Development of Robot Navigation System

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Abstract. The development of a new indoor mobile robots navigation method is one of the emerging areas in the engineering field. The robot device consists of a tag sensor RFID, a laser range detector and a handheld platform and ultrasonic sensors. Mobile robot navigation systems are important for ensuring a more reliable and precise protection and stability of human robot activity. The device needs to be developed using the latest RFID technologies to reduce the expense and precision of current navigation systems containing more sensors to achieve the necessary characteristics. The labels have novel distinguishing pieces of proof inside the recollections, and the recollections might be perused from a few meters away. RFID labels are used as a landmark for the global route plans and as course guidance to a target, the topological relationship map showing the correlation of distributed tags to the environment is used. The robot runs automatically through range data for scanned to locate a mark, after returns to movement after next through charts of topological. A precise means of estimating the position depends on the points of interest. Windows, ventilators, walls are needed for landmarks for buildings. A topological chart with nodes that fit the moments issued for navigation. Navigation can be studied through nodes for charts of topological and ultrasonic sensor is often used where an obstruction is sensed where turning left or right.

Key words: Robotics, Navigation, Arduino.

1. Introduction

Technological progress has already been rendered simpler, quicker, advanced and simpler to use. The key goal of the technological boom is to minimize human effort. Wail Gueaieb, and Md. Suruz Miah¹ built a robotic system to express the mobile robot environments unknown without considering vision system. The arrangement offers a secluded, computationally proficient, and financially savvy option in contrast to other route methods for countless versatile robot applications, especially for administration robots, for example, in huge workplaces and mechanical production systems for automation. RFID is used to study the movement of robot and its features. Heesung Chae, Sangik Na² proposed a method through all consideration of tags of RFID for global localization incorporating detection of signal. RFID reader on robot used for verify signal from it to mobilize the robot with respect to global position. The robot is used to determine its global position and the checking predetermined global position through local position. Shi Peng³ mentioned a method to enable robot to navigate for indicated in indoor space. Kumar Yelamarthi⁴ designed an integrated navigation
system of RFID and GPS for using robots. The robots are costly, not lightweight in the current setup. The programmes expected should be cost-effective and humane. The usage of indoor robotics has risen significantly after space traffic has become a concern. Navigation networks, typically GNSS-dependent, are restricted to satellite signals in accessible areas. Another technique must be used to manage correctly whether people or machines are going to pass through buildings. In this method, the detection of the radio frequency decides the orientation indoors. There are two popular approaches in RFID positioning: (1) A approach is based on signal intensity-RSSI is used to denote the obtained signal strength as a calculation. (2) The second technique is the one I used- the RFID is put in the shape of a 3x3 matrix at some positions. Each tag has two addresses (the next locations own address+ address). Thus, the robot goes around choosing the different positions. Navigation administrations which normally rely upon restricted to be utilized in open territories with satellite signals [5-8]. On the off chance that the clients or robots are going to move in structures, other methodology utilized to explore precisely. Methodology for identifying the radiofrequency is used to decide situation inside. The gauge status can deal through two methods such as quality of signal depends, and its intensity. The position is registered with specific techniques dependent on the estimations [9-10].

2. Methodology

The Robot is created utilizing RFID based restriction without utilizing GPS collector. The RFID labels will be on the floor with fixing and the robot system will have the reader of RFID, it will be close to a tag, it will peruse the tag information. As per information got from tag, positions arrange will be assessed. The robot will be explored in a fixed way. The ultrasonic sensors will be put at either side of the robot to maintain a strategic distance from impact at dividers. The system is made by using Arduino UNO. The Arduino will receive all the data. The control will be made by using RFID.Arnduino UNO as appeared in Figure 1 is an ATmega328P microcontroller board. It has 14 advanced input/output pins. The Uno board and form 1.0 of Arduino Software were the reference renditions of Arduino, presently advanced to fresher releases as shown in Figure 2. The Figure 2 shows RFID Tag.

