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Research Article

Touch Screen based Robot using Zigbee

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Abstract

In situations where humans cannot reach out to particular areas such as area of mishaps, natural calamity stuck places and also in industries where a particular task needs to be performed on a daily basis, using a robot to do the required operations and tasks is one of the preferred and better alternative. The touch screen based robot is a microcontroller based mechatronic system that contains a touch screen keypad, a LCD display, ZigBee along with other components to perform surveillance and assigned tasks. Here we design a robot that not only helps in rescue operations but also in military applications and hospitals.

Keywords: *Microcontroller, Robot, Touch Screen, ZigBee.*

1. Introduction

In today's fast paced society, time and man power are the major constrains in order to complete any task in large scale. The automation is playing important role to save human efforts in most of the regular and frequently carried works. The inflexibility and generally high cost of hard-automation systems, which have been used for automated manufacturing tasks in the past, have led to a broad interest in the design, development and implementation of robots capable of performing a variety of manufacturing functions in a flexible environment at lower costs.

The use of Industrial Robots characterizes some of contemporary trends in automation of the manufacturing process. However, present day industrial robots also exhibit a monolithic mechanical structure and closed-system software architecture (Kenneth Ayala, 2003). They are concentrated on simple repetitive tasks, which do not tend to require high precision.

In the implemented work, we present the design of a robot consisting of a transmitter and a control unit. The movement of the robotic module is controlled by the handheld touch screen device using ZigBee. The control unit performs the assigned task.

2. Robot in general

The scientific interpretation propounds a robot as an automatic machine that is able to interact with and modify the environment in which it operates (Muhammad Ali Mazidi *et al*, 1999). Therefore, it is essential to define what constitutes a robot. Fig. 1 shows the key components of a robot in general. Different definitions from diverse sources are available for a robot.

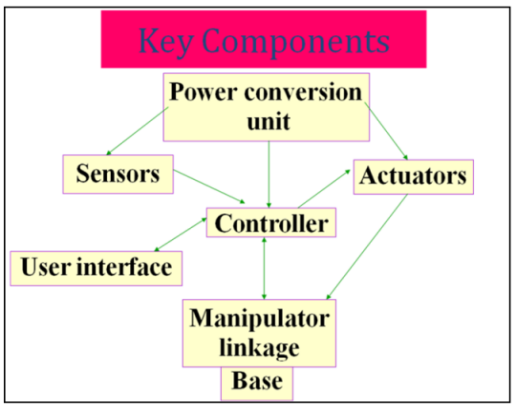

Fig. 1: Key Components of a Robot

Robots are required to function according to three principles known as the "Three laws of Robotics":

1. A robot should not harm any living being.
2. A robot must obey orders given by humans except when that conflicts with the First Law.
3. A robot must protect its own existence unless that conflicts with the First or Second law. These are the general laws that apply even to other machines and appliances. These are always taken care of in any robot design.

3. The designed Robotic Module

In this paper we present the design and development of a mobile Robot whose motion is controlled using a touch screen keypad. The module consists of a transmitter and a control unit. The transmitter block diagram is as shown in fig. 2.

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It consists of mechanism to direct the robot to the direction like left, right, forward and backward to reach the target with the help of a touch screen device. This analog data is send to the ADC then the converted analog to digital data is send to the microcontroller. Microcontroller sends the received data to the receiver section using ZigBee.

The receiver part is placed in the robot section i.e., the control unit. Communication between transmitter and the robot is via ZigBee. One ZigBee is placed at the transmitter end while another is connected at the receiver side. 8051 architecture based P89V51RD2 microcontroller (William C Burns *et al*, 1986) from NxP Semiconductors is used to implement this mobile robot. Microcontroller acts as the heart of this project, which controls the whole system. Fig. 3 and 4 explain the control unit design of the mobile robot.

