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Concept Adapting for Integration of RFID and WSN with Data cleaning

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ABSTRACT: Radio Frequency Identification (RFID) and Wireless Sensor Network (WSN) are most important wireless technologies which provide wide variety of applications and gives limitless future potentials. Integration of RFID and wireless sensor networks has given attention from research community. For the integration of WSN and RFID, one of the critical issues is the low efficiency of communication due to redundant data as redundant data increases energy consumption and causes time delay. Hence there arises a need of comprehensive algorithm to deal with the redundant data from multiple readers appropriately. To address it, an improved data cleaning algorithm needs to be identified for its feasibility and effectiveness which has to be verified via simulation. This concept will illustrate the capacity of the architecture under consideration and data cleaning algorithm along with its application. The appearance of new RFID chipsets from several companies (e.g. Intel) will reduce the price of RFID readers in UHF (Ultra high frequency) range in future. Accordingly we intend to deploy a cost effective public vehicle tracking system by the integration of WSN (using suitable network topology), RFID and GSM (Global System for Mobile Communication) module with selection of suitable data cleaning algorithm. The public vehicle occupancy would optimize by providing reliable public vehicle arriving information to the passengers at specified stops with faster communication as application. We envision that integration of RFID and WSN with improved data cleaning algorithm will open a large number of applications in which it is important to sense environmental conditions and to obtain additional information about the surrounding objects.

KEYWORDS: RFID reader, GSM, RFID Tag.

I. INTRODUCTION

Radio-frequency identification (RFID) is an automatic identification method, relying on remotely retrieving data using devices called transponders or RFID tags. The technology requires some extent of cooperation of an RFID reader and an RFID tag. An object can be applied to a product, called RFID tag that person or animal for the purpose of identification and tracking using radio waves. Some tags can be read from meters away and beyond the line of sight of the reader. The RFID has come up as emerging technology; A RFID system has several main components which include tags, antennas and readers. This set up can be used either in high frequency or ultra-high frequency. In 1946, Leon Theremin invented a toll for the Soviet Union which retransmitted radio waves with some audio information attached to it. Though it was not an identification device it can be considered a predecessor to the RFID technology. The IFF transponder was used by United Kingdom in 1939 which was then used for identifying planes as an ally plane or enemy plane as early in 19th century in World War II. The transponder of this kind is still used in today's aircrafts wherein the transmission and receiving of waves is used. The patent from Mario Candolle's in 1973 which talks about a passive radio transponder attached to a memory was the true ancestor of modern RFID. [02]
Paper is organized as follows. Section II describes literature in Section III. Problem analysis Section IV presents Implementation of concept of data cleaning with integration of RFID and WSN networkSection V having Analysis of result Finally, Section VI presents conclusion.

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II. LITERATURE SURVEY

A. RFIDs and WSNs

Distributed planning and scheduling of large-scale systems growing demands, computing resources tend to be ubiquitous, distributed largely, andembedded in their physical environments tightly. WSNs are attractive in many embedded system applications mainly because they do not need wired connections for communication. On other hand, RFIDs are used in a wide range of industrial fields, such as factory automation, distributed and process control, traceability management, supply chain management, real-time monitoring of health, and radiation check.The exploitation in industrial applications is expected to increase significantly in near future, especially in the fields of logistics, automation, and control. This positive trend should also be stimulated by the applications of new industrial standards such as GSM. The next revolution in computing technology is the widespread use of small wireless computing and communication devices that will integrate seamlessly into our daily lives. Integrated open-loop services infrastructure and RFID and then applied it to the blood management and traceability system. Used RFID technologies for the collection and sharing of data in a warehouse. Investigated a RFID and aWSN with Zigbee electronic labels were attached to sensors to integrate the RFID with the WSN. Their systems were developed to monitor the quality of agricultural products. Applied the WSN in the supply chain so that project stakeholders can obtain real-time data for their decision making. [01]

