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Design and Implementation of Anti-Collision Robot Processor Using RFID Technology

Swapnil Magar[1], Priyanka Imade[2], Dhanashri Kaginkar[3], Saurabh Pokle[4], Mr. Devanand Bathe[5]

Student, K. J. Somaiya Institute of Engineering and Information Technology, Mumbai[1,2,3,4]

Assistant Professor, K. J. Somaiya Institute of Engineering and Information Technology, Mumbai[5]

Abstract: RFID is wireless technology which operates on low power. This technology we use in our day-to-day life through various applications. Radio frequency identification technology is universally used in daily life. It is also used for robot navigation. For various industrial applications, numbers of robots working in the workplace can have chances of physical collision with each other or static objects. With RFID technology we are In such cases we have designed and implemented anti-collision robots for avoiding such crashes with the help of RFID Technology and implemented it by using Arduino. The design procedure and simulated results are useful in designing and implementing a practical system.

Keywords: Robot navigation, RFID, Arduino Uno, ultrasonic sensor.

I.INTRODUCTION

RFID is an acronym of "Radio Frequency Identification". It refers to a technology in which the digital data stored in RFID tags can be tracked by the RFID reader through radio waves. It is a method of data collection in which an object will automatically identify through low power radio waves. The RFID system consists of three components: RFID Tag, RFID Reader and an antenna. It contains an integrated circuit and antenna. RFID tags are used to transmit data to RFID readers which exist in the form of radio waves. Then the RFID reader converts the radio waves into the most usable form of data. Passive RFID tags transmit information using three types of frequencies: Low Frequency (125-134KHz), High Frequency / Near-Field frequency (13.56MHz) and Ultra High Frequency (865-960MHz). It will be scanned by the reader. Then the reader will transmit a signal to the tag which creates enough power for the chip and antenna to transfer information back to the reader. At the place, where multiple robots worked together and connected with RFID readers and tags. The signal received by tags from the reader will give information about the robots. When robots are working together there will be possibilities of physical collision of robots with each other along with the physical objects. To avoid the collision, we are using RFID technology and Ultrasonic sensor. An Ultrasonic sensor is an electronic device which calculates the distance of a targeted object by transmitting ultrasonic waves and converting the reflected ultrasonic waves into an electrical signal. It has two main components: the transmitter and the receiver. The transmitter transmits the ultrasonic waves by using piezoelectric crystals. The receiver gets the ultrasonic waves, when it will be back from the targeted object. Here we are using RFID technology to avoid static collision and ultrasonic sensors which are used to avoid dynamic collision.

II.RELATED WORK

There are a number of navigation techniques used. Few of them are commonly used techniques which is landmark based technique, vision-based technique, viz dead-reckoning based technique and behavior-based technique.[2] Estimation of direction of Arrival (DOA) of signal from transponder is improved which mentioned by myungsik kim et.at. because of this improvement robot can be able to easily control and time to time monitor of its all system and give reliable operation. In detecting motion of passive RFID tags within the range of antennas they have received a novel approach. D. Wehe, J. Borenstein, H. R. Everett and L. Feng, "Mobile robot positioning: Sensors and techniques," Robotic Systems J, volume 14, no. 4, pp. 231–249, April In 1997 in this article they presented various types of sensor and it's techniques for positioning of mobile robots. They introduce techniques and some categories for sensors. We see some examples and their results in detail. "Servicebots mobile robots in cooperative environments." In this article they implemented and design anti-collision robot processor for obstacle avoidance and also make smart robot which is able to avoid anti-collision .for proposed this system they used RFID technology which is more efficient and less power consuming and able to do speedily detecting process by using RFID Tag & which make overall system faster[2]. "Obstacle Detection and Avoidance for an Autonomous Surface Vehicle using a Profiling Sonar." in this IEEE paper they used a sonar system

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for obstacle avoidance. They design a simple processing pipeline using sonar for data returns. By using this system, they can able to detect all obstacle by varying the detection range[7].

