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# **Design and Simulation of RTLS using active RFID and Xbee wireless Technology using ARM-7**

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**ABSTRACT:** In this paper, we propose a systematic approach to designing and Implementation of RFID Assisted Navigation System consists of active tags deployed on worker of company to provide navigation information while the RFID readers attached to the center of the hall the tag when passing by to obtain the data for navigation guidance. We analyze the design criteria of RFID and present the design of the RFID reader in detail to support Industries and will improve the work quality in industries. We also jointly consider the scheduling of the read attempts and the deployment of RFID tags based on the navigation requirements to support seamless navigations. The estimation of the person position and its accuracy are also investigated.

## **I. INTRODUCTION**

In various institutions and companies, the common problem faced is to locate the staff/student immediately when needed. Few methods, which are in use, are the old fashioned traditional announcement systems. The drawback is that the privacy of the staff/student is affected & it also interrupts the regular functioning of the institution. Generally, many institutions have monitoring cameras to monitor the activity of the working environment status, but it leads to certain drawbacks like the coverage area is small & in a crowded place, a camera cannot identify the exact staff/student needed, for it needs a human eye to recognize the presence of the particular staff. In such case, the accuracy and reliability fails. The monitoring unit needs huge supply of televisions and man power for continuous monitoring. Centrex will be available in many institutions but sometimes nobody will attend the call. Later on, we will move to location detection method. As we know, many different location detection technologies are available today, GPS one of the most well-known. It is common to use GPS to locate a vehicle or an object in the outdoor environment. However GPS is not suitable for indoor environment because of its limitations such as reflection or attenuation caused by obstacles, occlusion, etc. Hence, we propose a new method that uses Radio Frequency identification (RFID) technology, without causing any disturbance to anyone. It is also simple & reliable, requiring no man power. The low cost and robust design of RFID Tags makes it suitable, to be attached to the people in order to track their location in a particular area. RFID is rapidly evolving, and is used with Biometrics technology for security purpose. RFID has been widely utilized for the automatic identification, inventory and tracking of animals, humans, library books, Pharmaceuticals, supply chains, merchandise, and other objects. It is used to prevent the others privacy and the regular course of the institution and also the basic challenges such as delay, accuracy, reliability, non-interruption etc. However, more accurate location information of staff/student could enhance these applications, and enable a large number of other applications. Here each staff is provided with a particular RFID tag. The institutions structure is well planned and each of its location is named for easy recognition. Then these locations are installed with a tracking unit. The system is controlled using a microcontroller and ZigBee is used to communicate. The results are accurate and absolutely reliable. The remainder of this paper is organized as follows. Section II describes the principle of the system. In Section III, Implementation of the units to locate the staff needed is explained. Thereafter, Section IV shows the Performance of the system. Lastly, Section V will conclude this paper.

1) We provide an analysis on the design criteria of RFID-RTLS. These criteria serve as guidelines for the design of the RFID readers and the deployment of the RFID tags. We present the relationships among these design criteria, and

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investigate how they should be used cooperatively to achieve the objectives of the navigation system. Based on these criteria, we identify the parameters that are important for the RFID-RTLS design.

2) We present the design of the RFID readers for RFID-RTLS in detail. The ranges of the critical parameters for the RFID readers are derived according to the requirements of the navigation system and the tag deployment.

3) We jointly consider the design of the RFID reader's read interval and the deployment of the RFID tags, such that the cost and energy consumption can be optimized as long as the requirements of the navigation system are satisfied. The proposed methods for read attempt scheduling and tag deployment are robust and adaptable to dynamic environments.

**II. RELATED WORK**

A RFID system is composed of RFID tags and RFID readers. A RFID tag stores data, and a RFID reader accesses the tag to collect the data through wireless communications. There exist two types of RFID tags: active tags, which contain power modules to support wireless communications, and passive tags, which power their transmissions through the energy absorbed from the radio waves of the RFID readers. Compared to active RFID tags, passive RFID tags are easier to maintain as they do not need power, and their cost can be as low as several cents. Therefore, passive RFID tags are more appropriate for applications that require a large number of tags. Traditionally, RFID tags were designed for commercial applications to replace the bar codes for asset counting [1], [2] and identification [3]. One important challenge in such applications is how to handle the read collision problem that occurs when one or more RFID readers query multiple RFID tags roughly simultaneously in a small area. As a result, most existing research focuses on anti-collision protocol design to schedule the reader's read requests and the tag's responses [4], [5], and [6]. In RFID-ANS, read collision is not possible as our design guarantees the one-to-one coupling of a RFID reader and a tag in a restricted area.

