

RFID Based Airport Luggage Checking and Tracking System using GSM Technology**D. BALAKRISHNA¹, A.RAGHURAM²**¹PG Scholar, Dept ECE, Indira Institute of Technology & Sciences, Markapur, JNTUK, India, E-mail: darlabalakrishna9@gmail.com.²Asst Prof, Dept ECE, Indira Institute of Technology & Sciences, Markapur, JNTUK, India, E-mail: raghuram223344@gmail.com.

Abstract: In the proposed system we are going to use latest technology RFID (Radio Frequency Identification). The RFID technology is used everywhere in which the main factor is Uniqueness. The unique property is provided by creating unique number for every RFID Tag. In this Tag we can store certain amount of data which are used in identification. The data in the Tags are read via RFID reader. In our proposed system we are going to implement passive RFID for luggage identification. In every luggage we are going to give a RFID Tag with the passengers detail in it. The main aim of this paper is that to trace and check the luggage at different security stages at the airports and inform the passenger about the status of his/her luggage every time the luggage passes each stage. Every luggage attached with an RFID card with unique number. That number is given to the passenger at the entrance of the airport. If this RFID tag make in communication with the RFID reader at the each stage, the data passes to the PC through the RS 232 cable and checks for any prohibited items like metals by using metal sensor contained in the luggage. This checking of metals in the luggage was done by the metal sensor. If the metal detected, the system gives alarm and inform the user through the message using GSM modem and the same information was passed to the database.

Keywords: RFID Reader, RS232 Cable, GSM, Metal Sensor.

I. INTRODUCTION

In the light of the increasing number of airline users, many initiatives have been undertaken to enhance customers' satisfaction. These include the implementation of RFID [1] luggage tracking system in airports. This system is still facing some challenges as it does not involve the passenger in the luggage tracking process. Consequently, an efficient luggage handling system is required. The use of an interactive RFID-based bracelet luggage tracking system would make the process of baggage handling easier and faster as it would reduce the passenger waiting time when a mishandling error occurs. The currently used baggage handling system causes a large number of mishandled bags. Mishandled baggage generates big losses to airline companies. RFID implementation in airports becomes very useful since it enhances the ability of luggage tracking, and increases customer's satisfaction. Yet, many improvements were done on the RFID system to optimize its results.

In this implementation of an intelligent RFID reader was done to provide various computing and logging operations, but also support the deployment of real-time tasks, execution control and automatic update of check-in and check-out information. The authors discussed an RFID equipment tuning and configuration methodology developed to support baggage tracking and feed dashboards with real time status of service level agreements between the airport, the airliner and the ground operators. A passive UHF [3] tag configuration is explained for suitcase identification and tracking in airport-handling applications. The evolving applications of RFID in airports, demonstrates a need for a new application that

would involve the passenger to reduce his anxiety about the location of his luggage. There is no proper existing system for luggage checking system, so we propose new system to tracking the luggage in airport. The objective of this proposed paper is to design and develop "Airport Luggage System" using GSM [2] technology along with RFID reader.

The objectives of this proposed paper are:

- To study the basic operation of RFID reader and design of authenticated person accessing system.
- To design and develop the metal detector system.
- To design alert system using GSM system by sending luggage whole information up to date.
- To design SD card storage memory and interfacing with PC.

The scope of this paper is to design and develop An Interactive RFID-based Bracelet for Airport Luggage Tracking System along with RFID reader for airport luggage security application that can give an output of the information such as authorized accessing data (RFID reader), alerting message using GSM modem, Metal detection each and every stage processing data send to passenger in the airport using GSM. The proposed system can be divided into three big parts, the first part, the RFID reader and the ARM7 microcontroller pairing. The second part metal detector and the GSM module pairing. The third part is SD card [4] to store the luggage data. This checking of metals in the luggage was done by the metal sensor. If the metal detected, the system gives alarm and inform the user through the message

using GSM modem and the same information was passed to the database. In this prototype proposed system we are using a single RFID reader and four switches. If we press the first switch, the system goes to the first phase of the security system. If the luggage was not present at the security node for some time, the passenger gets the message that your luggage checking was under processing. The system waits for some more time, the system send the message to the passenger that please contacts the concern airport authorities to enquire about your luggage. Like that every stage the luggage passes, the passenger gets success message of each stage. After passes all the stages, the passenger gets the message that your luggage received successfully.

