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Robot Navigation System Using RFID

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Abstract - *The paper proposes a technique in which we use radio frequency in robot assisted navigation which can be used for various purposes. In our approach RFID is used to determine the location indoors, the robot automatically moves along hallways using the scanned range data until a tag is found and then reads the unique serial number from the same tag for the next movement and this cycle continues until it reaches its final destination. We use a microcontroller (Atmega16), a RFID reader both mounted on the PCB which is further attached to the chassis along with motor drivers and wheels. The RFID tags are placed at locations pre-decided by the users. Our proposed techniques have real world applications such as intelligent navigation for wheelchairs, in nuclear power plants where the humans can be prone to many disasters.*

Key Words: **Atmega16, RFID, RFID reader, RFID tags, Robot assisted navigation.**

1. INTRODUCTION

The development in technology has always got us to find ways, easier, cheaper, advanced and easy to use. The main aim of technical boom is reducing human efforts. We thought of many ways to do so, the most effective way seems to reducing anything that takes time. Hence we designed a robot which saves human effort plus time, both parameters considered. In the existing system the robots are expensive and not compact. The systems needed now should be economically affordable and human-friendly. The use of indoor robots has drastically increased since space traffic has now become a thing.

Navigation services which usually depend on GNSS are limited to be used in open areas with satellite signals. If the users or robots are about to move in buildings, another approach must be used to navigate accurately. In our approach Radio Frequency Identification determines the location indoors. In RFID positioning there are two common methods:

1. One method is based on signal strength - We take received signal strength indication (RSSI) which presents the power of received signal as the measurement.
2. The second method is the one we used - Here the RFID is placed at certain locations in the form of a 3*3 matrix. Each tag has 2 address (own address+ address of the next location). This way the robot moves around picking up the various locations.

1.1 Existing System

In the existing system the robots are expensive and not compact. The systems needed now should be economically affordable and human-friendly. The use of indoor robots has drastically increased since space traffic has now become a thing. With the advent of RFID the indoor robots are now using technology which is cheaper as well as human friendly. To ensure safety more precise and stable bots are used which don't use the dead reckoning gyroscopes and GPS.

1.2 Drawbacks

In the existing systems the accuracy of robots is less and more number of sensors is used, hence the need for a more developed robot yet a cheaper one is required.

1.3 Proposed System

In our approach RFID is used to determine the location indoors, the robot automatically moves along hallways using the scanned range data until a tag is found and then reads the unique serial number from the same tag for the next movement and this cycle continues until it reaches its final destination. Due to advancement in the technology, every system is becoming simple and with less cost. So in order to achieve the operation we are designing the system using the new technology RFID which is very cheap and effective.

2. LITERATURE REVIEW

The classical system of mobile robots uses gyroscopes, GPS and many such dead- reckoning systems. In the present boon of technology the need of easier and cost effective systems are preferred. The robots earlier made having navigation functioning did not consider the fact that the use of robots can be made even in areas where the satellite range might not reach. Robot navigation means the robot's ability to

determine its own position in its frame of reference and then to plan a path towards some goal location. In order to navigate in its environment, the robot or any other mobility device requires representation, i.e. a map of the environment and the ability to interpret that representation. Navigation can be defined as the combination of the three fundamental competences:

1. Self-localization

2. Path planning

3. Map-building and map interpretation

The use of GPS, gyroscopes, radio frequency, etc. in navigating the robot is very effective but they come with the biggest disadvantage. The use of such bots may be limited to outdoors since there are regions underground or remotely located which can't be covered by the satellites. Thus it restricts the use of the robots. The proposed technique thus overcomes the problem of restricted area, i.e. our robot can be easily used indoors as well as outdoors. The robot designed is a prototype model; we can make further changes in it to increase the number of features and to make it more users friendly.

