RFID and Wireless Sensor Networks – An Integrated hybrid System

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Abstract: RFID (Radio recurrence distinguishing proof) and WSN (Wireless sensor systems) are two remote innovations that have ascended to noticeable quality over the previous decade and have wide assortment of uses in present and future frameworks. RFID helps discovery and object identification. Whereas WSN is used to monitor environmental condition remotely using multi-hop communication. Thus, integration of both the technologies may lead to growth their general usefulness and limit. This paper will focus on WSN and RFID technologies, their applications, integration of both the technologies and applications of hybrid system.

Keywords: RFID, WSN, Reader, Tag, Read Range.

I. INTRODUCTION

In the field of wireless communication two technologies exists, RFID and WSN (wireless sensor networks) are two valuable innovations that have a wide scope of utilizations. In RFID applications incorporate production network the executives and assembling, in remote sensor arranges the innovation has been connected in sending sensor bits to screen air contamination [1] and war zone reconnaissance [2]. The development of these technologies have to a great extent have parallel been done, in this manner there has not been much research in coordinating these two innovations [3]. A RFID framework would comprise of a RFID label reader and RFID labels [3], the capacity of the reader is utilize its radio handset to transmit an encoded sign and tune in on a specific recurrence for sign from a RFID tag [4]. Contingent upon the sort of RFID framework being executed the RFID tag may intermittently transmit a radio recurrence signal which may contain the labels ID or data about the article the tag is appended to. The RFID framework can distinguish singular articles inside a situation anyway it is unfit to give a sign of the physical state of that item or whether nature is appropriate for the item, this is the place remote detecting innovation can be utilized. A regular remote sensor arrange is included sensor bits outfitted with remote correspondences equipment [1], sensors to identify changes in its condition and a portal gadget [5] it works as a connection link between impromptu system of sensor bits and customary registering gadgets, for example, personal computers on a system [5]. Clients are then ready to question or screen the status of the earth wherein the sensor bits are in.

Current remote sensor ideal models don't take into account the identification and situating of an item inside a domain [6] just as giving a sign concerning whether that condition is appropriate for the article to be in. A framework which can give such data can be exceptionally helpful to mining industry

- Supply chain management
- Smart cities projects
- Healthcare

The focal point of this exploration is to build up a stage which underpins remote sensor bits that can recognize and find

questions inside a situation and to give data on whether the natural conditions are appropriate for the item to be in.

A remote sensor organize comprises of numerous segments, they can be either physical equipment or Software which works the equipment. The accompanying chart indicates how the physical equipment of an average remote sensor organize are associated. The three primary parts of a remote sensor arrange include:

- Sensor node
- Gateway
- Middleware

II. SENSOR MOTE

The sensor node lies at the center of the remote sensor organize. Its essential capacity is to peruse different parameters of nature in which it is in [5], contingent upon the sort of sensors it is outfitted with.
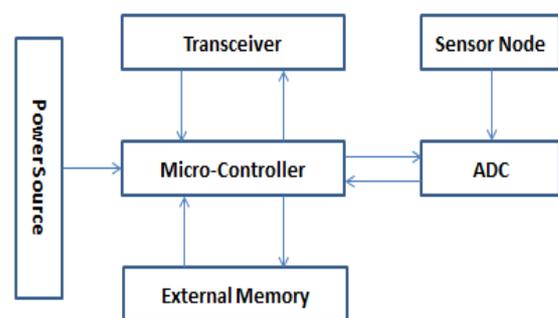

Figure 2. WSN node structure

III. GATEWAY DEVICE

The door gadget in a remote sensor arrange is the association between the sensor bits and customary PC systems [7]. This is required because of the distinctions in interchanges conventions utilized by the sensor system and PC systems [8].

The entryway gadget would regularly get sensor information from the sensor bits in the system remotely then programming running on the passage called the middleware would store the

sensor information in a database and perform handling on it and afterward spread the information to gadgets mentioning it.

IV. MIDDLEWARE

The middleware capacities as an entrance to the sensor system and its information [9], the sensor information moves toward becoming organized with the goal that it ends up more clear [9]. Fundamental examples inside the sensor information can likewise be acknowledged by utilizing information mining procedures. The client mentioning the sensor information would get to the entryway through an internet browser or by utilizing a local programming application on gadgets, for example, PCs and cell phones.

