An Overview of RFID And Sensors Implementation Towards Smart Security Robot Navigation System

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Abstract- *Radio frequency identification (RFID) is an umbrella term for an assortment of transponder systems, including dynamic (battery fueled) and detached (without battery) labels of generally differing complexity and capabilities. This paper proposes an execution of RFID and sensors in keen security robot navigation system. Robot development is for the most part controlled by human by utilizing a remote or portable. Robot navigation implies the robot's capacity to build up its own particular position and introduction within the casing of reference. With a specific end goal to explore the earth, the robot or some other mobility device requires a spatial guide portrayal of the earth and the capacity to decipher that portrayal. The system utilize Radio Frequency Identification (RFID) labels as landmarks to assess the robot position inside the topological guide. A topological guide comparing to the genuine condition is utilized to put the RFID labels as landmarks at vital spots like entryways, corners and so forth., that aides the robot to choose the following bearing to go. The robot comes the ways and swing to one side or right course at every crossing point of the foyers. On the off chance that any snags happened it moves left else it takes after command got from tag. It can likewise recognize metals, if any metal is identified it stops. The wireless video checking and recording system display on the robot for observing and recording in indoor. In this paper the RFID innovation assumes significant part.*

Keywords- Radio frequency identification (RFID), Robot navigation system, Ultrasonic sensor and wireless camera

I. INTRODUCTION

Navigation administrations which for the most part rely upon GNSS are constrained to be utilized as a part of open zones with satellite signs. On the off chance that the clients or robots are going to move in structures, another approach must be utilized to explore precisely [1-2]. In this approach Radio Frequency Identification (RFID) is utilized to decide the situation of inside.

In RFID situating there are two normal ways to deal with appraise the position [3-4]. One strategy depends on flag quality. It takes got flag quality sign (RSSI) which displays the energy of got motion as the estimation. At that point the position is registered with specific strategies in view of the estimations. A few techniques have been contemplated, for example, RFID position fingerprinting, cell-based situating, and the way utilizing reaches to the labels figured with RSSI.
Another specific strategy to appraise the position depends on the landmarks. In the landmark-based navigation, landmarks are required to be set in the building, normally on specific entryways and corners. A topological guide with hubs relating to the landmarks is utilized to do the navigation [5]. A navigation in view of landmarks is without physical reality. For instance, navigation might be go straight till the finish of the passage, swing to one side, and stop in the wake of passing two intersections. Along these lines it is critical to make an appropriate topological guide which should express the earth superbly. There must be sufficient number of landmarks to finish the navigation without botches, so every landmark ought to be interesting in the guide, simple to recognize, and settled in legitimate places, for example, entryways or corners. With these demands this proposes an approach utilizing radio frequency identification (RFID) labels as landmarks. The RFID labels impart by means of electromagnetic waves, which mean labels can be perused without contact and effectively to recognize from the environment. The labels have one of a kind identifications inside the recollections, and the recollections might be perused from a few meters away. The RFID labels are set on the floor in uncommon spots of the building. At the point when robots achieve one of these spots and read the tag, the position data is procured. The uninvolved RFID labels pick up control from the electromagnetic waves which the peruser transmits. In this manner the labels are very thin, light and with ease.

In the building, lobbies are normally developed with two straight dividers and a few entryways on them. The foyers might be in various shapes, so it is basic to change the robot's moving bearing in time while experiencing the lobbies [6-7]. There are a few strategy examined and investigated. Sonar extend discoverers are conceivable to gauge the separation to a divider and change the moving bearing of a robot with dividers as references. The laser extend scanner can make maps of close-by objects rapidly and with legitimate determination. With deference of both effectiveness and cost, it picks ultrasonic sensors to recognize the separation between the robot and the divider and alter the course when required. It

can likewise distinguish metals, if any metal is identified it stops.

Wireless surveillance cameras are close-circuit television (CCTV) cameras that transmit a video and sound flag to a wireless recipient through a radio band [8]. Numerous wireless surveillance cameras require no less than one link or wire for control; "wireless" alludes to the transmission of video/sound. In any case, some wireless surveillance cameras are battery-controlled, making the cameras really wireless start to finish.

