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## The Serving Robo

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### ABSTRACT

*This article describes the design and development of a Serving Robo which is considered as a possible solution to human automation. The robo technology will replace manual work throughout the world..In cafes, restaurants, hotels, and lodges, many individuals face a lot of problems due to abundant peak hours, the inconvenience of work and due to manual order processing these imperfections can be handled by using an electronic automation system called "Serving Robo" are used for ordering food, beverages, cleaning tables etc. The order from menu bar via kitchen is broadcasted on the wireless network. The menu bar includes LCD, Keypad, and Bluetooth module. When an individual places an order using the electronic menu bar. Using communication network the order is sent to kitchen and reception. Then food is handover to the individual.*

**Keyword:** LCD, Pathfinder, IR sensor, Obstacle Sensor, Bluetooth, Arduino.

### 1. INTRODUCTION

A personal assistant allows to delegate other tasks and save time from other work. However, a personal assistant is expensive to have. So instead, it's a good idea to invest in technology that can act as a personal assistant. This technology can do the work for and simultaneously save the expense of using a real personal assistant. The Servicing Robo competition is intended to help and improve the robotic assistant field. The robo is an exceptional autonomous robo which has the ability to follow a designated path like a pathfinder with the help of IR sensor arrays and reach its intended destination. It is based on Arduino robotics design implemented to seek out and detect its required destination and perform its deliberate task with precision and accuracy. The Robo Waiter should perform the entire sequence autonomously and have the ability to make decisions based on where it is, and where it has been in the past. Additionally, there are actions that will cause the entire trial to be failed, such as hitting the refrigerator door, picking up the wrong plate, and running into the "Grandma" doll. The Robo Waiter must be robust enough to complete all of the required and optional objectives. The Robo Waiter is intended to function similar to HERMES, a robot assistant developed by Intelligent Robots Laboratory. The Robo Waiter will contain some sort of tone detection and could possibly be expanded to voice recognition. Navigation is important because the Robo Waiter will need to be able to traverse a model house without running into walls or other objects.

The Robo Waiter may be expanded to include video message recording and playback, with the possibility of video conferencing, as well as other tasks. The Robo Waiter should be designed to be expandable so it can meet all of the specifications for the competition, as well as being a true personal assistant. Many foundations for the extensions are already there, such as sound detection, and video

object detection. Modularizing and expandability are the key ideas that are being promoted with this design. This should be a robot that can complete the competition requirements in a fast and efficient manner.

## 2. PROBLEM STATEMENT

Robos can be divided into two main types. The first one deals with the tele operated robo while the second one is autonomous robo. Tele operated robo is remotely controlled and guided by a human operator who views and senses the environment through the robo sensors. Whereas, the autonomous robo has multiple sensors to detect actions and measure state information which is then used to apply control logic as shown in Figure 1.1.

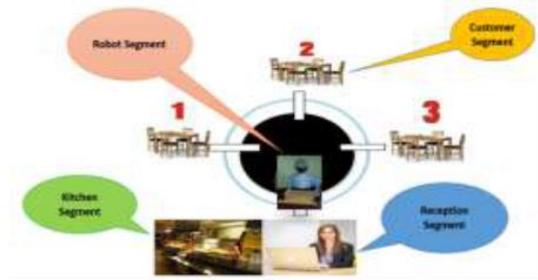


Figure: 1.1

## 3. COMMUNICATIONS NETWORK

In order to pass information between devices, a communication network is implemented. The SBC and the Master Control PIC communicate using a UART channel. The Master Control PIC sends commands to the slave PICs using a direct hard I/O and SPI for speed and easy code development. This allows the Master Control PIC to obtain vital information such as motor encoder counts, arm position, or ultrasonic information. A visual diagram of the communication network is shown in Figure 1.2.