RFID systems have been deployed for VANETs, in which RFID tags are installed on vehicles while RFID readers are deployed on stationary infrastructures. For example, in a typical Electronic Toll Collection (ETC) system [7], automatic toll RFID readers are installed at the gate. A RFID tag (attached to the E-ZPass on a vehicle) is read by the reader when a vehicle passes by the gateway. The toll system identifies the vehicle through the data obtained from the RFID tag, and automatically charges to the vehicle's or the driver's account. A similar system is established for parking fee collection in [8]. Compared to these systems, RFID-ANS contains stationary tags on roads while readers move with vehicles at high speeds. The most related work to RFID-RTLS are reported in [9], [10], and [11]. Chon et al. [9] propose the idea of using stationary RFID tags deployed on roads to localize vehicles when passing by. The feasibility of utilizing RFID tags for navigation when vehicles move at high speeds is investigated through an experiment in which a RFID reader reads the data in a tag when the tag is dropped down to the ground. Lee et al. [10] study the relationship between the tag read latency and the vehicle's speed, and evaluate their results on a test road. These two works demonstrate the feasibility and practicality of applying commercial RFID tags and readers in the vehicular environment. But none of them considers critical issues such as tag deployment and read scheduling, which are important to the design of a practical RFID-ANS as they mainly focus on the concept and feasibility study. In the Road Beacon System proposed in [11], RFID tags serving as traffic signs are deployed in the pavement and vehicles get the road information through reading the tags. The technical details of this work are unavailable to our best knowledge.

**III. PROPOSED SYSTEM****III.1 Principle-**

The location tracking system is based on wireless communication services between the reader unit and the tracking unit via ZigBee, and identifies the RFID tags to track the location of staffs & students. The RFID Reader emits a low power radio wave field which is used to power up the tag so as to pass on any information that is contained on the chip. RFID is one member in the family of Automatic Identification and Data Capture (AIDC) technologies and is fast and reliable means of identifying objects. The RFID technology is a means of gathering data about a certain item without the need of touching the data carrier, with the use of electromagnetic waves. One important feature enabling RFID for tracking objects is that it provides unique identification.

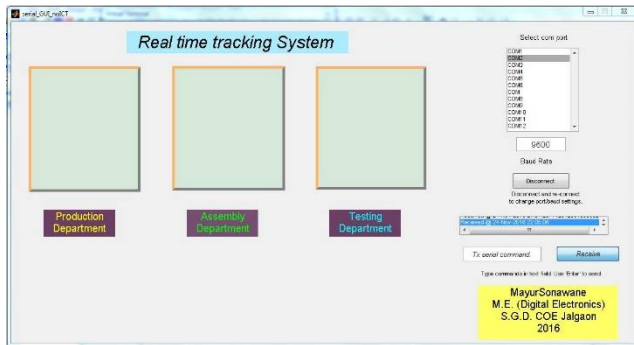
**III.2 Objective-**

The main scope of the system is to track the location of staffs in a huge institution/company, without wasting time and man power, overcoming all the traditional methods that are in use.

In this system we will show the demo of three section in the company for example if we consider a production industry.

- 1) R&D department
- 2) Production
- 3) Quality check.

If any person is change their department that will be indicated on control room by which we can observe that each labor has working their own work by this system their personal life will not affected like GPS. We will use the Matlab simulator for indication purpose.



Department	Compent1	Compent2	Compent3	Compent4	Compent5
R&D	ARM-7	ZigBee	RFID Rx	Tags	
Production	ARM-7	ZigBee	RFID Rx	Tags	
Q&C	ARM-7	ZigBee	RFID Rx	Tags	
monitor	ARM-7	ZigBee	RFID Tx	Matlab	PC

Fig1 :monitor section (Matlab GUI representation)

Table: Component list table

Here we have consider that

A1, A2, A3, A4 are the worker of R&D section.

B1, B2, B3, B4 are the worker of production section.

C1, C2, C3, C4 are the worker of Quality check section.

The GUI shows that

A1, A2, A3 is present in their unit but A4 is absent.

B1, B2, B4 is present in their section but B3 is gone to Quality check section.

C1, C2, C3 is working and present in their section but C4 is gone to the production department.