V. RADIO FREQUENCY IDENTIFICATION

The abbreviation RFID represents Radio Frequency Identification, the innovation has been around throughout the previous seventy years [10], however as of late has there been huge scale appropriation. RFID innovation considers the identification of items by methods for utilizing electronic circuits inside a RFID label which might be appended to an article which transmit a novel code to a RFID reader. This innovation is like that of utilizing standardized identifications and a standardized tag scanner in its capacity [2], there are anyway a few points of interest over utilizing customary standardized tags to distinguish an article; viewable pathway isn't required to recognize an item and label location run is up to 12 meters relying upon the tag-reader framework.
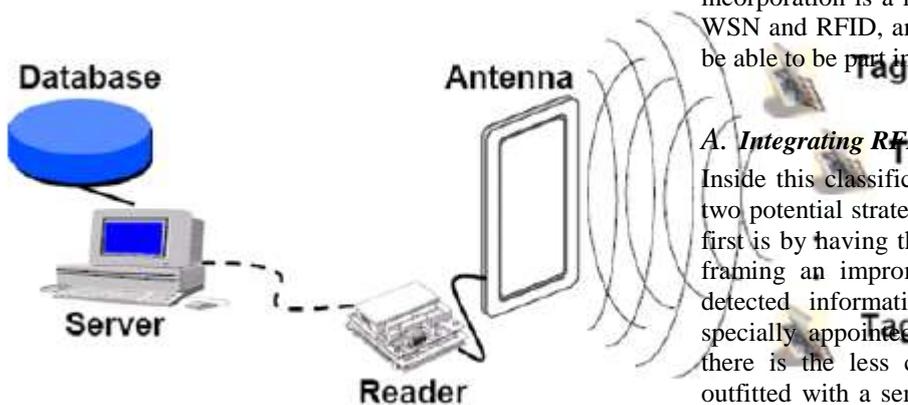
VI. TYPES OF RFID TAGS

In RFID the innovation can be separated into two classifications; Active and Passive. The dynamic kind of RFID tag is what utilizes an outside power source, for example, a battery to control its radio to speak with a RFID reader. The uninvolved RFID tag does not contain its own capacity source, it utilizes vitality given by the RFID reader when it is investigated by methods for electromagnetic acceptance [11]. The recurrence ranges at which RFID labels and readers work extend from 128 KHz to 5.8 GHz, the dynamic labels would normally work at the 2.4 GHz recurrence band while aloof labels work at under 100 MHz [10].

VII. TYPES OF RFID READERS

RFID reader innovation can be partitioned into three classifications isolated by the working recurrence band, with each being fit to various applications as radio waves perform contrastingly dependent on the recurrence. The recurrence groups utilized by RFID readers are;

Low frequency RFID - The LF RFID works in the 30KHz to 300KHz with label discovery scopes of up to 10cm .

High frequency RFID - HF RFID is most usually utilized in installment applications where a label discovery scope of more than 10cm is required. The recurrence band utilized is 3MHz to 30MHz .

Ultrahigh frequency RFID - UHF RFID readers is as of now the quickest developing of the 3 RFID recurrence types, this is because of the lower cost of assembling of latent UHF RFID labels. The UHF type is the one most defenseless to obstruction, this is because of the high recurrence band of 300MHz to 3GHz. Label discovery run is up to 12m .

VIII. RFID AND WSN INTEGRATION

Integrating RFID innovation with remote sensor systems is expedited by the need to amplify the value of the advancements as joined they take into consideration another point of view on potential applications in reality rather than scholarly research ventures. The exploration done on incorporation is a moderately new field when contrasted with WSN and RFID, anyway procedures of joining would already be able to be part into classifications.

A. Integrating RFID tags with sensors

Inside this classification of coordination procedures there are two potential strategies in which the sensor labels impart. The first is by having the sensor labels speak with one another by framing an impromptu remote system and handing-off the detected information and Identification code through the specially appointed system to a RFID reader. At that point there is the less complex setup, which is the RFID label outfitted with a sensor and having the information just being imparted while it is being investigated by a RFID reader.

B. Integrating Wireless sensor motes with RFID readers

A substitute way to deal with sensor labels is to consolidate RFID readers onto remote sensor bits, by doing this we beat the most concerning issues of RFID innovation; the aloof idea of RFID, this means one can't effectively scan for the area of a RFID tag. An individual would commonly need to move the RFID reader to examine questions so as to locate a Specific one.

In the design of incorporating a RFID reader to a remote sensor bit the RFID label recognition go is successfully reached out as the labels can be perused from a remote area by means of the remote sensor organize.

