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DESIGEN AND IMPLIMENTATION OF WIRELESSSURVEILLANCE AND RECONNAISSANCE ROBOT

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***Abstract* ----** The project focused on the implementation and application of robots in the real world. The present trend depends on machines. In industries the major part of the works are carried out by the machines. The reason behind is that, minimized risk, very less error percentage, increased through put, better quality production etc. The above mentioned key factors are directly effects on finance and profit of the industry. Now days the robots are also using in defence and security purposes, such robots are equipped with smart sensors which detect bombs, harmful gases, motion detection, etc. The aim of the project is to develop a robot with available resources which helpful in detecting harmful things from remote location, that minimizes the risk involved in such works

Keywords: programming, hardware interfacing, result, working, application

1. Introduction

Surveillance and Reconnaissance Robot is built using embedded technology that uses microcontroller to perform specific task. An embedded system is a combination of computer circuitry and software that is built into a product for purposes such as controlling, monitoring and communication. This system consists of two main parts namely smart vehicle and control-station. Basically the smart vehicle is a wheeled robot which is equipped with microcontroller, Zigbee, sensors and wireless camera. The control station has Zigbee, wireless camera-receiver and PC with hyper terminal front end.

2. Functional Block Diagrams

Before implementing any design, the design should be represented in the form of block diagram. As mentioned in previous section the system consists of two parts. The block diagram of each part is given to understand over all concepts.Fig1:shows the block diagram of control station. Control station consists of Zigbee transceiver, personal computer and video receiver. Control station is responsible for issuing commands and gathering the information from the robot.

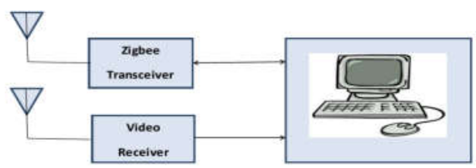


Fig 1: Functional block Diagram of Control Station

Fig2: shows the functional block diagram of smart vehicle. Smart vehicle consists of microcontroller, sensors, ADC, Zigbee Transceiver, DC motors, Driver circuits and battery bank.

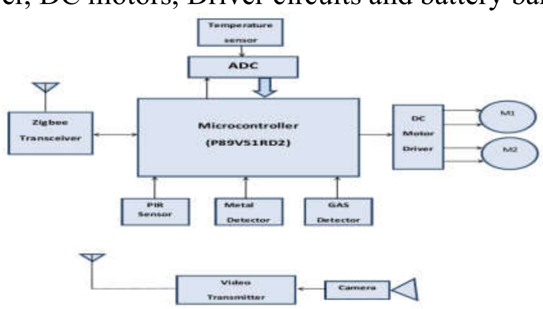


Fig 2: Functional block diagram of smart vehicle unit

3. Programming

As mentioned earlier the robot is build using embedded technology. An embedded system uses microcontroller/microprocessor to perform given task. Themicrocontroller is programmed to perform tasks assigned to it. Before programming, the sequence of functions is represented in the form of flow chart. The flow chart is diagrammatic representation, which illustrates a solution model for a given problem. Here four flow diagrams are represented to show the flow of the program.

3.1 Main Program Flow

Flow chart illustrated in fig 3 shows how main program will flow. At the beginning of program execution serial port is initialized and baud rate is

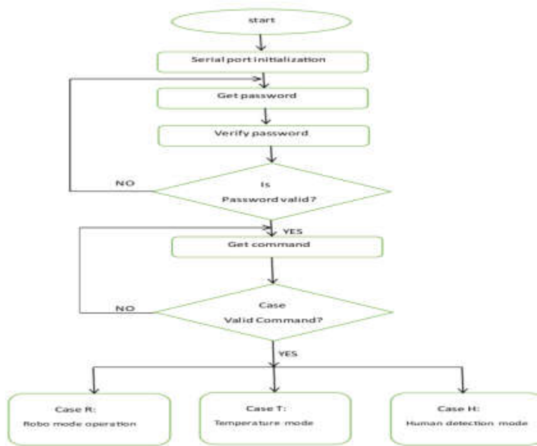


Fig 3: Main Program Flow Chart

set to 9600. In next step password issued by the user will be received and verified. If password is valid next step will be executed or else a message will be displayed “INVALID PASSWORD”. In next step user will be asked to issue commands. There are three choices to the user to issue commands, they are ‘R’to enter robo mode, ‘T’ for temperature mode and ‘H’ for motion detection mode.

