

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

DELIVERY ROBOT WITH QR SCANNER ROBOT FOR HOME DELIVERY

PURPOSE

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ABSTRACT

Robotics and Embedded systems have always fascinated us in many ways. The robots (delivery robots) localize by sensing the obstacles encountered during its travel and changes directions accordingly. It delivers the item inside the container secured using laser beams and the delivery is completed by scanning QR code.

Keywords: QR code, delivery robots, laser secured container.

I. INTRODUCTION

Navigation is the process of controlling and monitoring the motion of the vehicle. Navigation is categorized into four different types: land navigation, aeronautic navigation, space navigation and marine navigation. Here we are dealing with land navigation. Apart from these navigations there exists another type of navigation called autonomous navigation.

Autonomous navigation is a feature that allows a mobile robot to navigate from one point to another without an intervention or involvement from a human. This navigation accentuates on the motion of robot from one place to another without the intervention of humans. Autonomous navigation requires the robot to localize, explore and map its surrounding. Robotics is closely related to AI. There is a need for robots to be intelligent enough to perform tasks like object manipulation and navigation, involving sub-problems like mapping, localization, motion planning and responding accordingly.

These systems require the agent or robot to be able to spatially recognize its surroundings, learn from and build a map of its environment, figure out how to mobilize from one point to another, and execute that movement and come into action. The study and development of systems that can recognize, interpret, process, and simulate human effects is what is the Artificial Intelligence all about. The history of Artificial Intelligence has been long. The development of AI has been through many ups and downs facing from the period of “AI Winter” till today’s date where the market value of has tremendously increased. The aim of the research is to develop ability, where the machine would be able to interpret emotions and adapt its behavior and respond accordingly and effectively.

It is implemented using QR code (Quick Response) which is a trademark name for the 2D barcode system. This code was basically invented in 1994 by Denso Wave, whose idea was to track vehicles as they were assembled, and to scan the components at high speeds in Toyota Company.

Scanner which is in the form of a camera. It scans the QR code and disables the laser sensor. QR code will be generated once the product is booked by the customer and given to the customer through mail. Laser sensor is used for security purpose; it will get activated as soon as the product is out for delivery and will get deactivated once the QR code is scanned by the robot.

II. HARDWARE IMPLEMENTATION

The pertaining procedures, algorithms and behavior of the robot can be studied and improved in variety of ways. The delivery task can be accomplished by use of these algorithms on the robot to make it mobile. A robot must navigate and reach the customer. The robot knows where the starting or beginning is and where the target is, but it does not have any information about the obstacles between the two. The robot not only reaches its destination but also delivers the ordered goods to the customer having the QR code which is in turn scanned while receiving. The

goods are kept in a laser secured container. The components used are: Arduino, motor shield, servo, 4 motors, ultrasonic sensor (HC-SR04) battery, DC supply – For the robot: Arduino uno – is the single board microcontroller used for various purposes. Motor shield – The Servo motor connected to the Motor Shield: Movement of robot head. Used for running 4 motors. Left motors are conned to M1 and M2 & right motors are connected to M3 and M4. HC-SR04 Sensor (Ultrasonic sensors): Sensing the obstacles.

Connections – VCC - +5V , GND - Arduino Ground , Trig - Arduino Analog 0 , Echo - Arduino Analog 1. LED, Laser, Photo resistor, Piezo Buzzer, Breadboards, Arduino Uno, Resistor - 10k Resistor, 220Ω Resistor for led, jumper wire. Laser – specifies the unknown threat who tries to confiscate the delivery item. Photo resistors – detect the presence an object blocking the beam. Tie buzzer –Basically, produces the alarming sound as an alert signal. Bread board –Used to make the connections. Resistors – (10-20 ohms) opposes the flow of current. LED – Used to show whether it is locked or not – Green LED is used to indicate that the lock/container is open. Red LED is used to indicate that the lock/container is closed.