II. LITERATURE REVIEW

In this chapter, we will discuss about the information found by study and research that is critical and have an important value in the contribution of the whole paper. It also gives some basic knowledge or theoretical base and is used as a foundation to successfully achieve the main objectives. Most of the literatures are from the related articles, journals, books and previous works of the same fields. These literatures are then compiled and use as a guidance to the work of this paper. The RFID is not only a feasible, novel, and cost-effective candidate for daily object identification but it is also considered as a significant tool to provide traceable visibility along different stages of the aviation supply chain. In [7] the air baggage handling application, the RFID tags are used to enhance the ability for baggage tracking, dispatching and conveyance so as to improve the management efficiency and the users' satisfaction. We surveyed current related work and introduce the IATA RP1740c protocol used for the standard to recognize the baggage tags. One distributed aviation baggage traceable application is designed based on the RFID networks. We describe the RFID-based baggage tracking experiment in the BCIA (Beijing Capital International Airport).

In this experiment the tags are sealed in the printed baggage label and the RFID readers are fixed in the certain interested positions of the BHS in the Terminal 2. We measure the accurate recognition rate and monitor the baggage's real-time situation on the monitor's screen. Through the analysis of the measured results within two months we emphasize the advantage of the adoption of RFID tags in this high noisy BHS environment. The economical benefits achieved by the extensive deployment of RFID in the baggage handling system are also outlined.

A. RFID Description

The RFID system is used to record and track the movement of a luggage in the airport through radio frequency communication. This system is composed of two parts: the reader and the transponder. This latter is also known as the tag. It is made up of an antenna and a silicon microchip [5]. It has a unique identification number and carries information. This data represents the personal information of the passenger, or an identity code that is stored in binary format. Tags can be either passive or active. The proposed system

uses passive tags due to their widely use and cheap price. These tags do not have a power source but rather they get power from the incident electromagnetic field [6]. When the tag is in the RF field, it draws power used to get and transmit the stored information in the memory. In this way, the tag sends the traveler's information to the reader. Then, the reader converts the reflected waves sent by the tag into digital data for computer processing. Once the data is processed, the database system sends appropriate messages to the passengers.

B. Metal Detector

A metal detector [8] is a device which responds to metal that may not be readily apparent. The simplest form of a metal detector consists of an oscillator producing an alternating current that passes through a coil producing an alternating magnetic field. If a piece of electrically conductive metal is close to the coil, eddy currents will be induced in the metal, and this produces an alternating electric field of its own. If another coil is used to measure the electric field (acting as a magnetometer), the change in the magnetic field due to the metallic object can be detected.

C. GSM Technology

Definition of GSM: GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

GSM Modem: This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can either be connected to PC serial port directly or to any microcontroller. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging. This GSM modem is a highly flexible plug and play quad band GSM modem for direct and easy integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.

D. Similar Projects

In [3], the specification of RFID Technology helps distinguish between man and objects with high precision. This paper makes use of this capability for identifying and tracking baggage in an airport and plane in order to increase the efficiency of luggage transport system, which, as a result, increases the precision of the system, decreases the damages arising from the missing of the luggage and its wrong transport and decreases the errors of the manpower. In order to obtain an intelligent system and automatically identify objects, a unique number is required for tracking and control each object. This research has defined a new model with four choices (that is, airline name, flight number, nature of tag and

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chair number) in order to develop a unique identity number. This number is stored in the tag memory. With such tags passing through RFID Readers embedded at different places including the conveyor belt or at the gates, passengers' luggage may be easily tracked. This way, any problem can be easily dealt with. Thanks to its adaptability, this technology can be easily used in computerized network for sending and receiving information; and an information bank has also been used to instantaneously analyze and study the information.

In [4], Cost of mishandled or lost baggage, Passenger traffic monitoring is major issues in the air transport industry. The balance of enhanced security standards and customer convenience is becoming increasingly more difficult to achieve in the wake of new threats that terrorism poses. With airports and airlines continuing to be vulnerable to threats, one of the areas where the maximum time is consumed is check-in for passengers and baggage handling for airport / airline staff. The travel industry is under constant pressure to improve customer service, safety and satisfaction while streamlining the process of passenger travel. A number of technologies have been implemented to speed these processes but one technology that has the potential to revolutionize baggage handling technique is Radio-frequency identification technology (RFID).

