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Remote controlled Waiter Robot for Restaurant Automation

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Abstract

This paper describes the design and development of a waiter robot which is considered as a possible solution to restaurant automation. The robotics technology is replacing manual work at a fast pace throughout the world. In classical café, restaurants and hotels, the customers face a lot of problems due to congestion at peak hours, unavailability of waiters and due to manual order processing. These shortcomings can be handled by using a restaurant automation system where „Waiter Robots are used for ordering food and beverages. The desired order is also transmitted on wireless network to the kitchen via menu bar. The menu bar is based on the LCD, Keypad and the Bluetooth module. The customer places the order using electronic menu bar. This order is sent to the kitchen and reception using communication network. The waiter robot then transfers food from the kitchen to the customer.[1]

Keywords: Waiter Robot, restaurant automation, Line following, Menu card.

1. INTRODUCTION

Robots are used to serve humanity. The branch of robotics that plays such a vital role is called "social robotics". Social robots in today's scenario are now communicating with human, interacting and relating to society in all aspect and are capable of understanding social terms. Due to the modernization in robotic technologies, many new designs and mechanisms are being implemented which are able to read human thoughts and understand actions. Such robots find vast applications in robotics e.g. to help out injured, sick and elder people. Theses robots are adaptive, i.e. they can be used in multi-mode as per scenario. So far, the robots are those who learn from us, but that time will not be so far when the teacher will then be learner. There is an ever rising trend in using robots in restaurants for automation .These robots can welcome guests, take orders, and serve food to customers. Designing such robots can be effective to learn advance concepts in human-robot interaction, develop new models and protocols for communication as well as use new architectures for real time path planning, guidance and control. This paper is structured as follows:

This proposed work is based on the wireless communication with help of TSOP 1738 module (Infrared Receiver Module). This proposed work t include AVR ROBOT, TSOP IR receiver, Remote, buzzer, RC-5 Decoder. TSOP sensor is designed to receive the coded infrared pulses from the transmitter and directs the function of the device. Here Coded Infrared pulses are the commands from the operator then internally these commands are served as various activity of ROBOT.

Here we are using ROBOT for mankind operations in big restaurants as waiter or as employee. This ROBOT can able to do functions like taking orders from each tables ,passing to the operator and sweep out and make clean an area after the table is empty.[2]

2. PROBLEM DEFINITION

Robots can be divided in two main types. The first one deals with the teleported robots while the second one is autonomous robots. Teleported robot is remotely controlled and guided by a human operator who views and senses the environment through the robot sensors. Whereas, the autonomous robot has multiple sensors to detect events and measure state information which is then used to apply control logic. The problem of restaurant automation deals with the design of a communication system and a waiter robot which can coordinate with rest of the players in the system.[2]

3. DESIGN OF WAITER ROBOT

The robotic technology takes the place of manual work. In manual café systems. One can witness a lot of problems. The robot waiter is an innovation and the concept can be used for restaurant automation in various fast food chains. The robot waiter works as a line following robot for which sensors are used. The project has two important parts namely the Menu Bar and the Robot itself. The robot waiter will work on the phenomenon of line following, we have used six IR sensors; the three sensors in the centre are used for line following and set the robot waiter on line. The other two sensors installed on sides are used for table counting, i.e. if the robot count one, it means that it has stopped on the first table, and if the robot count two, the robot has stopped on the second table for few seconds and so on. And third sensor present on front side of robot will detect the objects coming in path of robot.

3.1 Menu card

The menu card is based on the LCD and Keypad. The LCD is used to display the order of menu card, while the Keypad is used to select the order. The customer places the order using keypad. The same order is displayed to the kitchen using robot.

3.2 Keypad Interface:

The keypad is used for placing the order. It is a simple 4x4 keypad which is used for the selection of order. Keypad is the easiest and the cheapest way to give the commands to the instructions to an electronic system. Whenever a key is pressed on the keypad module, the Arduino Uno detects the key and shows the corresponding key on 16x2 LCD.

3.3 Lcd Interface:

We interface the LCD with keypad so that the customer can see his order. The R/W (read/write) pin of the LCD is used to display messages. Since, the LCD is used to display the order which the customer wants, we only require write mode by displaying the order to customer when he is typing keys. The LCD has 16 columns and two rows and is monochrome display. The 16x2 LCD will have total 32 characters in, 16 in 1st line and another 16 in 2nd line.

3.4 Tsop 1738:

TSOP sensor is designed to receive the coded infrared pulses from the transmitter and directs the function of the device. The TSOP 1738 is a member of IR remote control receiver series. The IR sensor module consists of a PIN diode and preamplifier which are embedded into a single package. The output of TSOP is active low and it gives +5V in off state. When IR waves from a source with a centre frequency of 38 kHz incident on it then its output goes low.

Coded pulses from the IR transmitter are amplifying by inbuilt control circuit of TSOP1738 module. A signal is generated when PIN photodiode receives the signals. This input signal is received by an automatic gain control (AGC). For a range of inputs, the output is fed back to AGC in order to adjust the gain to a suitable level. The signal from AGC is passed to a band pass filter to filter undesired frequencies. After this, the filtered signal goes to a demodulator and this demodulated output drives an NPN transistor. The collector output of the NPN transistor is obtained at pin 3 of TSOP module.