III.PROPOSED SYSTEM

The anti-collision robot uses RFID sensors for its movements. Here Arduino uno is used to get a particular output. As the motors are connected through motor driver with Arduino. The RFID Reader is placed at the front side of the robot. When the robot is in a moving position RFID Reader sends a radio wave. Whenever any object comes in front of a robot, a radio wave is caught by objects and the information received by Arduino uno. Arduino control over the signal-based movement of motors to control on the speed of motors to avoid collision. Arduino uno is a microcontroller board which is developed by Arduino.cc this microcontroller based on microchip ATmega328p. RFID Reader is the head of the RFID system or we can say it's a main component of this system. The RFID Reader also known as interrogators. RFID Reader is used for communication with RFID tags by transmitting and receiving Radio waves. The RFID tags mainly consist of two components which are antenna and RFID chip, antenna is used for transmitting and receiving signal, and for storing Tag & apos;s id and other information we used RFID chip. RFID Reader/antenna is transmit data or information through radio wave. Ultrasonic sensor is an electronic device which calculates the distance of a target object by transmitting ultrasonic waves and converting the reflected sound into an electrical signal.

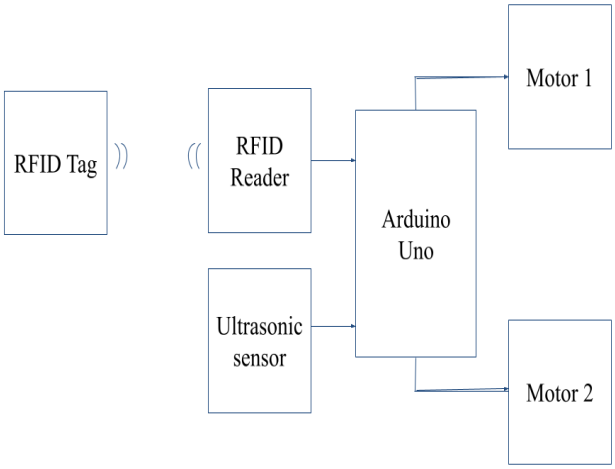

Fig.1 Block diagram

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. An RFID reader is the brain of the RFID system and is necessary for any system to function. Readers, also called interrogators, are devices that transmit and receive radio waves in order to communicate with RFID tags. An RFID tag in its most simplistic form comprises two parts – an antenna for transmitting and receiving signals, and an RFID chip (or integrated circuit, IC) which stores the tag's ID and other information. RFID tags are affixed to items in order to track them using an RFID reader and antenna. RFID tags transmit data about an item through radio waves to the antenna/reader combination. An Ultrasonic sensor is an electronic device which calculates the distance of a target object by transmitting ultrasonic waves and converting the reflected sound into an electrical signal.

IV.RESULT

RFID Reader collects information through RFID tags, used to transmit data towards the RFID Reader, when the robot is going on its desired path. When the first tag transmits its data to the reader, the reader forwards it to Arduino. Arduino sends signals towards the motor through the motor driver. With the help of that signal, both the Motors 1 and 2 started to move on their desired angles. When robots move and come in the range of the second tag and the reader gets a signal

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from the second tag, the Arduino controls the position of a robot with the help of motors by rotating them towards its desired angle and path. When the robot is powered on, both the motors of the robot will run normally and the robot moves forward. During this time, the ultrasonic sensor continuously calculates the distance between the robot and the reflective surface. This information is processed by the Arduino UNO. If the distance between the robot and the obstacle is less than 10cm, the Robot stops for 1 minutes, if the obstacle is steel detected then it repeats the process, until the obstacle is not detected then it moves forward. This process continues forever and the robot keeps on moving without hitting any object. When multiple signals come together, the Arduino gives first priority to the ultrasonic sensor and then the RFID reader.