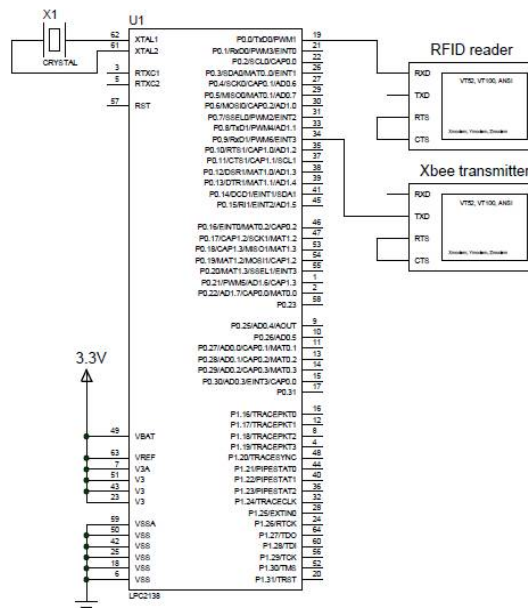


Fig2: circuit diagram of receiver section

### 1. Active RFID Transmitter Tag-

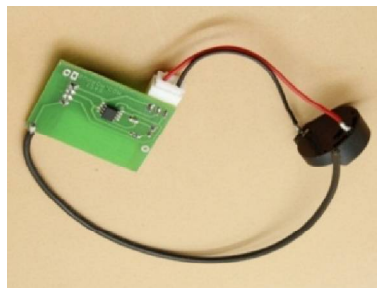


Fig3.Active RFID Transmitter Tag

The tag is active in the sense it is powered by battery and gives long range of operation as compared to passive tags. There a jumper for ON/OFF of the tag. When the jumper is moved to ON position the tag is connected to battery. When it is powered ON it transmits 16 bit unique code ID on 433 MHz frequency every 6 seconds. The transmission time for the signal is 100ms after which it goes to sleep thus saving battery. After 6 second it wakes up again automatically and transmits its unique 16 bit code. This keeps going on as long as the tag is powered ON. This is an active RFID Transmitter tag which transmits 16 bit unique ID on 433 MHz frequency giving range of around 25 meters.It is powered by its PCB mounted 3V battery on bottom. Total of 64 such active RFID transmitter tag can co-exist with each other in same premises each automatically occupying its own time slot without interfering with each other.The RF receiver for listening to these tags can be bought separately from us which gives out serial data containing 16 bit unique ID for each tag when detected in its range.

#### Features-

- Each transmitter tag has unique 16 bit ID, Preprogrammed during manufacturing
- Up to 25 meters range
- Built in Antenna and Battery on PCB

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LED indication for active transmission  
3V battery powered CR2032  
Low Cost and Compact Design

## 2. Zigbee-



Fig4.16 ZigBee /module

This is the new 2.4GHz XBee XB24-BWIT-004 module from Digi. Series 2.5 improves on the power output and data protocol. These modules take the 802.15.4 stack (the basis for Zigbee) and wrap it into a simple to use serial command set. These modules allow a very reliable and simple communication between microcontrollers, computers, systems, really anything with a serial port! Point to point and multi-point networks are supported.

### Specifications:-

1. 3.3V @ 40mA
2. 250kbps Max data rate
3. 2mW output (+3dBm)
4. Built-in antenna
5. Fully FCC certified
6. 6 10-bit ADC input pins
7. 8 digital IO pins
8. 128-bit encryption
9. Local or over-air configuration

## IV. CONCLUSION

### A. SUMMARY:

Radio frequency identification (RFID) is a rapidly growing technology that has the potential to make great impacts on economic of many industries. There are more recent advancements in chip manufacturing technology that makes RFID practical for new applications and settings. At its most basic, RFID systems consist of small tags, attached to staff/student. When wirelessly interrogated by RFID transceivers, tags, readers, respond with some identifying information that may be associated with arbitrary data records. Thus RFID systems are one type of automatic identification system, similar to optical bar codes. And hence using this simple & efficient method, we can track the location of staff/student by just staying in a particular place and without wasting human power & time.

### B. CONCLUSION & FUTURE WORKS:

This study has identified and explained the nature of RFID technology evolution with respect to RFID applications. RFID applications could reduce the number of errors by tagging an individual and by tracking the location in a timely manner. RFID based timely information about the location of a person would increase the efficiency and effectiveness of the tracking system. RFID technology will open new doors to organizations& companies to make them more secure, reliable, and accurate. The system should enable the integration and optimization of resources while improving accuracy and minimizing time leading to improvements in tracking the location. In future this idea, which is beneficial to both the student and the staff, can be done in large scale, depending upon its effective implementation as it shows in the seeds to develop various real projects.

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