The Block diagram is represented below,

![Block Diagram](image_url)

Figure. 1. Line diagram of Arduino

Ultrasonic sensor is quantifies, separation item through ultrasonic sound waves and it has send and receives capacity. Ultrasonic sensor as shown in Figure 3. Sensor decides the separation an objective to estimating slips times during the sending and getting the heartbeat of ultrasonic. Modern security gadgets utilize distinctive sensor styles to recognize undesirable passage to things. The sensor exhibit involves infrared, microwave and ultrasound instruments for following moving items. Every sensor type has its own personal points of interest and detriments. In wide condos, microwave sensors are effective as microwaves travel through dielectric materials. These sensors consequently comprise of
expensive super-high-recurrence materials, and their introduction to living creatures is hurtful. Infrared sensors are very responsive, minimal effort and normally utilized. Notwithstanding, if warming frameworks are dynamic or temperature move rates arrive at a specific edge limit, these sensors may cause bogus cautions. Infra range sensors frequently lose their affectability as small bugs enter the sensor focal point. Low force use, suitable expenses and great affectability characterize ultrasound movement finder sensors. This is the reason this type of sensor is generally utilized in private, working environment and car security frameworks. There are numerous detached and dynamic components of current ultrasound sensors, which are generally intricate to deliver and dissect. Sensors additionally need an intense tuning measure.

Integrated chip is to for control motors in robots through motor driver L293 series refers to IC’s of motor driver. Prearranged robot with an arranged rundown of label ID numbers characterizing its ideal way. The objective tag of the current route stage is resolved from the arranged rundown of labels characterizing the total robot's ideal way. When the known for tag, robot looks over signs from all labels inside with ranges corresponding. At that point it records the stage points of the sign originating from the tag speaking to the objective transponder around then moment. The stage distinction of the objective label's sign is then determined. When the way's present objective is reached, the robot checks in the event that it was the last tag in the way. In the event that not, at that point the calculation passes the control back to the initial step.

Frequencies of Bands are shown in Table 1.

| S.No. | Band            | Ranges (m) | Data Speed   |
|------|-----------------|------------|--------------|
| 1    | 130-165kHz      | 0.15       | low          |
| 2    | 14MHz           | 0.15 to 1  | low to moderate |
| 3    | 2500-5900MHz    | 1-2        | high         |

Figure.2. RFID Tag

Figure.3. Ultrasonic sensor
Flowchart of Robot Navigation is shown in Figure 4.

![Flowchart](image.png)

Figure 4. Flowchart

The H-Bridge arrangement as shown in Table 2. It represents regulates the movement of motor.

| S1 | S2 | S3 | S4 | Result-Motor Status       |
|----|----|----|----|---------------------------|
| 1  | 0  | 0  | 1  | Moves to right            |
| 0  | 1  | 1  | 0  | Moves to left             |
| 0  | 0  | 0  | 0  | Runs in free              |
| 0  | 1  | 0  | 1  | Stop/Brakes               |

3. Results and Discussions
The Development of Robot Navigation System is intended to move the robot as indicated by the signs got from RFID labels. The robot framework is made out of a Radio Frequency Identification label sensor, a laser scanner and a portable stage and ultrasonic sensors. The RFID labels utilized, milestones to worldwide way arranging and the connection with topological map. It represents the association of dispersed labels using the climate is utilized as guidelines of an objective. The RFID labels are put on the floor in extraordinary spots of the structure. At the point when robots arrive at spots and study the tag, the data position is procured. The inactive labels of RFID are obtained power through electromagnetic waves. In this way, the labels are very slight, light and with ease. The flow charts are used to robot motion navigation.

4. Conclusions
Robot route framework which utilizes RFID and Ultrasonic Sensors is proposed in this system. The main part is a piece of framework is RFID framework. Accordingly the sensors such as ultrasonic, it is empower the robot to find move. Framework prepares the robot to explore round the structure and records indoor climate. With totally lesser cost when contrasted with others. This additionally utilizes
a guide for topological of the plan of structure. It makes the robot to legitimate course rapidly. This methodology is a down to earth and attainable approach to make a brilliant security robot with route function and also to use for robot system to the universe of industry to speed up and effectiveness.

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