

Robotic Waiter

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Abstract

In today's world the use of robot is going on increasing. Robots are able to carry out every work more effectively and efficiently than a man can do. Hence one of such application of robot could be ROBOTIC WAITER. There are many areas of research that could be done for a robotic waiter. In this project we have try to make a prototype of Autonomous Robotic Waiter which will serve the refreshment to the customer. The implementation is done with available resources to reduce the cost of project. The robot used is FIREBIRD 5 ATMEGA 2560 and robotic arm is made by using 3 servo motors.

Keywords: Robotic Waiter

I. INTRODUCTION

The arena will be consisting of the black lines, LED and tables with switches. For interconnection the LEDs to glow and switches is done with the help of arduino.

LEDs will be place on the path of robots. When the customer comes he will press the button to get refreshment. As the button will be pressed (switch is on), the LED at the starting point and the LED at the junction from where robot will move to serve towards the table will glow. As the LED at starting point will glow the robot will initiate its program to follow black line. The robot will start following black line, when it will get a white light in the way it will turn left or right accordingly and serve the refreshment. After serving it will again follow the returning black line path and come to the starting position.

II. PURPOSE OF SYSTEM

The objective is to develop a small scale robot, called the Robot Waiter, which can help progress the field of robotic assistance technologies. A robot that functions as a personal assistant should be able to help in different environments, whether it would be a research lab, a hospital, or even at home. It would be able to deliver messages or items, project video and pictures, move and navigate on its own etc. The basic objective of the Robot Waiter is to take care of transporting food/refreshment to the customer.

III. WORKING MODELS

A. Black Line Following:

We are using Firebird V Atmega 2560 robot. This robot is fully automated. It has 3 white line sensors on it. Whenever the middle sensor will sense black color and other two white the robot will move forward. Whenever the values of other two sensors change it is a time to take decision for robot to turn left or right.

WORK SPACE FOR ROBOT

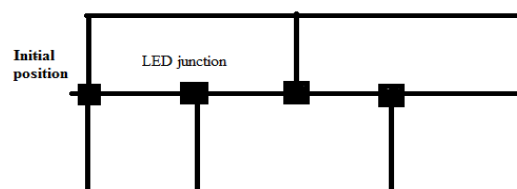


Fig. 1: Workspace

B. Serving the Refreshment:

The robotic arm is used to serve the refreshment. The arm is made up of 3 servo motors.

C. Queuing:

For this prototype we are using 2 robots for the refreshment. When the 1st robot serves the request; next time it should be the second one to serve. Means both the robots should serve alternatively.

Here, we are using arena with the LEDs on it. At the starting point both robots will be placed in queue. Whenever the LED at starting point glows, the robot at first will go to serve. The robot will move forward a bit. Now as the next time LED glows it's time for another robot to go for serving.

After the refreshment served, the robots will follow the returning path and come to the starting point and wait till LED glows for next time.

IV. REQUIRMENTS

A. Firebird Atmega 2560 Robot:

Fire Bird V is designed by NEX Robotics and Embedded Real-Time Systems lab, CSE IIT Bombay.

1) Features of firebird V :

Ideal for doing research in the areas of robotics, embedded systems, artificial intelligence and sensor networks etc.



Fig. 2: firebird V

- Covers wide range of subjects like Microcontrollers, Embedded Systems, Mechatronics, Sensor Networks, Image processing
- Modular Design: Unique layered design gives versatility in design
- Powered by rechargeable 9.6V 2100mAh NiMh battery pack High performance white line sensors with the illumination modulation facility for improved performance in line grid based navigation with improved power conservation
- Up to five IR range sensors covering front half of the robot with range up to 150cm for intelligent navigation
- Supports four DC motors with position encoders
- Easy to interface with PC using wired and wireless communication
- Supports 2.4GHz Wireless ZigBee for communication with multiple robot Easy hardware integration for adds on sensors like GPS, Magnetometers, accelerometers and gyroscope.

B. Aurdino:

Arduino is a tool that makes computers to sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.



Fig. 3: Arduino

Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs

To make this project more interactive we are using LED. The LED glow will call the robot. Aurdino is used here to connect switches and LEDs.

C. Servo Motor:

It is rotary actuator used for arm. The arm is made up of three servo motors. The motor is rotating by angle of 180 degree.



Fig. 4: Servo Motor

D. Switches:

We are using switches on each table. So to call robot there will be switch on every table. Each switch is of 3volts.

E. LED:

To make the environment interactive and for decision making we are using LEDs. Each LED is of 3volts or less.

F. Battery:

To give power supply to switches and hence LED 9volt battery is used.

G. AVR Studio:

The AVR is a modified Harvard architecture 8-bit RISC single chip microcontroller which was developed by Atmel in 1996.

AVR is an Integrated Development Environment (IDE) for writing and debugging the AVR applications. It consist of Assembler and external AVR GCC Compiler that provides edit and debug in same window and hence the faster error tracking.

H. Bootloader:

It is used to load the file on the external hardware i.e. Robot. If Bootloader firmware is loaded on the microcontroller, it allows in system programming directly via serial port without any need for the external ISP programmer.

After the boot loading process is complete, newly loaded code can be executed by pressing reset. Once the code is loaded on the microcontroller UART is free and can be used for other applications. Bootloader get invoked only if boot switch is kept pressed while microcontroller is reset using reset switch. hex file can be loaded on the robot via serial port or USB port of the Fire Bird V robot. Robot is shipped with the bootloader to program robot via USB port.

V. SCOPE OF PROJECT

The main idea of this project is to use robots in place of human to reduce the human efforts and get some useful works done. It can be used as a waiter in restaurants or as a staff in hospitals or in an industry as a labor to pick objects and place it to its destination. The customer will place his; the robotic waiter receives the order form of a signal from the LED and switches. The robot moves to a defined location, turns to its left, places the order.

The robot could be design with the gripper that will pick and place the objects too. For more precision we can use the image processing also that could help to use this robot in many applications.

VI. ADVANTAGES

- Effective and efficient work as we are using robots.
- Reduces customer waiting time.
- One time investment in the system.
- Work can be faster and may reduce the cost of laboring.

VII. DISADVANTAGES

- Failure of robot may fail whole system.
- Cost of maintenance is high for robots.
- Robots need the précised values to work in the environment.

VIII. CONCLUSION

As we see the robots are increasingly becoming the part of everyday life; the use of ROBOT WAITER can be extend to various functional purposes. We have tried to implement the robot waiter from the existing appliances which could be use by elderly people or disabled people for house service.

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