IX. CONCLUSION

The utilization of semi-passive or Active RFID with WSN has a promising future since reade range turns out to be a lot bigger. The work exhibited in this paper is a commitment to the improvement of the incorporation of RFID and WSN innovations utilizing half breed astute choice emotionally supportive networks to expand recognizable proof, following and detecting abilities required for smart observing of exercises and communication backing to individuals in crisis reaction while clearing after peril event. These two advancements broaden the entrance of inescapable figuring in each area of setting mindful condition decreasing the limits of casual information and procedures to reflect ongoing circumstances and quick basic leadership. The proposed reasonable system exhibits that incorporated RFID– WSNs combined with the utilization of homogeneous and heterogeneous keen gadgets coordinating readers can expand the strength, the precision and dependability of information in the canny checking of savvy structures.

REFERENCES

[1]   P. Baronti, P. Pillai, V. W. Chook, S. Chessa, A. Gotta, and Y. F.Hu, "Wireless sensor networks: A survey on the state of the art and the 802.15.4 and ZigBee standards," Computer Communications, vol. 30, no. 7, pp. 1655-1695, May 2007.

[2]   L. J. Celentano, "RFID-Assisted Wireless Sensor Networks for Cardiac Tele-healthcare," 2007.

[3]   H. Liu and M. Bolic, "Integration of RFID and wireless sensor networks," Proceedings of Sense ID, pp. 1-6, 2007.

[4]   L. Ho, M. Moh, Z. Walker, T. Hamada, and C. Su, "A prototype on RFID and sensor networks for elder healthcare: progress report,"network design and analysis", pp. 70-75, 2005.

[5]   L. Ruiz-Garcia, L. Lunadei, P. Barreiro, and J. I. Robla, "A review of wireless sensor technologies and applications in agriculture and food industry: state of the art and current trends." Sensors (Basel, Switzerland), vol. 9, no. 6, pp. 4728{50, Jan. 2009.

[6]   A. Mitrokotsa and C. Douligeris, "Integrated RFID and Sensor Networks Architectures and," pp. 511-536, 2009.

[7]   P. Song, C. Chen, K. Li, and L. Sui, "The Design and Realization of Embedded Gateway Based on WSN," 2008 International Conference on Computer Science and Software Engineering, pp. 32-36, 2008.

[8]   D.-f. Ye, L.-l. Min, and W. Wang, "Design and Implementation of Wireless Sensor Network Gateway Based on Environmental Monitoring," 2009 International Conference on Environmental Science and Information Application Technology, pp. 289-292, Jul. 2009.

[9]   I. Chatzigiannakis, G. Mylonas, and S. Nikoletseas, "50 ways to build your application: A survey of middleware and systems for Wireless Sensor Networks," 2007 IEEE Conference on Emerging Technologies & Factory Automation (EFTA 2007), pp. 466-473, Sep. 2007.

[10] K. Bailey and B. Wiebe, "SensorFusion: Localization and Tracking of Sensors Using RFID," 2007

[11] R. Want, "The magic of RFID," Queue, no. October, 2004 Christoph Jechlitschek, "A Survey Paper on Radio Frequency IDentification (RFID) Trends", Radio Frequency IDentification - RFID, pp. 1-6,2010.

[12] Nandita Srivastava, "RFID Introduction, Present and Future applications and Security Implications", pp. 1-10.

[13] Mukhdeep Singh Manshahia, "Wireless Sensor Networks: A Survey", International Journal of Scientific & Engineering Research, Volume 7, Issue 4, April-2016.

[14] Yasaroglu Pinar , Abduljabbar Zuhair , Alotaibi Hamad , Akcam Resit , Kadavarthi Shiva , Abuzaghleh Omar, "Wireless Sensor Networks (WSNs)", 2016 IEEE Long Island Systems, Applications and Technology Conference (LISAT), 2016.

[15] Vidyasagar Potdar, Atif Sharif, Elizabeth Chang, "Wireless Sensor Networks: A Survey", 2009 International Conference on Advanced Information Networking and Applications Workshops, pp. 636-41, 2009.

[16] SobhiMejjaouliaRadu F.Babiceanu, "RFID-wireless sensor networks integration: Decision models and optimization of logistics systems operations", Journal of Manufacturing Systems Volume 35, pp. 234-245, 2015

[17] Harish G, M.Z.Kurian, "Integration Of Rfid And Wsn Via Wire", International Journal of Advances in Electronics and Computer Science, ISSN: 2393-2835 Volume-2, Issue-8, pp. 111-114, Aug.-2015

[18] Davinder Parkash, Twinkle Kundu,Preet Kaur, "THE RFID TECHNOLOGY AND ITS APPLICATIONS: A REVIEW", International Journal of Electronics, Communication & Instrumentation Engineering Research and Development Vol.2, Issue 3, pp. 109-120, Sep 2012 .