Control Flow Of Wireless Camera

CHAPTER 5
Architecture/Design

5.1 Introduction

In this section, you will mention the overall architecture and design of the project concept. You may include diagrams representing the structure of various layers in your project as follows. The following is a pstricks generated diagram.

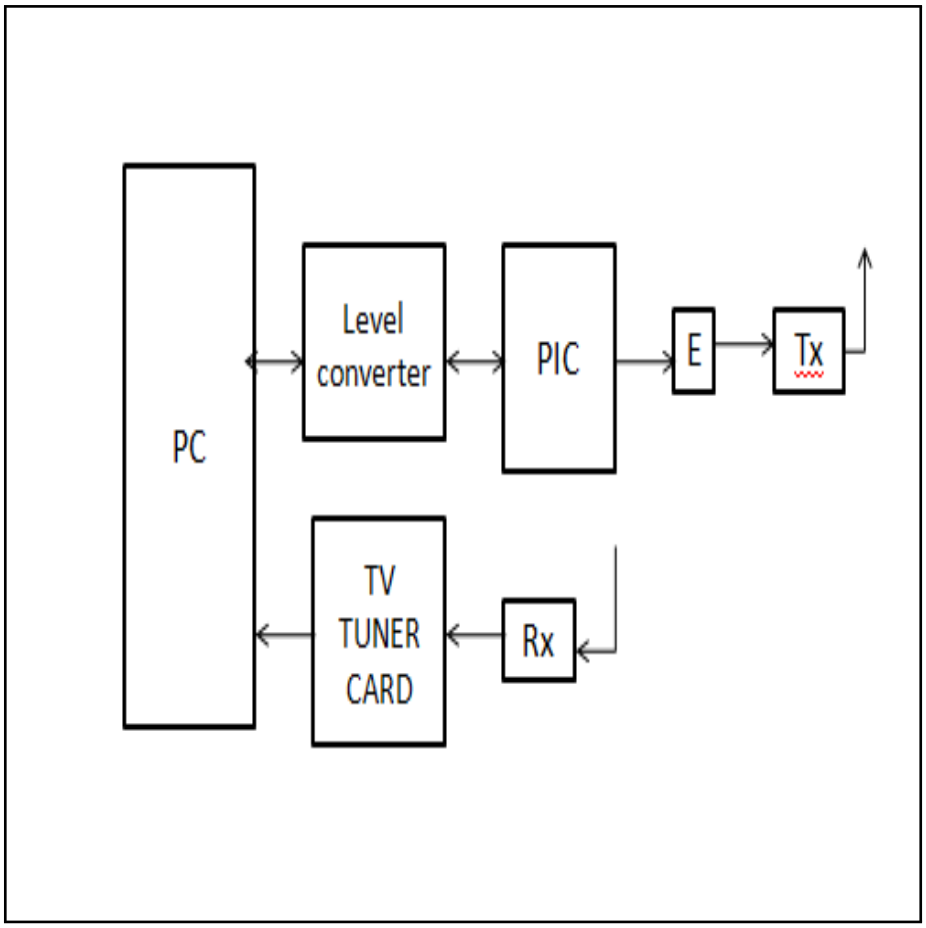

Fig. 5.1: PC-Side Block Diagram

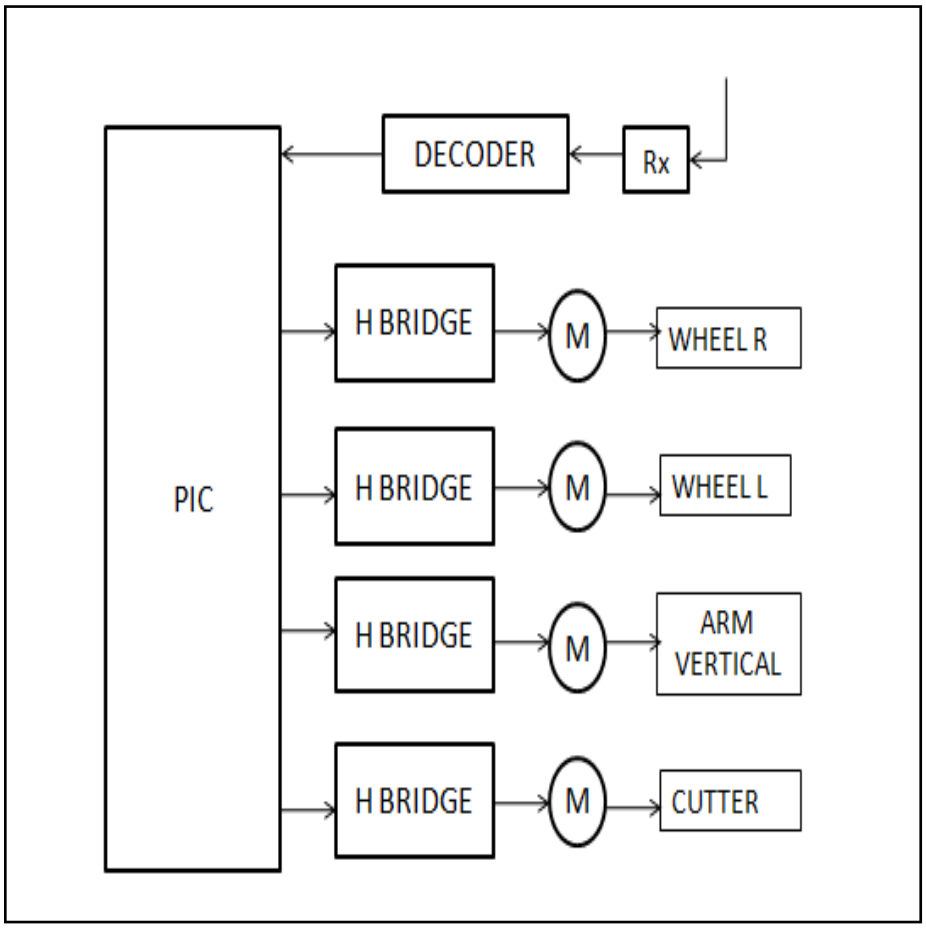

Fig. 5.2: Robo-Side Block Diagram

CHAPTER 6
Implementation

6.1 Introduction