3.2 Robo Mode Program Flow

Robo mode operation is illustrated by flow diagram given in the fig 5. The robo mode operation is responsible for controlling the movement of the vehicle.

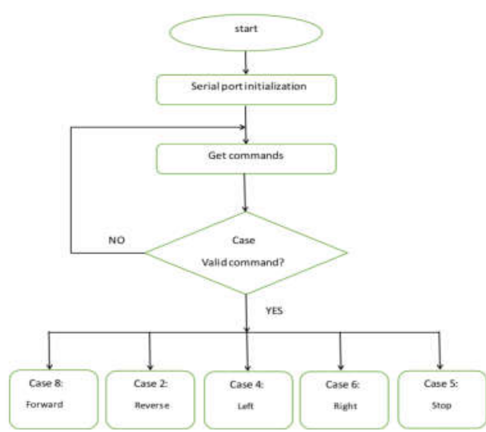


Fig 4: Robo Mode Flow Chart

There are five commands to control the movements of the wheeled robot. If the user enters number ‘2’robo will move forward and similarly commands ‘8, 4, 6, 5’ for backward, left, right and stop respectively.

3.3 Temperature Mode Program Flow

Figure 5 illustrates the temperature mode program flow. Temperature is a parameter that is Analog (continuous) in nature but digital computers use binary (discrete) values. Thus A to D converter is most commonly used device for data acquisition.

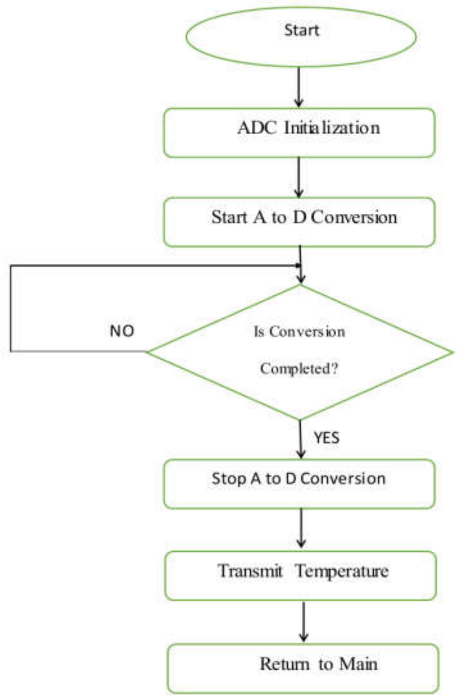


Fig 5: Temperature Mode Program Flow

As user enters the command ‘T’processor switches and executes temperature mode operation. As shown by the flow chart ADC is initialized and conversation stars by setting bit ‘SC’. Before starting the conversation 3 bit address is latched on address bus by setting bit ‘ALE’ (address latch enable). On completion of conversation ADC chip holds EOC (end of conversation) flagup which is monitored by the controller. Then data is read form data bus upon setting output enabling bit ‘OE’. Once the data is received in the form of binary is converted to BCD (binary coded decimal) and transmitted to control station.

Figure 6 shows the timing diagram of ADC 0809 multi-channel ADC. From the timing diagram we get brief idea of programming ADC 0809. It should be notice that clock signal required for ADC 0809 must be provided from an external source. To select an analog channel by providing to A, B and C address according to the table 1. To latch in the address ALE pin is activated by providing L-to-H pulse as shown in the figure 6.