II. SYSTEM ANALYSIS

A. Existing System

The robot navigation strategies have been proposed in the course of recent years. These systems go under one of the accompanying categories: dead-retribution based, vision-based, landmark based and behavior-based strategies [9]. The basic thought behind dead-retribution navigation systems is the incorporation of incremental movement after some time. The dead-retribution navigation strategy is based on nonstop encoder readings that give the position, orientation, and straight and precise speeds of the robot. This kind of navigation is generally utilized because of its effortlessness and simplicity of support. Nonetheless, little exactness errors and sensor floats definitely prompt expanding aggregate errors in the robot's position and orientation, unless a free reference is intermittently used to correct the error. Given these shortcomings, scientists moved their enthusiasm to vision-based navigation to enhance the robot position estimation by following the visual highlights in the earth and utilizing them as landmarks [10-11]. This estimation for the most part returns bearing to the visual highlights just, with no from the earlier information of the landmark positions. By the by, such a system likewise has its own particular detriments, which incorporate the absence of information profundity, complex picture preparing algorithms with high computational weight, and its reliance on the working condition. Receiving behavior-based navigation systems can mitigate this issue, as they can incorporate a moderately extensive number of sensors, making them appropriate for navigation in unstructured conditions. Nonetheless, depending on various sensors makes the system powerless against their floats and combined errors. The robot navigation system is connected with some other robot navigation systems those are:

- Ultrasonic sensor based path finding.
- Human control (or) Remote control.
- Mobile robot navigation.

B. Proposed System

An inventive keen security robot navigation system utilizing RFID and sensors. Navigation based on handling some simple highlights of a RF flag is a promising other option to various kinds of navigation techniques in the cutting edge. The principle thought is to misuse the capacity of a brilliant security robot to explore from the earlier obscure situations with and without a Vision system, wireless correspondence and wireless video monitoring and recording System with building an inexact topological guide of the robot workspace, similar to the case in most other navigation algorithms. The recommended algorithm is fit for achieving an objective point in its from the earlier obscure workspace, and also following a coveted trajectory with a high exactness. The proposed arrangement offers a secluded, computationally productive and practical contrasting option to other navigation methods for countless applications, especially for benefit robots, for example, for example, in expansive workplaces and sequential construction systems. The adequacy of the proposed approach is outlined through various PC recreations considering proving grounds of different complexities.

III. LANDMARKS AND MAPS FOR NAVIGATION

A. RFID Tags as landmarks

In this approach it utilize UHF latent RFID labels, and figure 1 demonstrates the label it utilizes as landmarks. The tag has an IC with 800-bits nonvolatile memory, which finish up a 64-bit special label identification and 512-piece free memory can be perused and compose by the client. It works inside the UHF band (840-960MHz), and has a size of 62.2mm 82.5mm.The tag is joined to a thin plastic board which is glued on the floor in the building.

An interrogator is mounted on the robot. At the point when the robot moves inside the building, its course isn't sure. Therefore, when the robot is going by a tag, it can't tell which course it originates from. This demand the labels can be perused from each course. Accordingly a roundabout polarization receiving wire is utilized, which can get information ignoring the orientation.

Figure 1. RFID Tags

The RF handset transmit the RF flag to grill, at that point the label picks up control from the flag ,adjust the information, and sends back to the handset. The RF handset gets the ID number and reports it to a PC for additionally handling. Since the use of superior tag and roundabout polarization reception apparatus, the robot does not have to modify the course to peruse the labels. The robot just goes by the labels and gets their numbers.

B. Maps for navigation

According to the design highlights of a building, the entire space is isolated into various rooms and lobbies The doors and crossing point of passages are important spots for a robot, at which the robot must do the decision to go straight, turn left, turn right or stop in the event that it is the goal. In reality, the entire development of a robot is to go by these important places and do the decision legitimately from the begin till the end. It can take going by the specific places as turning points, and the navigation of a robot is to complete arrangement of breakthroughs. In this manner a guide is required for choosing the order to achieve the breakthroughs. Figure 2(a) demonstrates a commonplace element of a building. The letters a, b, c, d, e, f, g, h mean the doors, corner or the convergence of corridors. Figure 2(b) is the topological guide which demonstrates the relationship of these spots. The hubs a-h corresponds to the exceptional places as a general rule. The edge of the diagram demonstrates the conceivable path starting with one place then onto the next. At that point the course from the begin to the goal can be immediately overseen.