The figures that had given below is the figure which describes the current position of the progress of our project.We have followed a modular wise implementation.

6.1.1 Robotic base

The figures that had given below is the figure which describes the base of the robot of our project. Its the structural view shows the orientation of the wheels and the base motors.

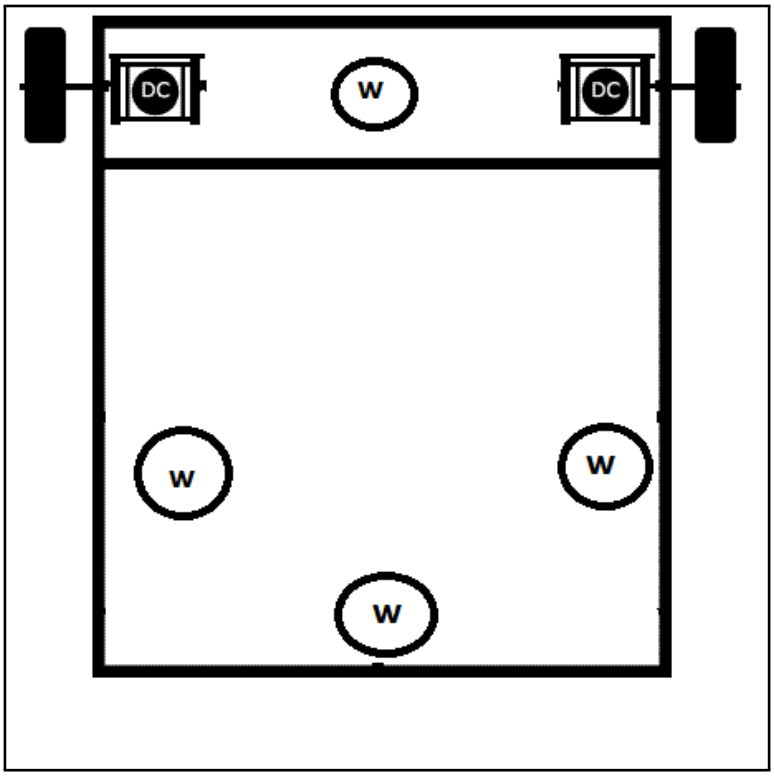

Fig. 6.1: Robotic Base

6.1.2 GUI-interface

Graphical user interface is designed in Visual Basic and the design is in such a way that the robotic base and robotic arm cutter can be controlled via this interface