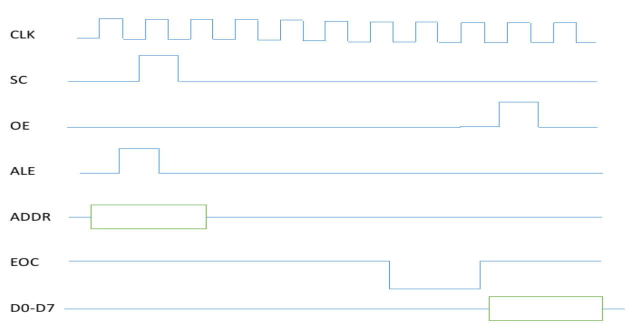


Fig 6: Timing Diagram for ADC 0809

To initiate the conversion SC pin is activated by inserting L-to-H pulse. EOC pin is monitored to see whether the conversation is finished. H-to-L output indicates that the data is converted and is ready to be picked up. An L-to-H to the OE pin will bring digital data out of the chip.

C	B	A	Selected analog channel
0	0	0	IN0
0	0	1	IN1
0	1	0	IN2
0	1	1	IN3
1	0	0	IN4
1	0	1	IN5
1	1	0	IN6
1	1	1	IN7

Table 1: Analog Channel Selection of ADC 0809

3.4 Motion Detection Program Flow

Figure 6 shows motion detection program flow. For motion detection PIR (Passive Infrared Sensor) will be used. Output of thePIR sensor is connected to the one of the microcontroller pin. At the beginning PIR sensor is initialized. Then PIR sensor is monitored continuously using **"while"** loop. For example **while(pir != 1);**. As motion is detected sensor sends **active high** pulse.

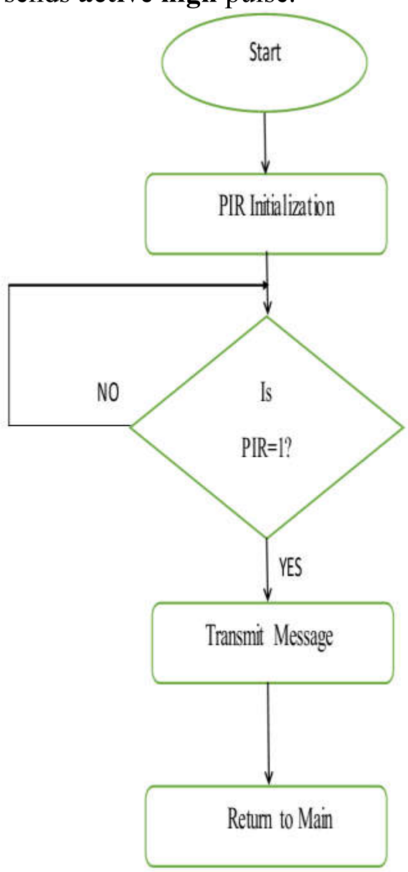


Fig 6: Motion Detection Program Flow

As user enters command ‘H’ processor executes motion detection routine. In this routine as mentioned above the PIR sensor is monitored. When motion is detected around within the range of the sensor an active high signal is generated. This active high signal is picked up by the controller and transmits message “MOTION DETECTED” to the base station.

3.5 Interrupt Programming

To detect other two parameters gas and metal detection, external hardwareinterrupts are used. These two sensors are connected to the external hardware interrupt pins **INT0** and **INT1** respectively.

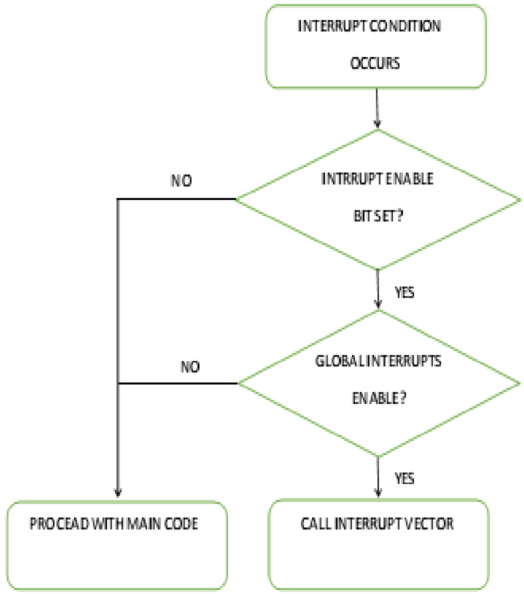
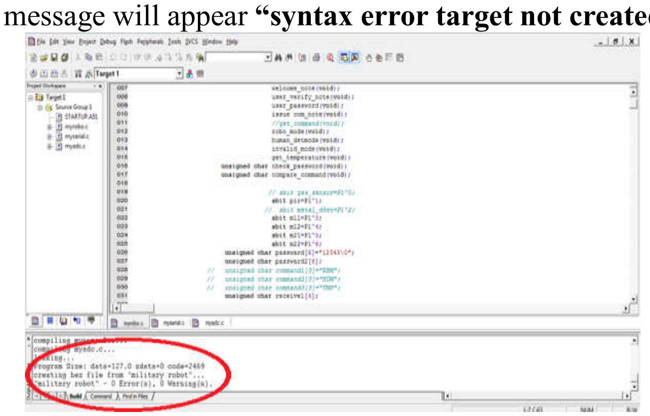