Container door lock- Container, micro servo 9G, electric lock. Items are stored inside the container which is laser secured. Servo 9G is used to open the lock. This is done through set of codes. Electric lock is used to secure the container. QR code scanner- Raspberry pi, Stock web cams. Raspberry pi is used to support web cam and coding is uploaded into it. Stock web cams –These are used for high resolution captures. Here main use is to scan the QR code quickly and decode it according to the line of instructions given.

III. FLOWCHART

Laser secured system

- Breadboard is used to make the connections. One leg of photo resistor is connected to analog input 0 and other to 5v.
- 10k resistor is connected to GND and analog input 0. Buzzer to pin 9 and GND.
- LED is connected to digital input pin 6 and pin 7.
- Alligator clips are connected to the GND and to the digital input pin 4.

Flowchart for the robot

Flowchart for the robot is shown in the figure below. The robot starts for the source location and checks all its sensors. Using the ultrasonic sensor it checks if the location is the destination specified. With IR sensors it checks for the corners and edge. If yes then it reverses its coordinate system, retraces steps until history is depleted that is, until it reaches the position it had started from and ends its operation. If No then it checks for the Right if it’s open, rotates its coordinate to 90 degree clockwise records the turn. It performs same operation for Left if it is open, rotates counter clockwise and records the turn. Once no obstacle is encountered it moves straight 1 block and repeats these operation until it reaches its defined destination.

TABLE I: Values Returned by the Algorithm and Its Respective Turn

Degrees	Turns needed
0	No turn
90	Turn right
180	Turn back
270	Turn left

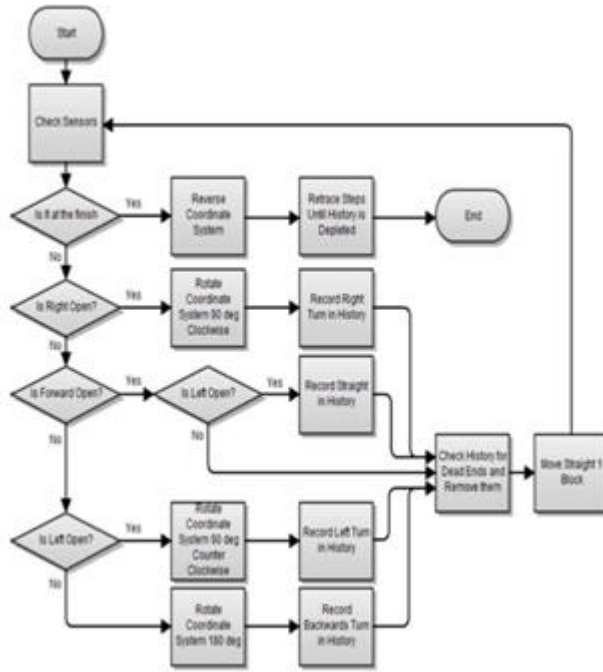


Figure 1. Flowchart for the robot

IV. SYSTEM ARCHITECTURE

The System Architecture is divided into three parts. First part is the Laser Secured container in which the object is kept. This section contains the laser, beeper, mirrors and the ordered object. This system is connected to the embedded robot. This robot has different sensors and a web cam/camera. The sensors help in navigation and cam is used to scan the QR code. The sensors used are basically infrared sensors, ultrasonic sensors wifi modules , Bluetooth modules and many more. The composition of laser system and the robot is packed all together and the robot navigates to the destination being fed into its system. Once it reaches its destination the receiver needs to show the QR code to cam fixed at the head of the robot. The robot checks for the authorization. If the authentication is valid the container opens its door and the laser is switched off and the receiver can take his/her order from the container. If any intruder or eavesdropper is encountered and if it tries to open the container or tries to steal the belongings then an alert is sent to the main station. The authorization is done through QR code sent to the receiver at the time of ordering. This is sent to the customers email account.