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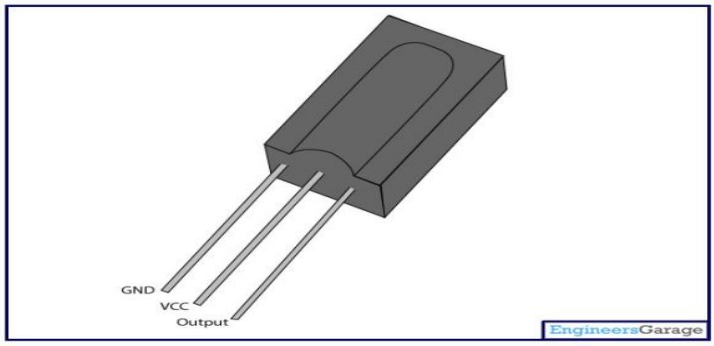


Figure 1 Tsop 1738

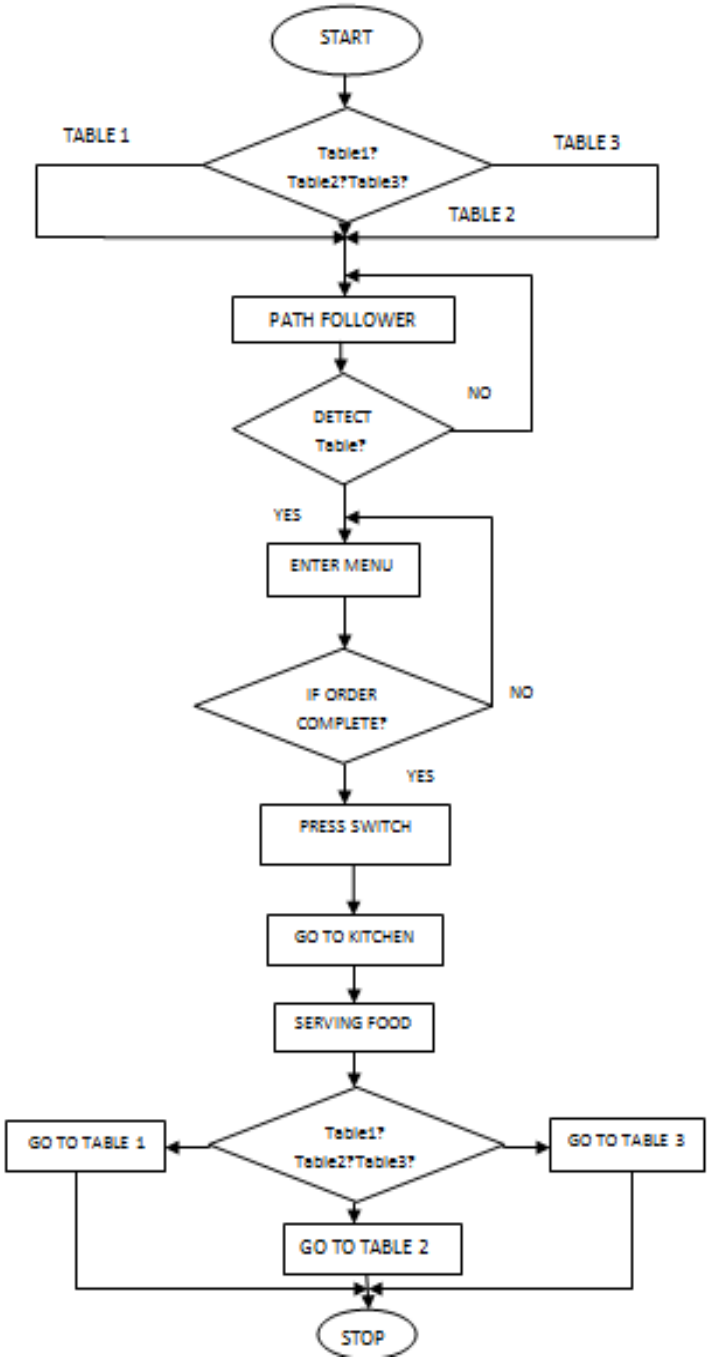
3.4.1 RC5 Decoder:

RC-5 only provides a one-way link, with information travelling from the handset to the receiving unit. The RC5 is a cost effective solution that can replace braking transistor/resistor networks in high duty cycle braking applications. The

RC5 can be sized based on the application, from continuous to intermittent. The RC5 is wired in parallel to the drive and only handles regeneration power.

4. WORKING

4.1 Flow Chart



Robot waiter will work on the phenomenon of Line following. Block diagram as shown in figure2, explain our proposed work. we have used three white line sensors and are used for line following and set the waiter robot on line, other two sharp sensors installed on sides are used for table detection. Once the robot is set on the line, now we need to give the command to waiter robot to do the work.

Figure 2 Waiter Robot Block Diagram

We have used IR remote to give the command to waiter robot. If the command is forTable1 then following operation will take place:

- **a.** Robot take the path for table1, robot will detect the table depending on two side sharp sensor values.
- **b.** Once it reach to table1 robot will stop there, and ask the customer to enter the menu.(ie message will be displayed on lcd as enter the menu)
- **c.** When customer finish the order again message will display on lcd as ,whether customer want to continue ,if no then press NO button on keypad or else continue with giving the order.
- **d.** After finishing the order, ordered menu with quantity will display on lcd after that last message is to press the switch button on waiter Robot.
- **e.** Switch button is to indicate robot that it is done with taking the order and take the path to kitchen.
- **f.** In kitchen robot will give the beep and it will display the ordered menu with quantity and it takes the ordered food and serve to the table1.
- **g.** After that waiter robot will come back to its initial position.

If the command is forTable2 then waiter robot takes the path to table2 and further steps are same as mentioned above. One more possibility is, if there is order from both the table then waiter robot starts from table1 takes the order, at the same time follow the path and takes order from table2 as well and then robot enters into kitchen, takes the food from kitchen and serve to the respective table.

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