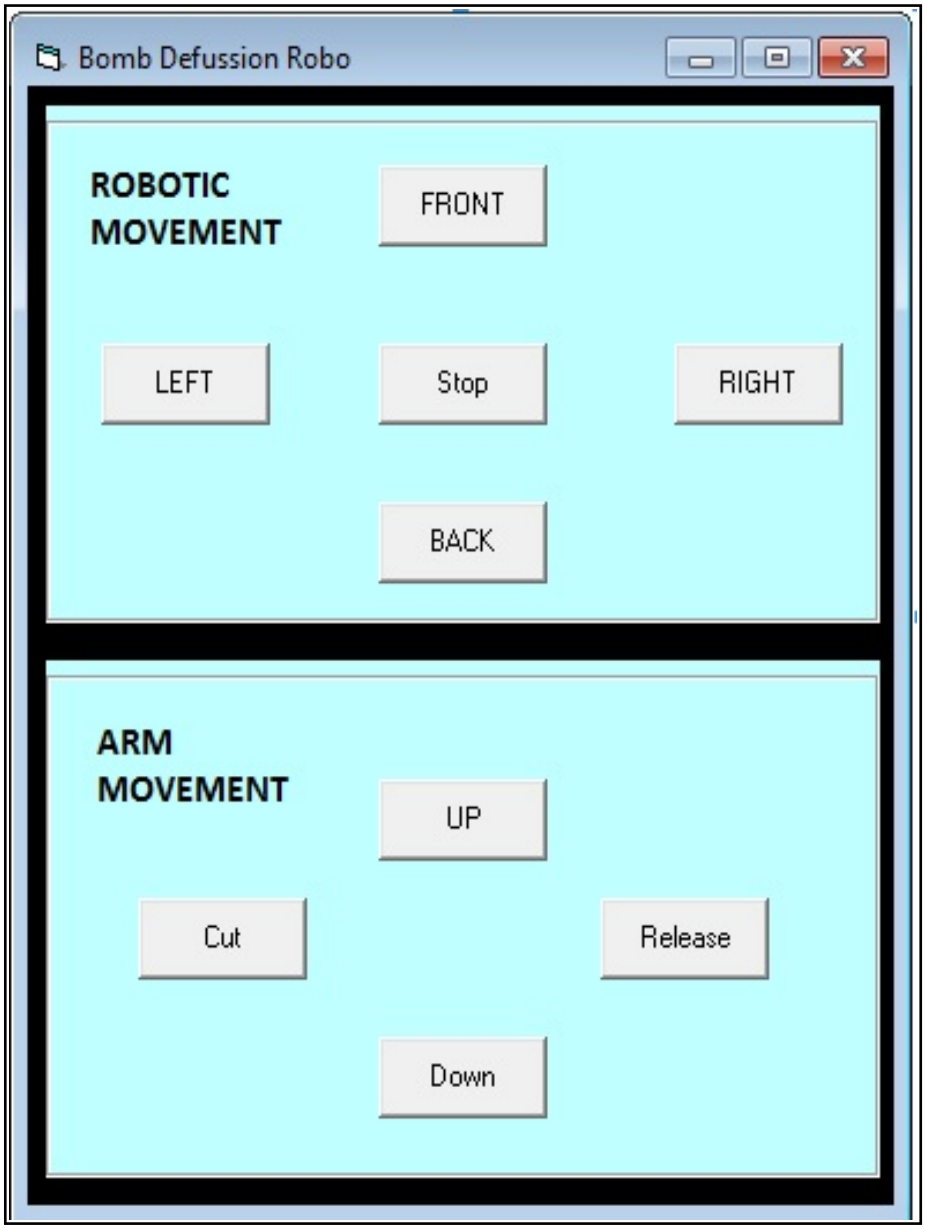

Fig. 6.2: snapshot2-GUI-interface

6.2 Pseudo codes

PC SIDE

```
#include<pic.h>
__CONFIG(HS & WDTDIS & PWRTEN & BOREN & UNPROTECT & LVPDIS);

static bit rf_txen @((unsigned)&PORTA*8+4);
unsigned char i,j,ser=0x37;
bit b;
void delay(unsigned int y)
{
while(y--);
}



void interrupt rcx(void)
{
if(RCIF==1)
{
RCIF=0;
ser=RCREG;
i=0x01;
}
}

void main()
{
ADCON1=0x07;
TRISE=0x00;
PORTE=0x00;
TRISA=0x00;
PORTA=0x00;
TRISC=0x80;
TRISD=0x00;
PORTC=0x80;
```

```
PORTD=0x00;
delay(100);
i=0x00;
            SPBRG=0x19;
            BRGH=1;
            SYNC=0;
            CREN=1;
            TXEN=1;
            RCSTA=0x90;
            GIE=1;
            PEIE=1;
            RCIE=1;

delay(20000);
while(1)
{
if(i!=0x00)
{

if((ser>=0x2a)||(ser<=0x7a))
{
            PORTA=ser;
            rf_txen = 0;
            i=0;
            delay(15000);
            delay(15000);
            rf_txen = 1;
}
}
}
}
```

ROBO SIDE

```
#include<pic.h>
__CONFIG(HS & WDTDIS & PWRTEN & BOREN & UNPROTECT & LVPDIS);


unsigned char portdata,portb_int=0x00,gpsdata[20];
```

```
void delay(unsigned int y)
{
while(y--);
}

void interrupt bport(void)
{

if(INTF==1)
{
INTE=0;
GIE=0;
INTF=0;
portb_int=0x01;
INTE=1;
GIE=1;
}
}

void main()
{
ADCON1=0x07;
TRISA=0x00;
PORTA=0x00;
TRISD=0x00;
PORTD=0x00;
TRISC=0x00;
PORTC=0x00;
TRISB=0xFF;
PORTB=0xFF;
lcd_init();
delay(100);
lcd_command(0x80);
lcd_condis("InterruptProgram",16);