B. Challenges in Integration of RFIDs and WSNs

RFID and WSNs represent two complementary technologies. RFID is widely used to identify, detect, or monitor objects. In comparison with other types of sensors, the low cost the superior advantage of RFID however, RFID is incapable of providing the detailed information about the conditions of objects. On other hand, a WSN can integrate logics into RFID nodes and allows an RFID system to operate in a multi-hop fashion and with the detailed information about the nodal conditions, RFID and WSN as an infrastructure for telecommunication. The tasks involved in the integration ofWSNs and RFIDs are to design or select: 1) RFID tag memory 2) WSN association protocols 3) routing and addressing schemes 4) RFID sensor-actuator data integration and management 5) service definition and delivery 6) context and service matching and 7) distributed middleware. Due to space constraints, only the first three challenges are discussed, and the focus is on data cleaning and filtering. [1]

III.PROBLEM ANALYSIS

A. Energy Consumption:

Energy efficiency has been a crucial problem when combining RFIDs and WSNs. Wireless device has a strict requirement of power consumption sensors or RFIDs in most of existing networks have very limited battery lives. It is crucial to learn the power consumption at very early design stage .Designers need it to determine system parameters, communication protocols, and functionality restrictions. The information is commonly obtained from simulation. The majority of work on energy efficient routing only focused on the efficiency factor rather than the need of achieving reliable and real-time communication[03] Haase et al.[04]. Provided an overview over the currently simulators and methodologies. To save energy in operation, Vannucci et al. [05] proposed to use backscatter radio in a RFID. Transmitter for each sensor is simplified to a transistor connected to an antenna, and therefore, the cost for each sensor's communicator become negligible, while energy used for wireless communication per sensor is minimized. [1]

B. Time Delay

Just as industrial networks may comprise a large number of sensors and the delay increases with the increased number of nodes. Meeting time constraints of real-time traffic in WSNs is a hard task. The main reason is that real-time devices must share the same communication medium with timing unconstrained devices. Since data from nodes is used to generate correct commands for a machine in industrial applications, time delay in data communication will cause the malfunction of machine. Provided a better understanding of cross-channel interference in a co-located industrial network and proposed a general methodology cross-channel interference conditions. Gamba

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et al [06].proposed the retransmission strategies for the centralized cyclic polling-based systems over wireless channels subject to external interferences. The experiments and simulations have shown that there are alternative strategies which can reduce the rate of the failed nodes during the periodic window as compared to other strategies. Moraes et al. [07] proposed architecture based on a virtual token passing procedure that circulated a virtual token among real time devices. [01]

C. Redundant Data:

The data from RFID is generally unreliable by nature the rate of the acquired data is around 60%–70%. To obtain sufficient data, readers in the WSN interrogate tags periodically. While the issue of reading rate can be addressed, it leads to a new issue of duplicated readings it can be a severe issue when the sensor nodes are densely distributed to ensure no area is missed between neighbouring nodes. Transmitting duplicated data to data server causes the waste of energy, time delay, and other network resources. It is desirable to clean data at the level of sensors and data warehousing to eliminate the redundant or unreliable data. The objective of eliminating redundant data is coupled with the reduction of energy consumption and time delay, i.e. the elimination of redundant data helps to reduce power consumption and minimize the time delay in data transmission. In the following, the algorithms for data cleaning and filtering will be focused [01]

D. Data Cleaning Algorithms

Data cleaning is to eliminate redundant data meanwhile maintain the integrity of original data. Some progresses have been made in data cleaning or cleaning technologies. For example, Jeffrey[09].proposed an algorithm based on the pipeline framework. Different steps of cleaning are applied based on the characteristics of the raw data. This algorithm worked well for data leakage and repeated reading. In his sequential work, a data cleaning strategy based on the time correlation was proposed. This algorithm used a probability model and mainly developed to solve the problem of data leakage. Sarma [07] also introduced a pipeline algorithm to improve the quality of the data flow. All of the aforementioned algorithms were developed to address the problem of unreliability of RFID data caused by data leakage and repeated readings the problem of data redundancy has not been tackled. Carbunar[08] discussed the problem of redundant data. He suggested cleaning data by keeping inspection and silence of redundant readers. However, the proposed algorithm for detecting the device of redundant readers cannot avoid the fact that many readers have to work together at the same time. Based on the specified application. [01].

IV. IMPLEMENTATION

The proposed system is basically composed of four module, 1: GSM modem, 2: RFID Reader module EM-18, 3: At mega controller with LCD Display 4: Web Based application

Initially the corresponding input is provided by tags which is read by RFID reader modules which is integrated with GSM module the problem we have discussed about data redundancy which is solved by data cleaning algorithm by selecting appropriate strategy to clean redundant data meanwhile to obtain exact cleaned value by following data cleaning algorithm procedure.