Fig 7: Interrupt program flow

3.6 Program Development and Creating Hex File

The program is developed using the tool **“Keil uVision3”.** The language used for developing program is **Embedded C**. Initially a new project is created with the name **“military robot”**. While creating the project it will ask for device, where device selected is 89V51RD2 Philips make. Once the project created a file is saved with **.C** extension (eg. myrobo.c) and added to the source group. Program is edited in editor window and program is developed module by module. Header files are created for serial communication and ADC programs such as “**myserial.h”** and **“myadc.h”**. Header files are also added to the source group.
After completion of program editing target will be built by selecting build target button. If any syntax error found during build target a message will appear **“syntax error target not created”**.



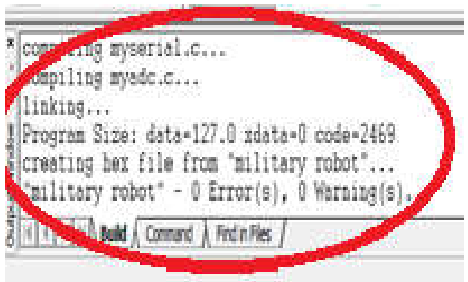


Fig 7:Output window

Once all the errors are rectified, hex file is created as shown in the figure 7.

4. Hardware interfacing

Connecting peripherals such as ADC, DC motors, sensors, key boards, etc to the microcontroller in proper method using hard wire connection is called hardware interfacing. Here interfacing is represented in the from circuit diagram. The circuit diagrams are drawn using **proteus ISIS 7**tool. Some of them circuit diagrams are given the following sections.

4.1 DC Motor Interfacing

The figure 8 shows the circuit diagram of dc motor interfacing to the microcontroller though L293D dc motor driver. The pin numbers 2,7 and 10,15 of L293D are connected to microcontroller pins P1.1,P1.2,P1.3 and P1.4 respectively. The signals generated on this pins are responsible for controlling the direction (cw/ccw) of dc motor.

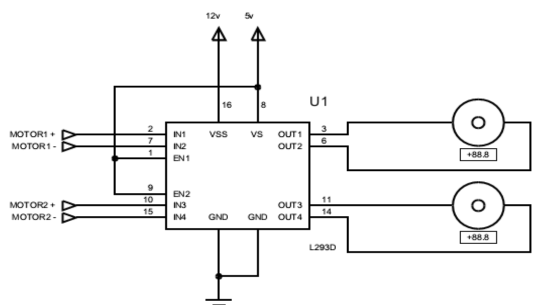


Fig 8: L293D Driver

The table 2 gives motion of the robot depending on control signals generated by the controller.

Control Signals				Direction
M1+	M1-	M2+	M2-	
1	0	1	0	Forward
0	1	0	1	Reverse
0	1	1	0	Left
1	0	0	1	Right
1	1	1	1	Stop

Table 2: Control signals

4.2 ADC Interfacing

As discussed in earlier section to measure temperature ADC is required. The figure 9 shows the circuit diagram for ADC interfacing.