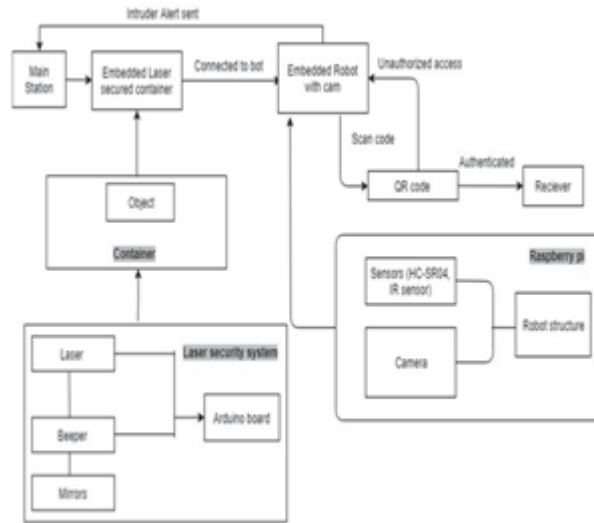


Figure 2. System Architecture

V. SOFTWARE IMPLEMENTATION

i. Code for laser system

```

sensorPin  = A0; //resistor
sensorValue = 0;
piezoPin  = 9; //buzzer
void setup()
{
  pinMode(sensorPin,INPUT)
  pinMode(7,OUTPUT)
  pinMode(6,OUTPUT)
  pinMode(piezoPin,OUTPUT)
  digitalWrite(7,HIGH);
  digitalWrite(6,LOW)
}
void loop()
{
  sensorValue=analogRead(sensorPin);
  if sensorValue<=1000
  {
    digitalWrite(piezoPin,HIGH);
    {
      tone(9,3047,400);
      noTone(8); //sound of beeper
    }
    digitalWrite(7,HIGH); //beeping of buzzer
  }
  else
  {
    digitalWrite(piezoPin,LOW);
    digitalWrite(7,LOW); //no beeping of buzzer
  }
}
    
```

```

}
sensorValue <= 1000;
}
    
```

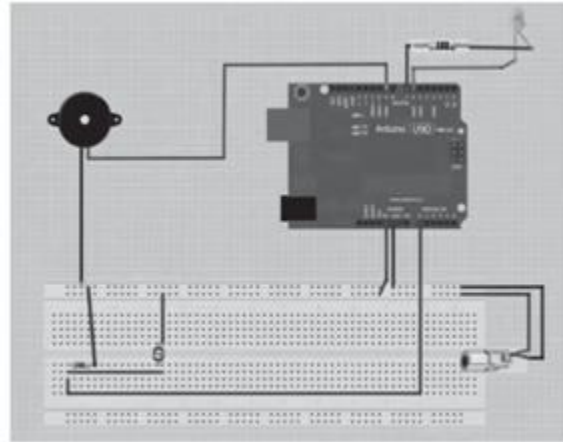


Figure 3. Circuit diagram for the laser system

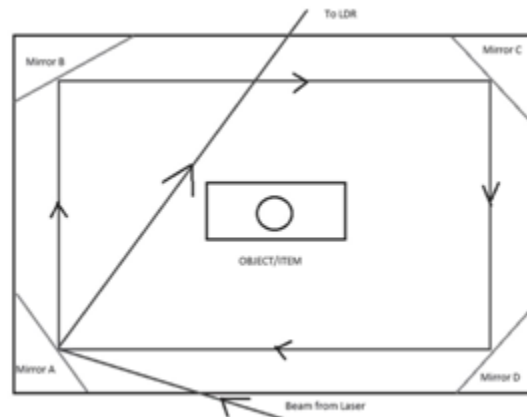


Figure 4. Anticipated system for the container

For QR code

Software required- Python ide + Java. We are sending the QR code to the mail of the customer. We are referring a site that generates QR codes. The generated QR code can be sent to the email of the customer which is provided during the order. The code is different for each order. If multiple orders are made then all orders are clubbed together and single code is sent for that particular customer.