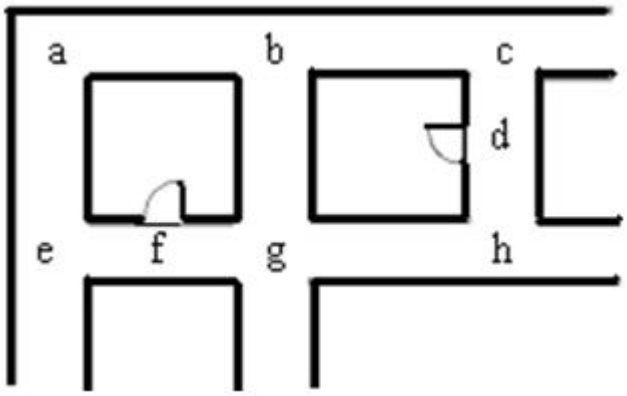


Figure 2(a). Feature of Typical Building

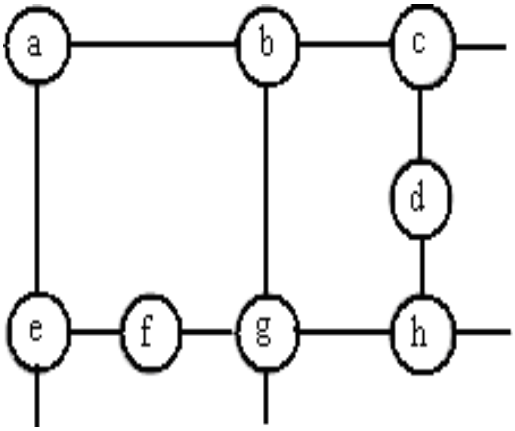
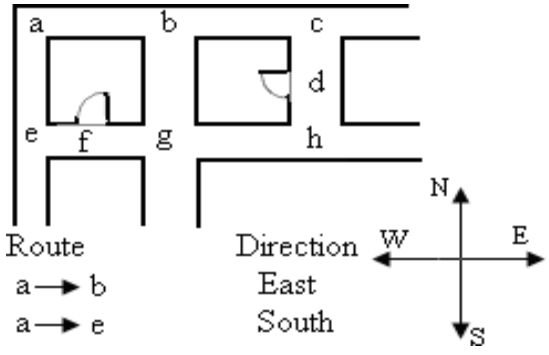


Figure 2(b). Topological Graph of Places

To check the exceptional spots it utilizes RFID labels glued in the focal point of the course at the specified spots. Figure 3shows the robot is going to move into the detecting zone. When it distinguished the tag and get its extraordinary ID, PC inside the robot will make sense of where the robot is. With the topological guide the robot will discover the following hub to go on the course. Since the robot may get to each place toward each path, "turn left or right" orders don't appear to work alright. Therefore, it utilizes headings as North (N), South (S), East (E), West (W) for robot development control. We should first allot headings when making a guide as Figure 4. With the topological guide and the bearings, the aggregate course of robot is anything but difficult to set up.

Figure 3. Tags at Important Places



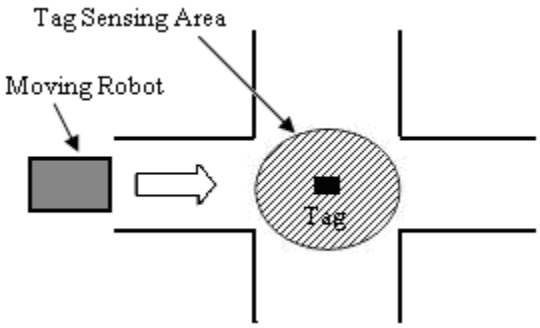


Figure 4. A Map with Compass Direction

IV. ROBOT SYSTEM

The robot is comprising of the mechanical section, a PC, a RFID peruser and a recieving wire, and ultrasonic sensors. The mechanical part is a platform with haggles which is controlled by the microcontroller. The RFID interrogator is associated with the PC by means of RS-232 serial port. The ultrasonic sensors are connected to the sides of the robot and used to quantify the separation to dividers. Since the zone where labels can be identified at crossing points is very substantial, the robot needs to utilize ultrasonic sensors to decide when to turn without crash to the divider as in Figure 5. And the sensors will keep robot out of impact when the foyer isn't straight.