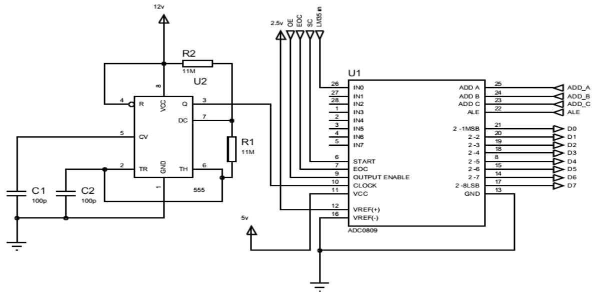


Fig 9: ADC 0809

4.3 Main board circuit diagram

5 Results

Figure 11 shows hyper terminal window. The hyper terminal responsible for setup communication between base station and robot. Whenever command is given through hyper terminal the response of the robot is displayed on hyper terminal window as shown in the figure 11.

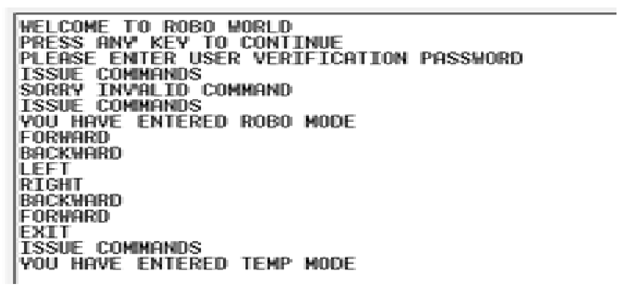


fig 11: Hyper terminal Window

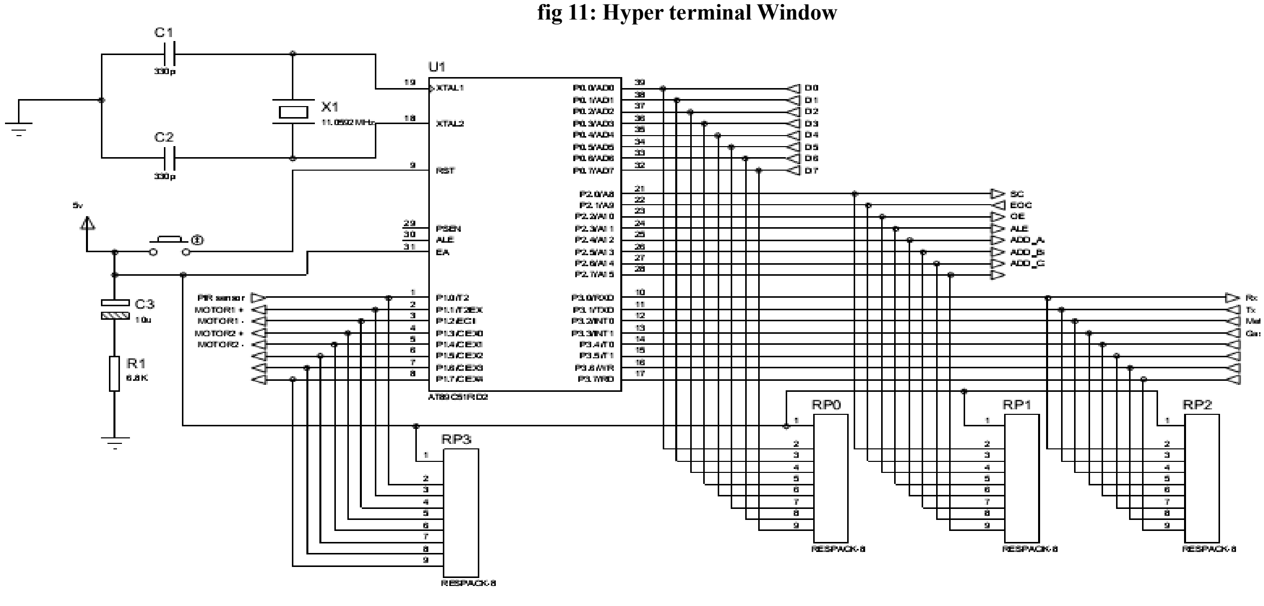


Fig10: Main Board Circuit diagram

6. Conclusion

Robots can be used for security purpose. Robots are helpful in minimizing the risks. Robots have artificial intelligence and can't think theirby own. Robots will work according to the program developed by the programmer. Robots are intelligent but not smart. And finally robots can be built with available resources if we have proper idea about technology.

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