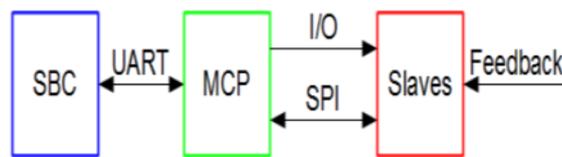


Figure: 1.2

## 4. METHODOLOGY

Android app:

User section:

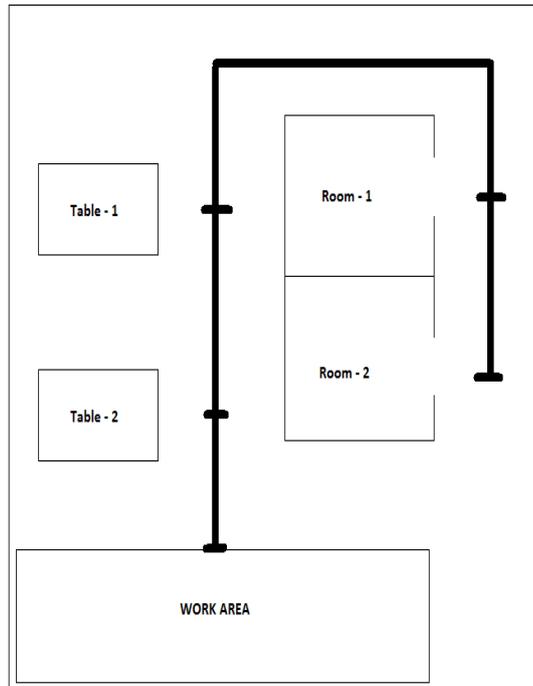
**FOOD**

|  |  |
|--|--|
| <input type="button" value="Menu -1"/> | <input type="button" value="Menu -2"/> |
| <input type="button" value="Menu -3"/> | <input type="button" value="Menu -4"/> |
| <input type="button" value="Menu -5"/> | <input type="button" value="Menu -6"/> |

**ACCOMODATION**

|  |  |
|--|--|
| <input type="button" value="Menu -1"/> | <input type="button" value="Menu -2"/> |
| <input type="button" value="Menu -3"/> | <input type="button" value="Menu -4"/> |
| <input type="button" value="Menu -5"/> | <input type="button" value="Menu -6"/> |

**Design Server:**



**ROBO REQUIREMENTS**

**Long Battery Life** - The Servicing Robo should be able to withstand for long working days and it should be available for users to for long periods of time while providing a high current output.

**Rechargeable** - The robo requires a strong rechargeable battery so that it is directly recharged than replacing.

**Quick Travel** - The Servicing Robo should be able to navigate quickly to the destination.

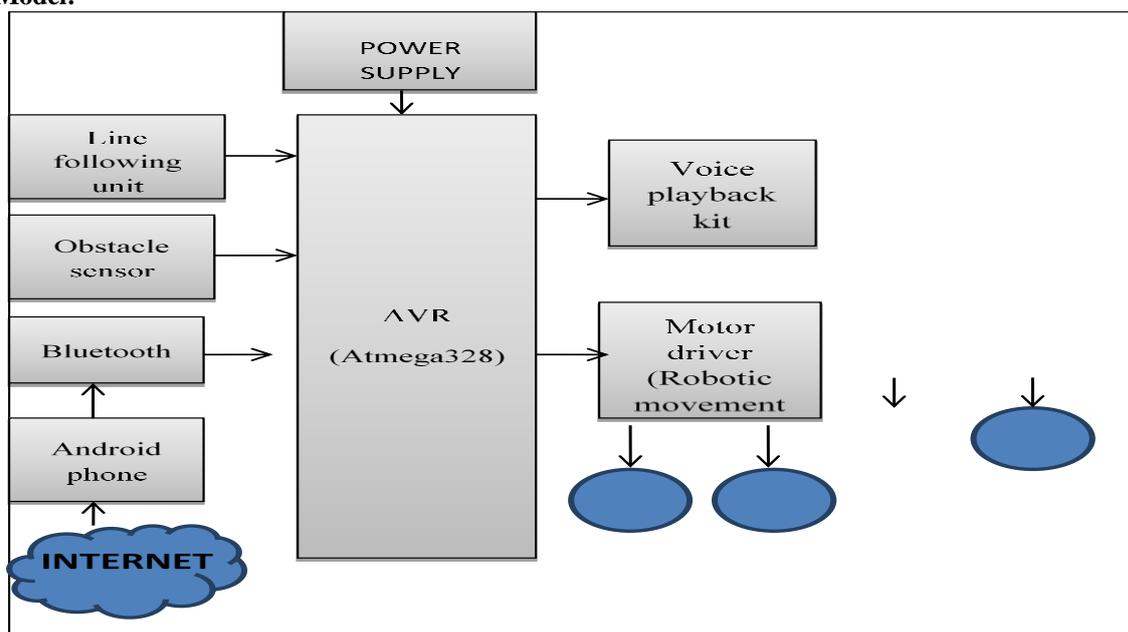
**Sound Activated** - According to the competition, the Servicing Robo should be activated by a tone. This could be expanded to have the Servicing Robo react to commands given by the individual.