III. HARDWARE IMPLEMENTATION OF THE PROPOSED SYSTEM

This chapter briefly explains about the Hardware Implementation of the paper. It discusses the design and working of the design with the help of block diagram and circuit diagram and explanation of circuit diagram in detail. It explains the features, timer programming, serial communication, interrupts of LPC2148 microcontroller. It also explains the various modules used in this paper.

A. Proposed System Design

The implementation of the proposed system design can be divided in two parts.

- Hardware implementation
- Firmware implementation

Hardware Implementation: Hardware implementation deals in drawing the schematic on the plane paper according to the application, testing the schematic design over the breadboard using the various IC's to find if the design meets the objective, carrying out the PCB layout of the schematic tested on breadboard, finally preparing the board and testing the designed hardware.

Firmware Implementation: The firmware part deals in programming the microcontroller so that it can control the operation of the IC's used in the implementation. In the present work, we have used the Orcad design software for PCB circuit design, the Keil μ v3 software development tool to write and compile the source code, which has been written in the C language. The Proload programmer has been used to write this compile code into the microcontroller. The firmware implementation is explained in the next chapter.

The proposed system design and principle are explained in this chapter using the block diagram and circuit diagram. The block diagram discusses about the required components of the design and working condition is explained using circuit diagram and system wiring diagram.

1. Block Diagram of the proposed system and its Description:

The block diagram of the design is as shown in Fig.1. It consists of power supply unit, ARM 7, switches, RFID Reader, GSM, Metal Detector, LCD. The brief description of each unit is explained as follows.

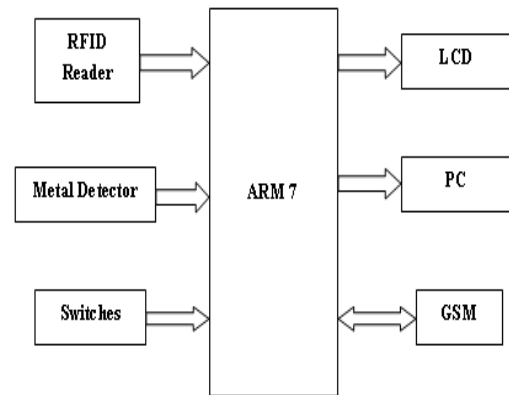


Fig.1. Block diagram of the airport luggage system.

B. Working Procedure

The main aim of this paper is that to trace and check the luggage at different security stages at the airports and inform the passenger about the status of his/her luggage every time the luggage passes each stage. Every luggage attached with an RFID card with unique number. That number is given to the passenger at the entrance of the airport. If this RFID tag make in communication with the RFID reader at the each stage, the data passes to the PC through the RS 232 cable and checks for any prohibited items like metals contained in the luggage. This checking of metals in the luggage was done by the metal sensor. If the metal detected, the system gives alarm and inform the user through the message using GSM modem and the same information was passed to the database. In this prototype proposed system we are using a single RFID reader and four switches. If we press the first switch, the system goes to the first phase of the security system. If the luggage was not present at the security node for some time, the passenger gets the message that your luggage checking was under processing. The system waits for some more time, the system send the message to the passenger that please contacts the concern airport authorities to enquire about your luggage. Like that every stage the luggage passes, the passenger gets success message of each stage. After passes all the stages, the passenger gets the message that your luggage received successfully. The coding was written in embedded C language and compile using keil compiler. The relevant hex file was dumped into the microcontroller using FLASH MAGIC software.

IV. FIRMWARE IMPLEMENTATION OF THE PROPOSED SYSTEM DESIGN

A. Firmware Implementation

Firmware implementation deals in programming the microcontroller so that it can control the operation of the IC's used in the implementation. In the present work, we have used the Orcad design software for PCB circuit design, the Keil μ v4 software development tool to write and compile the source code, which has been written in the C language. The Flash magic programmer has been used to write this compile code into the microcontroller.

Software Tools Required

- Orcad
- Keil μ Vision4
- Flash Magic

Orcad is used for drawing the schematic diagram, it is mentioned above. Keil μ v4, Flashmagic are the two software tools used to program microcontroller. The working of each software tool is explained below in detail.