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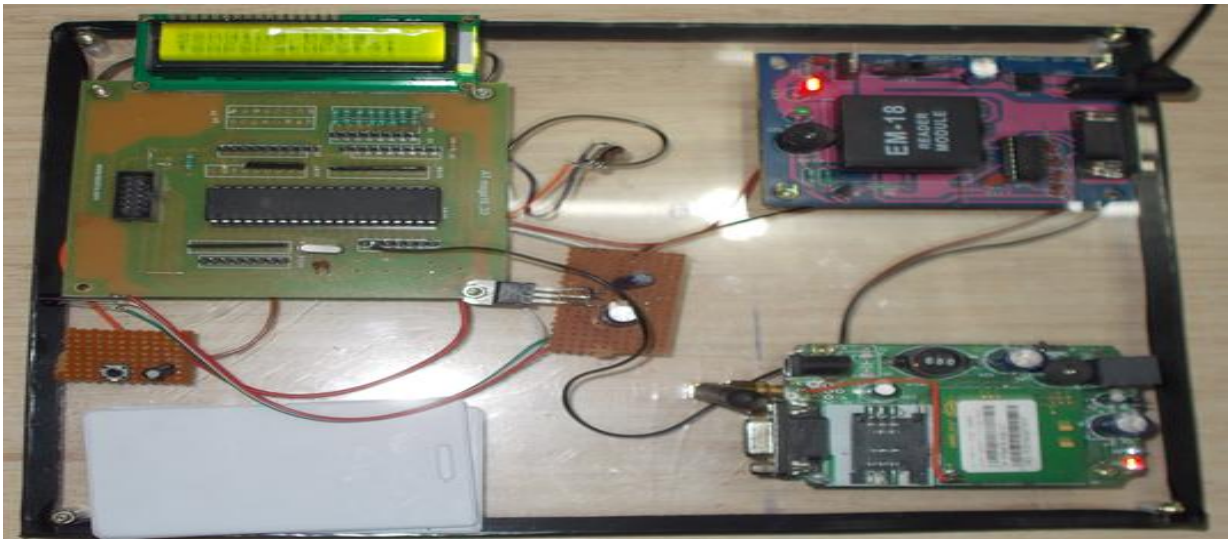

Fig01: Integration of RFID and WSN (GSM Modem) with Data Cleaning Algorithm

The AT commands are sent by the computer to the MODEM/ mobile phone. The MODEM sends back an Information Response i.e. the information requested by or pertaining to the action initiated by the AT command. This is followed by a Result Code. The result code tells about the successful execution of that command. There are also unsolicited Result Codes that are returned automatically by the MODEM to notify the occurrence of an event. For example the reception of a SMS will force MODEM to return an unsolicited result code. AT commands are used to control MODEMs. AT is the abbreviation for Attention. These commands come from Hayes commands that were used by the Hayes smart modems. The Hayes commands started with AT to indicate the attention from the MODEM. The dial up and wireless MODEMs (devices that involve machine to machine communication) need AT commands to interact with a computer. These include the Hayes command set as a subset, along with other extended AT commands. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification. A GSM/GPRS MODEM

V. RESULTS ANALYSIS

This chapter focuses on the results of cleaned data method based on integration of RFID and WSN with data cleaning algorithm for redundant data of tags which are read by multiple values by temperature sensor as but after applying data cleaning algorithm we are getting only single valued data by selected threshold value as shown in fig