The PC is accountable for preparing the information from the RFID interrogator and ultrasonic sensors by means of serial ports and sending orders to the microcontroller to affect on the development of the robot.

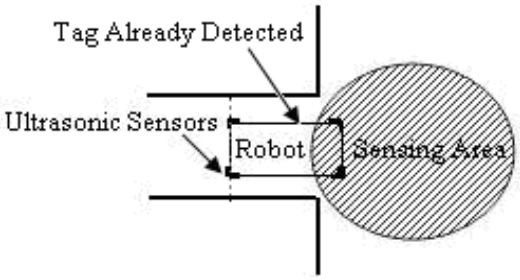


Figure 5(a). Robot cannot turn

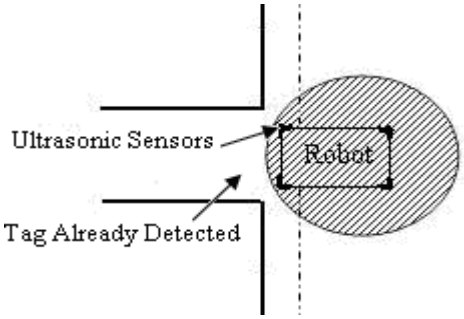


Figure 5(b). Robot can turn without collision

Figure 6 demonstrates the steady of the navigation system executed on the PC, and figure 7 shows the navigation procedure. The robot can begin from a random place in the building and explore from where the main tag is identified. The ultrasonic sensor is enacted each a couple of moments to quantify the separation to the divider. In the event that a crash is anticipated, the moving heading will be changed.