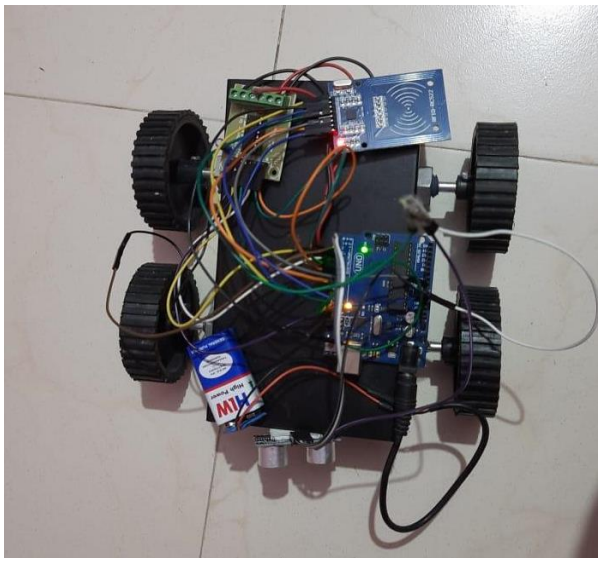

Fig.2 Top side of robot

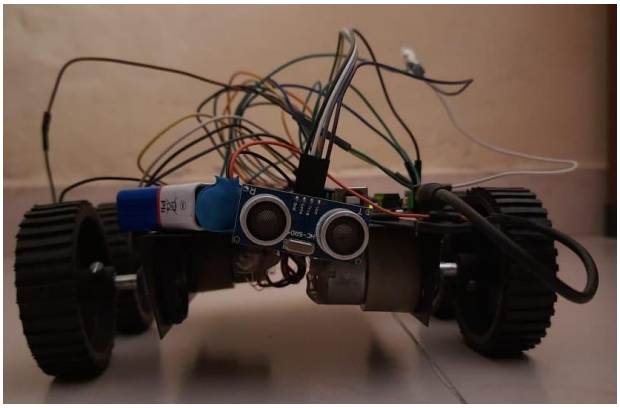

Fig.3 Front side of robot

V.CONCLUSION

In a world full of machines and instruments and robots, this anti-collision robot is designed, implemented and constructed in such a way that it avoids collisions with other robots or physical objects. In order to make it easily accessible and useful we have used the cheaper and cost-effective RFID technology to improve the performance, also the power consumption and the faster detection of tag IDs. This type of system is flexible, robust and can be used in various applications like supermarkets, warehouses, vehicles, etc.

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VIII.REFERENCES

1. C. M. & Roberts, “Radio frequency identification (RFID)”. Computers & Security, 25(1). 18–26. doi:10.1016/.2006.02.03/ISSN 0167-4048.
2. K. Beck, M. Pauly, and L. Peters, “Servicebots mobile robots in cooperative environments,” in ERCIM News, number 42, July 2000.
3. D. Wehe, J. Borenstein, H. R. Everett and L. Feng, “Mobile robot positioning: Sensors and techniques,” Robotic Systems J, volume 14, no. 4, pp. 231–249, April 1997.
4. Nak Young Chong & Myungsik Kim, “Direction Sensing RFID Reader for Mobile Robot Navigation”, IEEE Trans. Automation science and Engg., vol. 6, no. 1, january 2009.
5. Bing Jiang, Sumit Roy, Matthai Philipose and Kenneth P. Fishkin,, “Unobtrusive Long-Range Detection of Passive RFID Tag Motion”, IEEE Trans. Instrumentation and Measurement, Volume 55, No. 1, 2006 February.
6. Alberto Barcellini,Paolo Rocco, Andrea Maria Zanchettin, Luca Bascetta, Marco Raymo & Anders. “Integrating an anti-collision system based on laser Time-Of-Flight sensor in an industrial robot controller” .
7. Sukhatme, G. S. & Heidarsson, H. K. “Obstacle Detection and Avoidance for an Autonomous Surface Vehicle using a Profiling Sonar.” 2011 IEEE International Conference on Robotics and Automation. Shanghai.
8. C. A., Ryther & Madsen, O. B. “Obstacle Detection and Avoidance for Mobile Robots. Technical University of Denmark” 2009.
9. Vaghela Ankit, Vaghela Savan, Patel Jigar, “Obstacle Avoidance Robotic Vehicle Using Ultrasonic Sensor, Android And Bluetooth For Obstacle Detection” IRJET, volume A247, pp. 29-32, 2005.
10. SusmitaLopa, Muhammad Masud Tarek, FaizaTabassum, & Dr. Bilkis Jamal Ferdosi “Obstacle avoidance carGlobal Journal of Researches in Engineering: HRobotics & Nano-Tech.”