Programming Code Description: A compiler for a high level language helps to reduce production time. To program the LPC2148 microcontroller the Keil μ v4 is used. The programming is done in the embedded C language or Assembly language. Keil μ v4 is a suite of executable, open source software development tools for the microcontrollers hosted on the Windows platform. One of the difficulties of programming microcontrollers is the limited amount of resources the programmer has to deal with. In personal computers resources such as RAM and processing speed are basically limitless when compared to microcontrollers. In contrast, the code on microcontrollers should be as low on resources as possible.

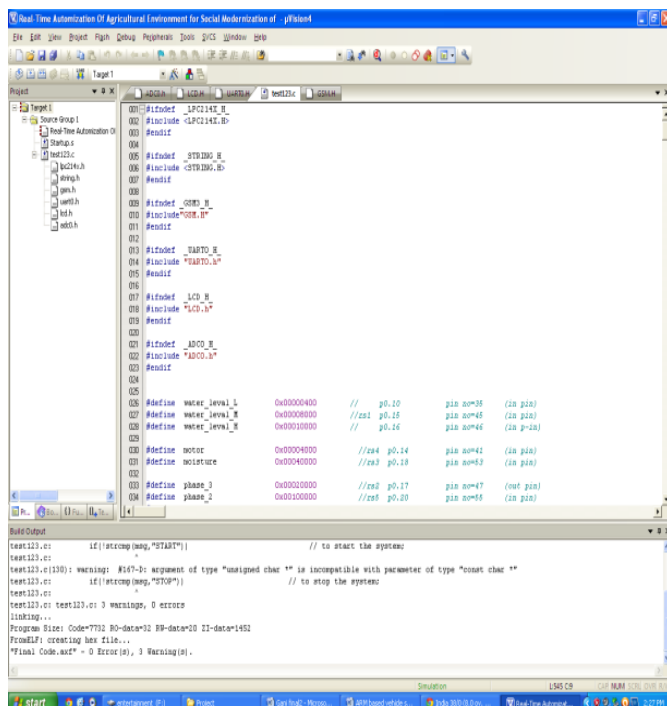


Fig.2. Compilation of source Code.

Keil Compiler: Keil compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code. The compilation of the C program converts it into machine language file (.hex). This is the only language the microcontroller will understand, because it contains the original program code converted into a hexadecimal format. During this step there are some warnings about eventual errors in the program. If there are no errors and warnings then run the program, the system performs all the required tasks and behaves as expected the software developed. If not, the whole procedure will have to be repeated again. Below figs.2 and 3 show the compilation of the program.

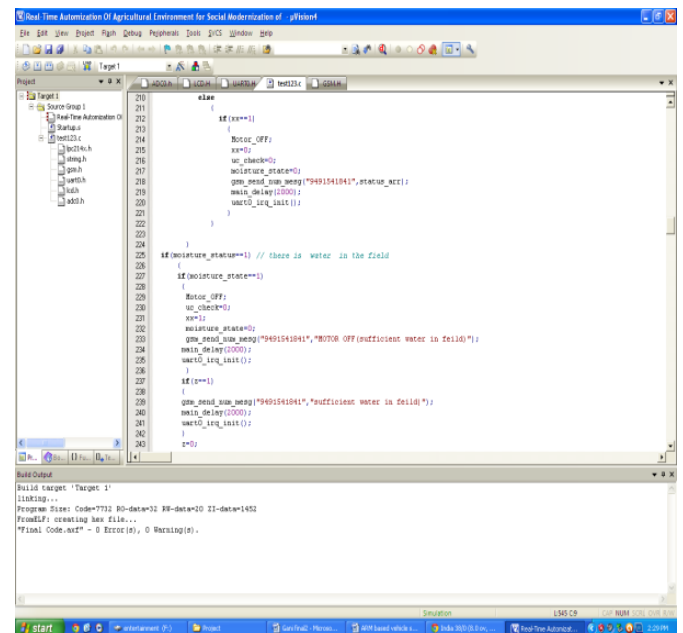


Fig.3. Run process of compiled Code.