**Collision Detection** - The Servicing Robo is computerized, collision detection needs to be builtin as to avoid damages in surroundings or anything it may be carrying.

**Plate Detection** - The Servicing Robo should be able to detect certain entities. In this case, it needs to detect the plate which will be transporting during the competition.

**LED Detection** - LED sensors should be used to give the Servicing Robo hint to move to certain areas.

**Working Model:**



## DESIGN OF SERVICING ROBO

The Servicing robo works as a pathline following robo for which four sensors are used. The design has two important parts namely the Menu Bar and the Robo itself.

### MENU BAR

The menu bar is based on the LCD, Keypad, and the Bluetooth module. The LCD is used to display the order of menu bar, while the Keypad is used to select the order. The customer places the order using the electronic menu bar. The order is sent to the kitchen and reception using Bluetooth.

The Servicing Robo will work on the phenomenon of pathline, it uses four IR sensors; the two sensors in the center are used for pathline and set the Servicing Robo on the path. The other two sensors installed on sides are used for table counting, i.e. if the robo count's one, it means that it has stopped at first table, and if the robo count's two, the robo has stopped at the second table for 20 seconds and so on.

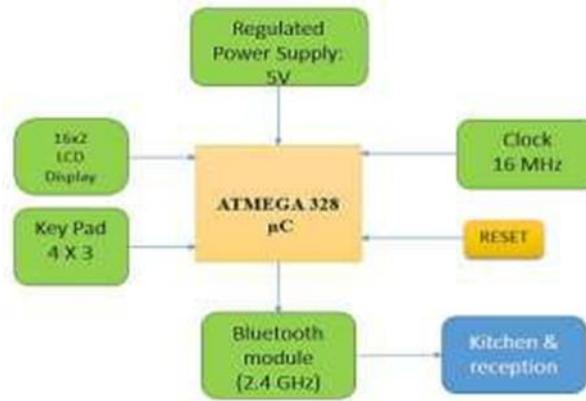


Figure: 1.3 Block Diagram of Menu Bar

### LCD INTERFACE:

The Interface of LCD with the keypad so that the customer can see their order. The R/W (read/write) mode of the LCD is used to display messages. If microcontroller sends '0' to the R/W mode then it is in "read mode" used to read characters from the LCD. However, if the microcontroller sends '1' to then it's in "write mode". As the LCD is used to display the order which the customer wants, we only require writing mode by displaying the order to the customer when they are typing.



Fig 1.4: Block Diagrams of Robo

### BLUETOOTH INTERFACE:

Bluetooth module (HC-06) contains 4 pins namely Power (Vcc), Ground (GND), Rx (receiving) and the Tx (transmitting) pin. The circuit uses crystal frequency of 16MHz for heart beat signal according to their basic requirement. The Bluetooth module is used as a wireless communication device for the communication between the Reception, kitchen and Menu Bar.

## V. HARDWARE REQUIREMENTS

### Battery and Power Supply Unit Battery:

The storage battery or secondary battery is such battery where electrical energy can be stored as chemical energy and this chemical energy is then converted to electrical energy as when required. The conversion of electrical energy into chemical energy by applying external electrical source is known as charging of the battery. Whereas conversion of chemical energy into electrical energy for supplying the external load is known as discharging of the secondary battery.

**Power supply:** Two 4V batteries are connected in series to get 8V/A.5Ah rating. The power supply is needed for all of the electronic circuits.