Transmitter Unit

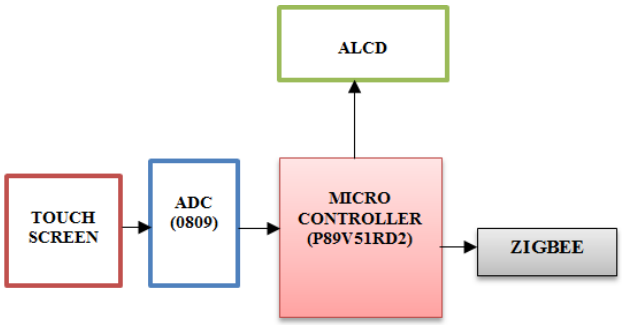


Fig. 2 Transmitter unit

Robot Unit

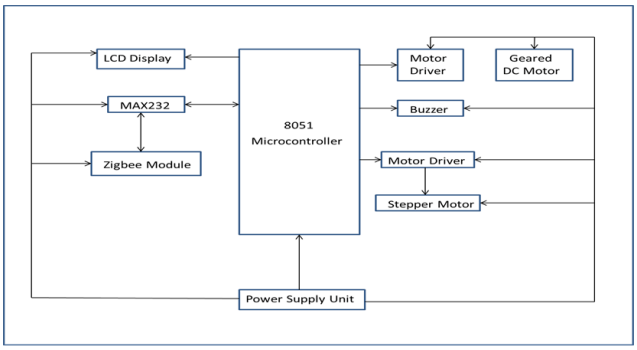


Fig.3: Robot Unit Block Diagram

The Robot consists of the following components:

- Microcontroller – P89V51RD2
- ZigBee
- Geared Dc motors
- Stepper motor
- L293D drivers
- ULN2003 driver
- Battery – 12V/ MAXCON Adapter 12V
- APR9600, a Single-Chip Voice Recording & Playback Device with 60-Second Duration
- A 16X2 Alpha-numeric LCD for display
- ADC
- Serial cable
- Single strand wires
- Robot chassis
- Touch screen
- Adapter (3 pin)
- 2 x 3 and 4 x4 PCB board
- DB9 connector
- Capacitors
- Berg connectors (male and female).

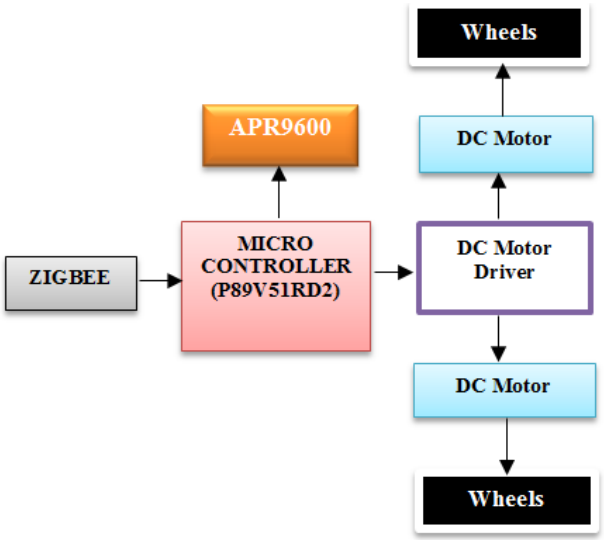
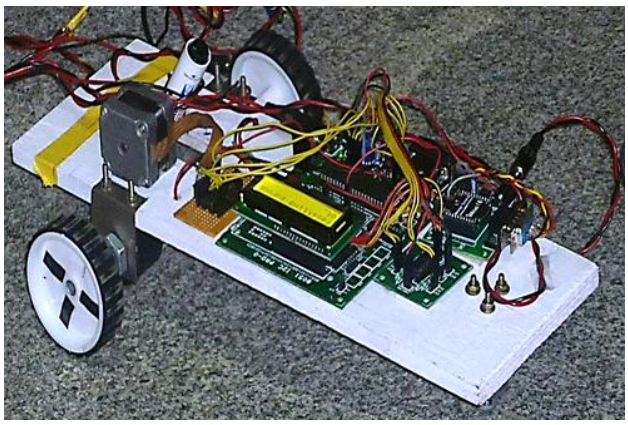


Fig.4: Robot Unit

4. Snapshot of the designed Robotic Module



Conclusion

The ability to navigate in any environment is crucial for any robot in order to accomplish impressive navigation task. The proposed robot finds its application in the companies, aircraft fuselage or engines where human intervention is dangerous and in such scenarios these tiny machines can be used.

The system was checked for its functionality for successful motion of the robot within a certain diametric-distance, thus the robot was able to do successful surveillance in the specified area.

One of the primary advantage of Touch Screen Based Robot is that it can be used in many Military Applications such as bomb detection and disposal which reduces the necessity to risk human life. It also reduces the need for excess man power. It can be reprogrammed to be used in Dormant and Active Volcanic Craters for video surveillance, in areas of Toxic gaseous emission, in Medical Science, Mine Detection and High Temperature Detection.

As a future scope, the ZigBee can be replaced by RF so that the range of controlling and surveillance increases. The insect like locomotion for our project will provide more maneuverability to the locomotion as it can move through rough terrain surfaces.

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Feroz Morab is currently pursuing M.Tech, under VTU, Bangalore. He is doing research on robotics and its practical implementation and has publications in many International Journals to his credit. He is moving towards Ph.D and his areas of interest include Communication, Field Theory and Digital Signal Processing.

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