lcd_command(0xc0);
lcd_condis("RF Data:          ",16);
```

```
lcd_command(0xc8);
RBPU=0;
GIE=1;
INTE=1;
INTEDG=1;
lcd_command(0xc8);

while(1)
{
if(portb_int==0x01)
{
lcd_command(0xc8);
portb_int=0x00;
portdata =PORTB;
portdata=(portdata>>4);
portdata=(portdata&0x0f);
portdata=(portdata+0x30);
/*lcd_command(0xc9);
lcd_data(portdata);*/

if(portdata==0x31)
{
        PORTC=0x66;
        delay(60000);
        delay(60000);
        PORTC=0x55;
}
else if(portdata==0x32)
{
        PORTC=0x99;
        delay(60000);
        delay(60000);
        PORTC=0x55;
}
else if(portdata==0x33)
{
        PORTD=0x56;
```

```
            delay(60000);
            delay(60000);
            PORTD=0x55;
}
else if(portdata==0x34)
{
            PORTD=0x59;
            delay(60000);
            delay(60000);
            PORTD=0x55;

}
else if(portdata==0x35)
{
            PORTA=0x56;
            delay(60000);
            delay(60000);
            PORTA=0x55;

}
else if(portdata==0x36)
{
            PORTA=0x59;
            delay(60000);
            delay(60000);
            PORTA=0x55;

}
else if(portdata==0x37)
{
            PORTC=0x56;
            delay(60000);
            delay(60000);
            PORTC=0x55;
}
else if(portdata==0x38)
{
```

```
            PORTC=0x65;
            delay(60000);
            delay(60000);
            PORTC=0x55;
}
else if(portdata==0x30)
{
            PORTC=0x55;
            RD0=0;
            RD3=0;
}
}
}
}
```