3. BLOCK DIAGRAM

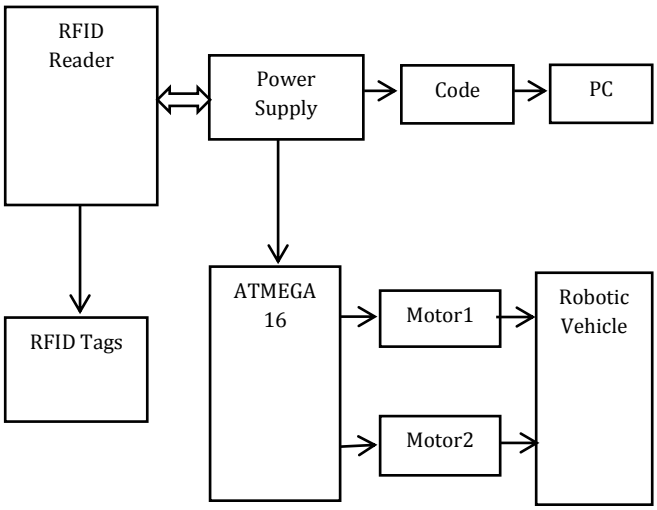

Fig -1: Block Diagram of the proposed system

3.1 Atmega16

The AVR is a modified architecture 16-bit RISC single chip microcontroller. It is one of the microcontrollers which use on-chip flash memory. It is used to store the data collected from various RFIDs, such huge data cannot be stored by normal microcontrollers.

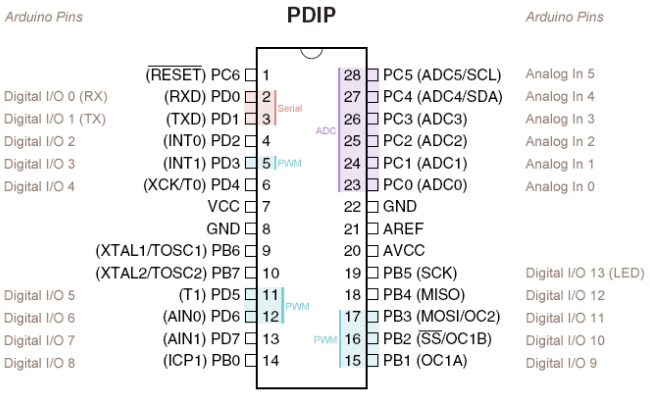

Fig -2: Pin configuration of Atmega16

3.2 DC Motor

A 30 rpm DC motor is used. The microcontroller sends a signal to the motor driver indication the direction the robot is to be moved. Along with the 2 motors 2 dummy wheels are also used to provide balance.

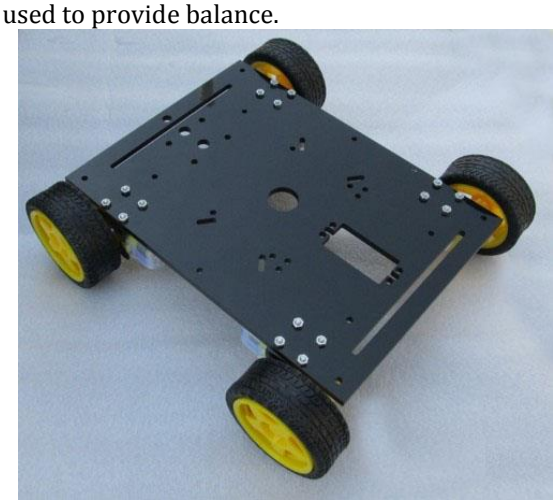

Fig -3: Base of the Robot

3.3 Battery

A 6v/1.3A battery is used initially. This is supplied to atmega8 which is the VCC pin. Before this the battery is supposed to be stepped down to 5V which drives the Atmega16.

Fig -4: Sample Battery of 6V

3.4 RFID Reader and RFID Tags

RFID (radio-frequency identification) is the wireless non-contact use of radio-frequency electromagnetic fields, for the purposes of identifying. A radio-frequency identification system uses tags, or labels attached to the objects to be identified. Two-way radio transmitter-receivers called interrogators or readers send a signal to the tag and read its response. RFID tags can be passive, active or battery-assisted passive.