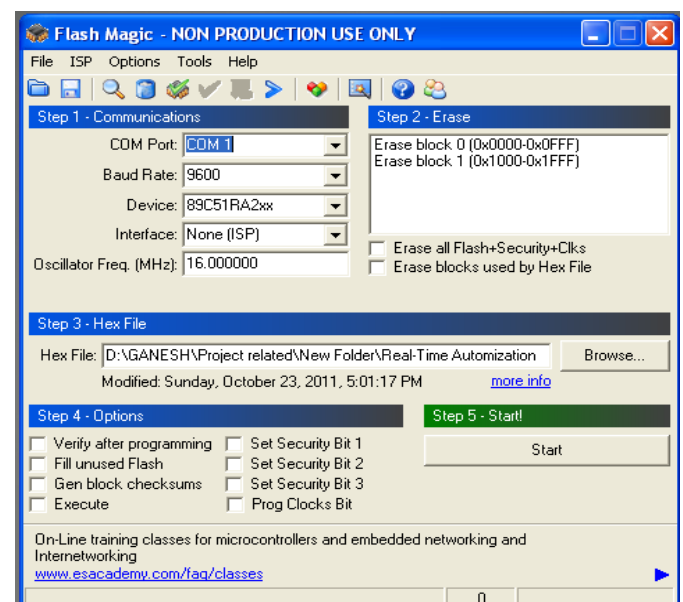


Fig.4.Dumping of the code into Microcontroller.

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B. Flash Magic

Flash Magic is a PC tool for programming flash based microcontrollers from NXP using a serial or Ethernet protocol while in the target hardware. The figs.4 and 5 below show how the baud rate is selected for the microcontroller, how are the registers erased before the device is programmed. If dumping process of the hex file is completed, then the controller will work as per our requirement.

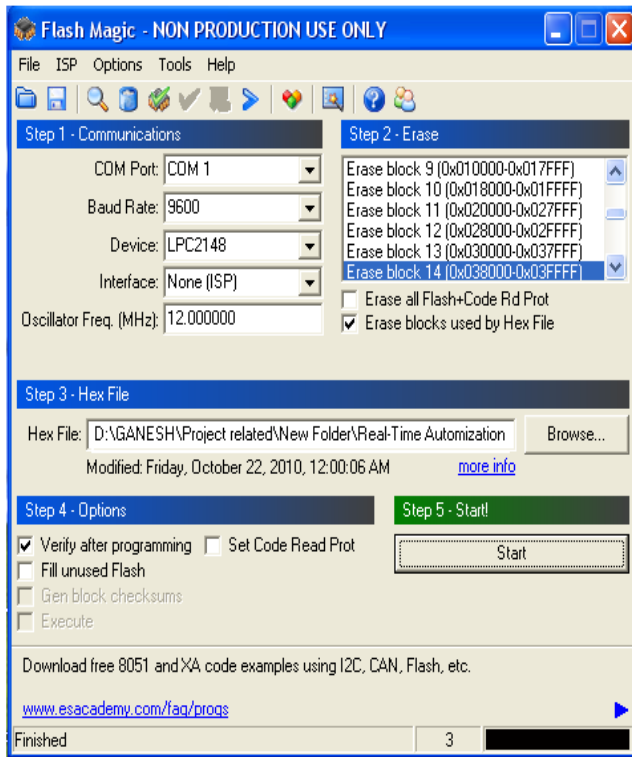


Fig.5. Dump process finished.

V. RESULTS

The smart airport luggage system proposed in this proposed system was fully developed and tested to demonstrate its feasibility and effectiveness. The implementation of realization of "RFID Based Airport Luggage Checking and Tracking System Using GSM Technology" is done successfully. The communication is properly done without any interference between different modules in the design. Design is done to meet all the specifications and requirements. Software tools like keil uvision simulator, proload to dump the source code into the microcontroller, orcad lite for the schematic diagram have been used to develop the software code before realizing the hardware. Circuit is implemented in Orcad and implemented on the microcontroller board. The performance has been verified both in software simulator and hardware design. The total circuit is completely verified functionally and is following the application software. It can be concluded that the design implemented in the present work provide portability, flexibility and the data transmission is also done with low power consumption. The below fig.6 shows the entire connections of circuitry.