GUI CODE

```
Private Sub cmdBack_Click()
  MSComm1.Output = "2"
End Sub

Private Sub cmdCut_Click()
  MSComm1.Output = "4"
End Sub

Private Sub cmdDown_Click()
  MSComm1.Output = "6"
End Sub

Private Sub cmdForward_Click()
 MSComm1.Output = "1"
End Sub

Private Sub cmdLeft_Click()
  MSComm1.Output = "7"
End Sub

Private Sub cmdRelease_Click()
```

```
  MSComm1.Output = "3"
End Sub

Private Sub cmdRight_Click()
  MSComm1.Output = "8"
End Sub

Private Sub cmdStop_Click()
 MSComm1.Output = "0"
End Sub

Private Sub cmdUp_Click()
  MSComm1.Output = "5"
End Sub


Private Sub Command1_Click()

End Sub

Private Sub Form_Load()
 MSComm1.PortOpen = True
End Sub

Private Sub Form_Unload(Cancel As Integer)
 MSComm1.PortOpen = False
End Sub

Private Sub Frame1_DragDrop(Source As Control, X As Single, Y As Sing

End Sub
```

6.3 Limitations

Some of the Limitations of our prototype are the following.

We brought the wrong dc motor for the wheels of our robotic vehicle,it adversely effected the speed of our robot vehicle. We are not able to integrate the video panel inside the GUI application.Also the robot is large in size when compared to other military robots so it cant penetrate through small areas.

CHAPTER 7
Testing & Maintenance

7.1 Tests

Testing is done at the time of implementation of each module.This project contains two components. The software component and the hardware component. The software component consists of the control application. The hardware component comprises of the robot. Both these two components have further internal components. All these components had to be tested individually and after being integrated as well.

7.1.1 System Test and Procedure

The wireless bomb disposal robot consists of a number of modular components. These modules have been tested, verified individually and then integrated with other modules.

7.1.2 Testing strategy-Unit testing

A modular approach has been used in designing the robot and the same approach has been taken in its testing. The following are the modules that have been tested: The Software Application, The Robotic Base, The DC Motor Circuit, The Serial Interfacing Circuit

7.1.3 Integration Testing

After the individual testing, the robot underwent integration testing. All circuits were mounted on the robot, connected to the microcontroller circuit and tested. Control signals from the serial port of the PC were generated using the control application and tested by turning on or off the appropriate motor.

7.2 Maintenance

we have implemented our project mainly on focusing on the maintenance of the project since this project can be extended up to any level based on cost as well as application area.

CHAPTER 8
Conclusion

8.1 Conclusion

We are able to complete almost the requirements that we had specified for our project with basic movement of the robotic vehicles and its arm movement and the cutter movement and also the GUI module for controlling the robot.

The Wireless Bomb Diffusing Robot will provide great service for the bomb diffusing squad, the military and the police.For instance, at one place it can be used by the bomb diffusing squad,While another application can be to provide up to date information in a hostage situation.

8.2 Future work

The system that we have built is a working prototype of a robot, which should be compact, fast and accurate. This prototype may not have the features and reliability of the original design. It is only being developed to ensure that the design is feasible, not impractical and can be implemented on a much larger scale in a more efficient way. At present, the robot is not a very flexible machine that is it may not provide the efficiency to cope with the complex objects or it may not have the capability to penetrate into small places, which is necessary requirement. But it can be used to design such a robot, which can be small in size, fast and accurate in its movements. we can improve our project by implementing artificial intelligence , night vision camera, removable cutter/multi cutter

REFERENCES

WEBSITES:-

1 www.rentron.com

2 www.iguanalabs.com/7805kit.html

3 www.kmitl.ac.th/kswichit/

BASE PAPER:-

Bomb disposal robot project done by the department of computer engineering of Sir Syed University of Engineering and Technology University Road, Karachi 75300 January 2005