VI. RESULTS AND EXISTING SYSTEM

The delivery robot has already been implemented in real time. The new technology that has been added is QR code implementation and the idea of implementation is taken from the room security system, where the door of the room can be open and closed using the QR code sent to the owner via email in hotel management systems. The existing system has been implemented as a food delivery robot which navigates along the sidewalks.

VII. FUTURE ASPECTS

It can be implemented on drones for more precise and faster delivery. It can avoid most of the obstacles by implementing the same on the flying drones. We can replace QR code with Password protected lock on the lock of the container containing the ordered items. The robot can be made to interact with the customer like saying “Thanks for ordering” or any other phrases .This can be achieved by using AI concept and using different modules like Bluetooth module etc.The robot can be provided with better and durable parts so as to make it more efficient. Codes can be added to allow the robot to follow traffic rules. Payments can be done through QR codes using mobile wallets that are nowadays most widely used by people. Robot can be made even smarter by connecting it to internet using wifi module. This in turn helps the robot to connect through GPS and track locations faster and in a very effective way. The containers can be secured even more using dense laser secure systems with more advanced technologies.

VIII. ADVANTAGES

The robot can perform delivery job with ease. Human labor is reduced and work efficiency is enhanced. Prevents burglary of the delivery goods. More affordable and less expensive way for delivery. Fast delivery is possible. Special equipments are not required. All one needs is to scan a QR code using camera on the cell phones. Easy to access. There is no need to provide the details/information of the person/company we are paying to or buying from. Here QR code comes into picture. The camera on the robot scans the QR code. This will identify the company or item or the person instantly to whom the email was sent. Safety is increased. Storing the payment details on the mobile phone can be tedious and vulnerable to scammers. The chances of theft and fraudulent purchases is reduced with QR codes. QR codes are quite trendy in today’s world and will be implemented even more in the future, are interesting, easy and convenient way to pay using cell phones.

IX. CONCLUSION

The **Flood Fill Algorithm (FFA)** can provide the possible path with the direction above other algorithm. The most important equipment inside the **micro mouse** is controller that must be programmed with software to ensure micro mouse making wise decisions and navigating smoothly. The **Path Finding Algorithm (PFA)** is fed with sources and destination points. Laser sensors algorithm provide security to the goods. QR code algorithm is used to generate QR code for the different products sent to the customer through mail. Finally, this robot is designed for delivery purposes with advanced security. Secured and easy delivery is possible. Has a vast scope and choice of extending the ideas to new levels.

X. ACKNOWLEDGMENT

We would like to thank Mrs. S. Usha, HOD and Professor of CSE department, RRCE for her constant support and motivation. We would also like to thank all our professors for guiding us.

REFERENCES

1. S. Krishnan, P. Sharma, Z. Guoping, O. H. Woon, "A UWB based Localization System for Indoor Robot Navigation", *IEEE International Conference Ultra-Wideband*, pp. 77-82, 2007.
2. Zhe Fu. "A Design and Realize for Micromouse’s Mazesolving", *Microcomputer Applications*.vol 9,pp59-62. 2008
3. George F Ludger "Artificial Intelligence - Structures and strategies for complex problem solving" 5th Edition, Pearson, 2009.
4. K. Zhu, K. Ong, "A reactive method for real time dynamic vehicle routing problem", *12th ICTAI*, pp. 176-180, 2000.
5. Nils J Nilsson *American Association for Artificial Intelligence* AI magazine 2005.
6. Xindong Wu, Senior Member, *IEEE "Data Mining: An AI Perspective"* vol.4 no 2 (2004)
7. Satvika Khanna et al. "Expert Systems Advances in Education" *NCCI 2010 -National Conference on Computational Instrumentation CSIO Chandigarh, INDIA, 19-20 March 2010*

8. https://en.wikipedia.org/wiki/Artificial_intelligence
9. <https://www.ted.com/topics/ai>
10. <https://github.com/adafruit/Adafruit-..>
11. <https://www.jeremyblum.com/portfolio/libetec>.