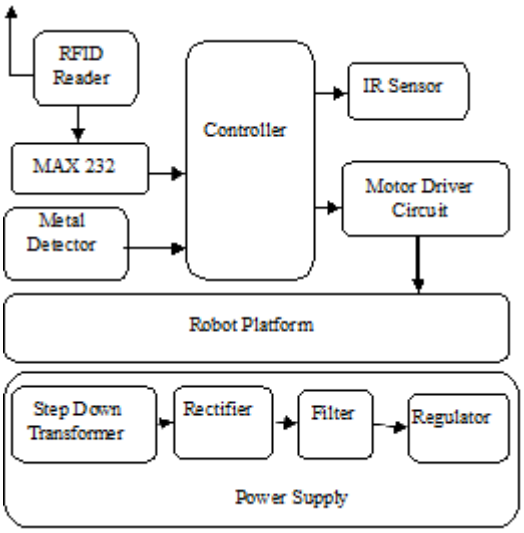


Figure 6. Block Diagram of Navigation System

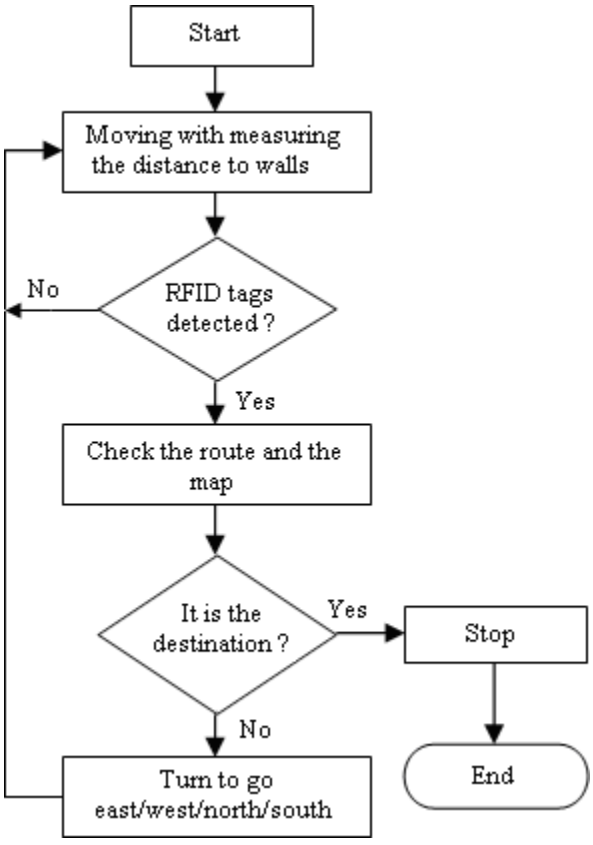


Figure 7. Flow Chart for Navigation Process

V. WIRELESS VIDEO MONITORING & RECORDING SYSTEM

Wireless security cameras are close-circuit television (CCTV) cameras that transmit a video and sound flag to a wireless beneficiary through a radio band [12]. Numerous wireless security cameras require no less than one link or wire for control; "wireless" alludes to the transmission of video/sound. Be that as it may, some wireless security cameras are battery-fueled, making the cameras genuinely wireless through and through. Wireless cameras are demonstrating extremely well known among current security customers because of their low establishment costs (there is no compelling reason to run costly video expansion links) and adaptable mounting alternatives [13]. Wireless cameras can be mounted/introduced in areas beforehand inaccessible to standard wired cameras. Notwithstanding the usability and comfort of access, wireless security camera enables clients to use broadband wireless web to give consistent video spilling over-web.

VI. CONCLUSION

A novel RFID based robot navigation system is proposed in this paper. This system makes the robot ready to explore around the building and records in indoor condition. The core some portion of the system is the RFID system and the ultrasonic sensors, which empower the robot to find itself and move without botches. This likewise utilizes a topological guide of the building design, which makes the robot to appropriate course rapidly. This paper conveys another item to the world of industry to expand speed and productivity. This approach is a reasonable and doable approach to make a savvy security robot with navigation work. For future augmentation of this paper the robot may utilize distinctive materials to its planning procedure, based on various useful activities of it. It can May likewise utilize more no of IR sensors to maintain a strategic distance from snags from various sides. And additionally the robot may build RFID ranges.

REFERENCES

[1] L. Armesto, J. Tornero “Automation of Industrial Vehicles: A Vision-based Line Tracking Application” IEEE Conference on Emerging Technologies & Factory Automation, 2009, pp 1-7.

[2] L. Kneip, F. Tache and et al. Characterization of the compact Hokyo URG-04LX 2D laser range scanner Proc. of IEEE Int. Cof. On Robotics and Automation pp.1447-1454, 2009.

[3] O. Kubitz, M. O. Berger, and et al. Application of Radio Frequency Identification Devices to Support Navigation of Autonomous Mobile Robots Proc. of IEEE Conf. On Vehicular Technology Vol. 1, pp. 126-130, 1997.

[4] C.P.Urmson, M.B.Dias and R.G.Simoms Stereo Vision Based Navigation for Sun-Synctoonous Exploration Proc. of IROS, pp. 805-810, 2002.

[5] M. Ogaz, R. Sandoval and M. Chacon Data Processing from a Laser Range Finder Sensor for the Construction of Geometric Maps of an Indoor Environment Proc. of IEEE 52nd Midwest Symposium on Circuits and Systems pp. 306-313, 2009.

[6] I. Hallmann and B. Siemiatkowska, ―Artificial landmark navigationsystem,‖in Proc. Int. Symp. Intell. Robot. Syst., Jul. 2001, pp. 219–228.

[7] A.K.Ray, M.Gupta, and et al. Sonar Based Autonomous Automatic Guided Vehicl (AGV) Navigation Proc.

[8] Of IEEE Int. Conf. on System of Systems Engineering pp.1-8, 2008

[9] Emily M. Harwoo. Digital CCTV: A Security Professional's GuideVision Based Autonomous Robot Navigation Algorithms and Implementations,authors:Amitava Chatterjee, Anjan Rakshit, N. Nirmal Singh. ISBN: 978-3-642-33964-6 (Print) 978-3-642-33965-3 (Online)

[10] A.K.Ray, M.Gupta, and et al. Sonar Based Autonomous Automatic Guided Vehicl (AGV) Navigation Proc.
Of IEEE Int. Conf. on System of Systems Engineering pp.1-8, 2008

[11] Emily M. Harwoo. Digital CCTV: A Security Professional's Guide

[12] Home security camera:select the best for yout home”. Home Security Source. 31 October 2010. Retrieved 11 March 2012.

[13] “wi-fi range dynamics”.xirrus.2006. Retrieved 11 March 2012.