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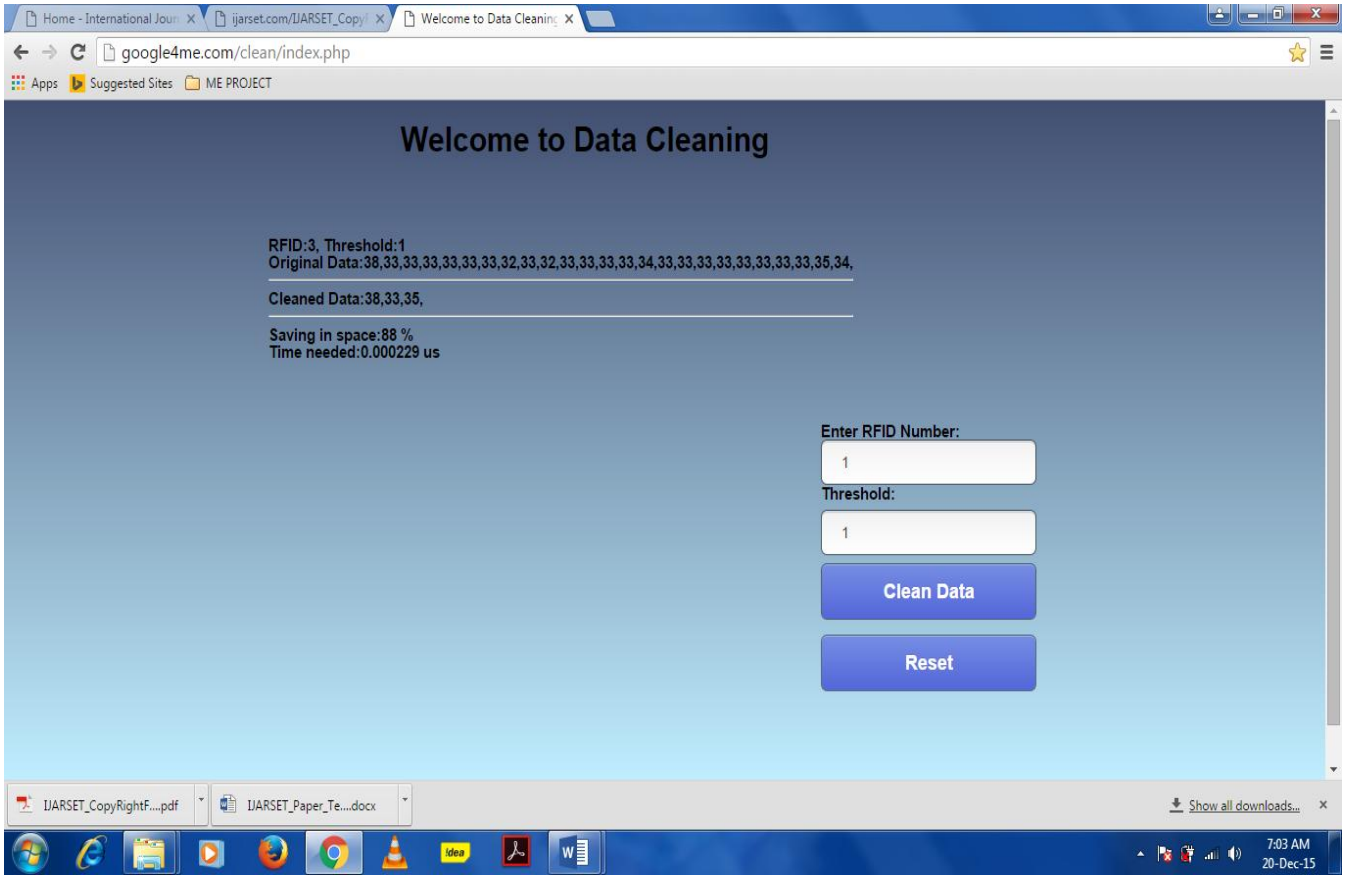

Fig 02: Data cleaning result

Features	**RFID**	**GPS And GPRS**	**RFID, GIS, And GPS**	**GPS, GPRS, And GIS**	**RFID, GSM and our application**
Data Transmission	Slow within range	Moderate; delay due to satellites blocking	Moderate	Faster	Faster
Data Information	Only RFID	Only coordinates	RFID data and coordinates	Position, picture and vehicle information	RFID data, Position, Vehicle Information
Control centre	No	No	No	Yes	Yes
Hardware Cost	Low	Moderate	High	High	Low
Hardware Implementation	Simple	Simple	Complex	Complex	Moderate

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Reliability	Less	Less	Moderate	Moderate	High
Application	Specific	Specific	Limited	Limited	Wide
GUI	No	No	No	Yes	Yes

Fig 03: comparison of existing system with proposed system

VI. CONCLUSION

In the Integration of RFID & WSN the system consists of different modules which are wirelessly linked with GSM modems. SMS service of GSM network is cost effective which is used for the transfer of data between different modules. Thus we have used data cleaning algorithm to clean the redundant data in integration of RFID with WSN network as comparing the results of existing system

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