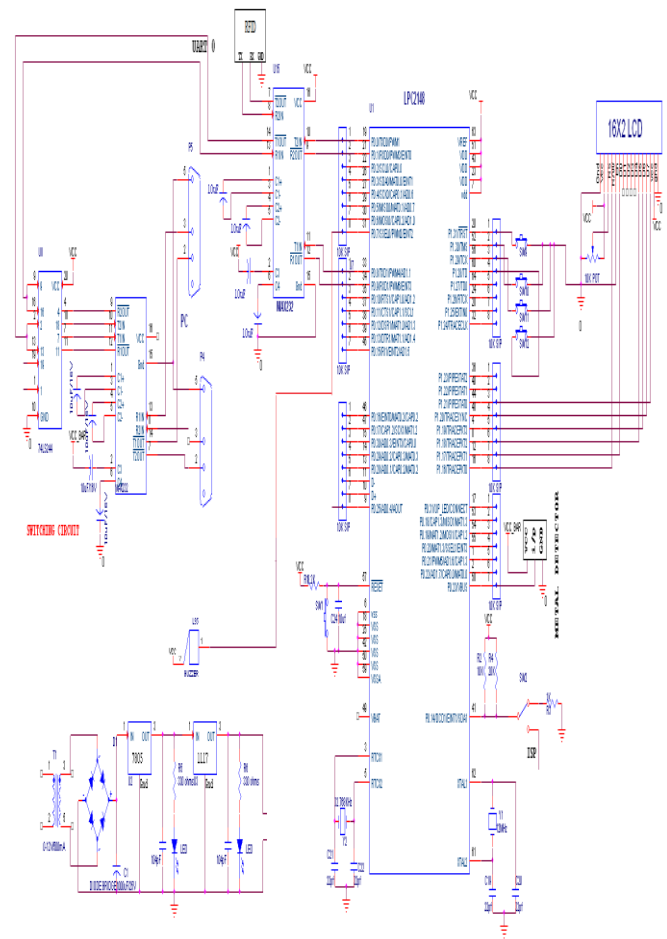


Fig.6. Schematic design of the airport luggage system.

VI. CONCLUSION & FUTURES COPE

This paper finally concluded and future scope will be enhanced below.

A. Conclusion

In this proposed system, Implementation of RFID dramatically increases efficiency and lowers operational costs, avoids cost of lost baggage & delayed planes. A number of technologies have been implemented to speed these processes but one technology that has the potential to revolutionize baggage handling technique is Radio-frequency identification technology (RFID). RFID is used to enhance the ability for baggage tracking, dispatching and conveyance so as to improve the management efficiency and the users' satisfaction. The RFID-enabled system provides baggage handlers and airport operators with real-time and historical track-and-trace data, giving an instant overview of the position of bags in user mobile. Developed in response to customer requests, the system provides a significant improvement in communication between the operators and baggage handlers, which will help to reduce the number of short-shipped or misrouted items. This, in turn, will improve passenger security and satisfaction as well as reducing flight delays caused by mishandled baggage.

B. Future Scope

- A Front Camera can be used for Lane Tracking purpose.
- System can be monitored & globally tracking using PC.
- Instead of a Microcontroller we can use a CPLD chip since the CPLD incorporates many more features than a Microcontroller. VLSI/VHDL can be used for CPLD programming.

C. Advantages

- Reduce the accidents.
- Analyze the accidents detail.
- Send location of car and its maintenance to base station through GPS & GSM technique.
- Security of vehicle.

D. Applications

- Government vehicles.
- Industrial
- Hospital

VII. REFERENCES

- [1] AeroAssist, "RFID in Aviation: airport luggage control," AeroAssist.pt, Jun. 2008.
- [2] Y. Ouyang, Y. Hou, L. Pang, D. Wang, and Z. Xiong, "An intelligent RFID reader and its application in airport baggage handling system", 4th International Conference on Wireless Communications, Networking and Mobile Computing, pp. 1-4, Oct. 2008.
- [3]<http://www.ijscce.org/attachments/File/v2i5/E0973092512.pdf>.
- [4]<http://iaito.co.in/resources/RFID%20based%20Airport%20Management-new%20copy.pdf>.
- [5] RFID Journal, "How much does an RFID tag cost today?". URL: <http://www.rfidjournal.com/faq/20/85>.
- [6] RFID Journal, "How much do RFID readers cost today?". URL: <http://www.rfidjournal.com/faq/20/86>.
- [7]http://www.jtaer.com/apr2008/zhang_ouyang_he_p9.pdf.
- [8] C. R. Medeiros, J. R. Costa, and C. A. Fernandes, "Passive UHF RFID tag for airport suitcase tracking and identification", Antennas and Wireless Propagation Letters IEEE, Vol. 10, pp. 123-126, Feb. 2011.