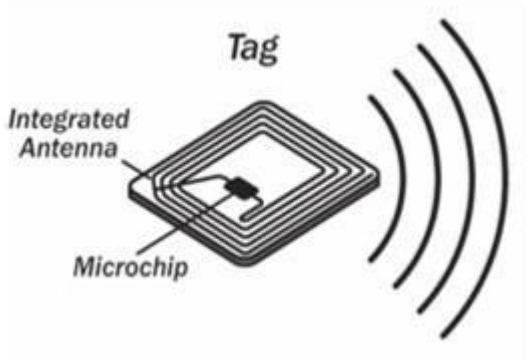

Fig -5: RFID Tag

3.5 Voltage Regulator 7805

A regulated power supply is very much essential for several electronic devices due to the semiconductor material employed in them have a fixed rate of current as well as voltage. The device may get damaged if there is any deviation from the fixed rate. The AC power supply gets converted into constant DC by this.

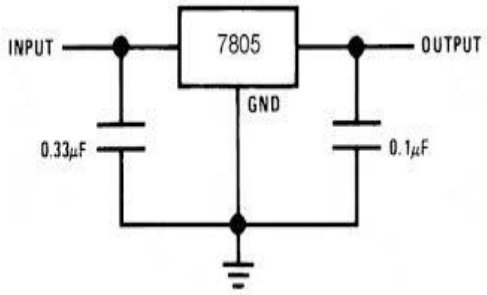

Fig -6: Circuit of Voltage Regulator

4. SUMMARY AND CONCLUSION

An automatic robot inside the building can complete many tasks efficiently. We proposed a robot system which makes the robot able to navigate around the building. Navigation based on processing some analog features of a Radio Frequency Identification (RFID) signal is a promising alternative to different types of navigation methods in the state of the art. This approach is a practical and feasible way to create a robot with navigation function. By avoiding the use of topological maps and location based on GPS major drawbacks have been avoided. By using a 3*3 matrix model, a faster and easy to use way has been implemented. As stated earlier the growth in technology is made to make more efficient systems and to reduce human efforts. Both these parameters are being fulfilled using the proposed technique. The proposed system is a prototype, by making further changes more features can be added along with improving the efficiency of the robot.

5. APPLICATIONS

1) Security and Surveillance: These robots are used for security and surveillance wherein the robot has to move around the hallways in a fixed direction / following a given route.
2) Nuclear power plant: in many cases special masks are designed to avoid human and nuclear chemicals/radiation, in spite of which there still is a high risk to human health. In this case using a robotic vehicle comes as a cheaper solution and saves human from a lot of harmful radiation.
3) Room service/Hospitals: the designed robot can also be used for room service or for replacing the staff in hospitals. This can be done by placing RFID tags outside each room or patient beds in case of hospitals and the robot can move along accordingly.
4) For the disabled: The navigation robot made can give directions to the disabled, with further development it can also help them get things or guide ways for them tracing the tags.

6. ADVANTAGES

1) Reduces human efforts
2) Cost effective
3) Indoor applications
4) Eradicate the use of satellites
5) No need of topological mapping of the area

Future scope: The proposed system is a prototype, by making further changes more features can be added along with improving the efficiency of the robot. The robot is not only used in industrial applications it can be used for many day to day purposes. One of the major applications of this project which was also a reason to design the entire system was to help visually impaired people who will definitely benefit from our robot.

REFERENCES

[1] Wail Gueaieb, An Intelligent Mobile Robot Navigation Technique Using RFID Technology, IEEE Transactions on instrumentation and measurement, Vol. 57, No. 9, September 2008

[2] S. Srilakhsmi, K. Venkata Phani Raja, A Mobile Robot Navigation System Using RFID Technology, IOSR Journal of Electronics and Communication Engineering (IOSR-JECE), Volume 4, Issue 3 (Nov. - Dec. 2012)

[3] S. Arulselvi, Robot Navigation System with RFID and Ultrasonic Sensors, Middle-East Journal of Scientific Research, IDOSI Publications, 2014

[4] T. Tsukiyama, RFID Based Navigation System for Indoor Mobile Robots, Preprints of the 18th IFAC World Congress Milano (Italy) August 28 - September 2, 2011

[5] A. Seshanka Venkatesh, K. Vamsi Krishna, N. K. R. Swamy, P. Simhachalam, Robot Navigation System with RFID and Ultrasonic Sensors, International Journal of Engineering Research & Science (IJOER), Vol-2, Issue-9, September- 2016