**CONTROLLER UNIT (ATMEGA328) ARDUINO**

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

**IR OBSTACLE SENSOR**

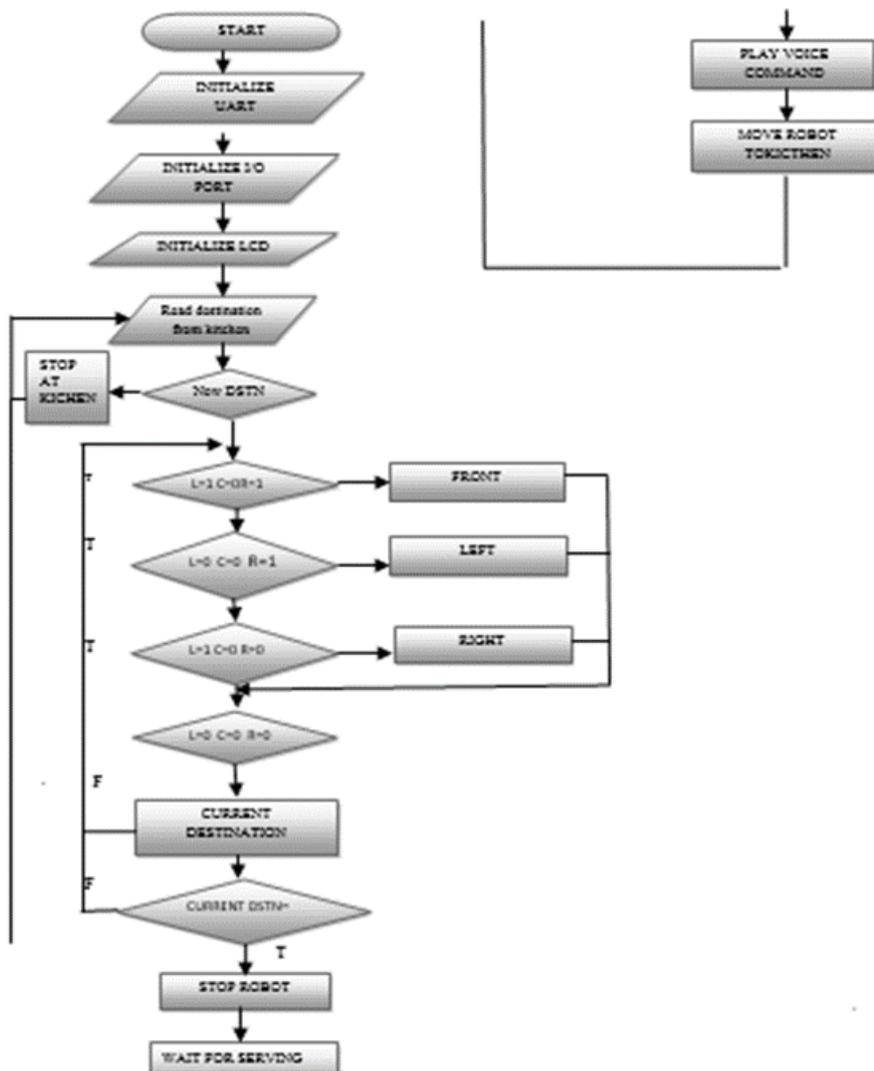
In electronics, the sensor is analogous to human’s visionary senses which can be used to detect an obstacle which is one of its common applications. In robotics, a group of such modules is used so that a robot can follow a pathline pattern.

**SOFTWARE REQUIREMENTS**

**ARDUINO IDE**

A program for Arduino may be written in any programming language for a compiler that produces binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio.

The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.



**5. CONCLUSION**

Making the best use of robo technology bring advancement to future and can be work effectively as well. The servicing robo discussed above can be very effective if rightly executed in the restaurant as well as other fields such as hospitals, offices, lodges etc. for the purpose of serving.

## 6. FUTURE ENHANCEMENT

The main idea of the Servicing Robo is to use robo in replace 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 him; the robotic waiter receives the order form of a signal from the LED and switches. The robo moves to a defined location turn to its left, places the order. The robot could be designed with the gripper that will pick and place the objects too.

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