SMART AIRPORT LUGGAGE CONTROL

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ABSTRACT - The development of global associations and dual transfer flights increases the passenger and baggage volumes creating big challenges to airports and airlines. One of the major requirements of airport is the rapid processing of baggage sorting. Existing baggage handling system relies on an aging Barcode system with high error percentage. In this system, transport operation is conducted at very low speed and precision. For reading and control of barcodes, barcode readers need to carefully read barcodes in direct sun light. There have been many attempts to solve these problems. Thus, the use of RFID in this system is one of the best ways to decrease the problems.

The main aim is to trace the luggage at different security stages at the airports and inform the passenger about the status of their luggage. Every luggage is tagged with an RFID tag with unique number and passenger receives that number during check-in at the airport.

This system offers better solution for the Airport baggage controlling system as it is cost effective and convenient. The RFID tags are used to enhance the ability for luggage tracking, dispatching and conveyance so as to improve the management efficiency for user satisfaction.

Index terms - RFID, AVR controller, luggage detection

I. INTRODUCTION

Radio Frequency Identification (RFID) is an emerging technology that is enormously spreading in business and industry. Airline industry is one of many industries that could be benefited from RFID technology.

The airline industry annually handles more than 2 billion flyers. Tracking passenger baggage is a major challenge to the airline industry for both customer satisfaction and security. Departures can be delayed significantly for meeting security measures for baggage matching, which impacts cost efficiencies and customer satisfaction. Cost of mishandled or lost baggage and passenger traffic monitoring is major issues in the aviation industry. According to a 2008 baggage survey, the aviation industry lost around 12 billion in 2007 due to mishandled baggage.

Balancing of enhanced security standards and customer convenience is becoming increasingly more difficult due to threats of terrorism. As airports and airlines are endangered due to threats, the maximum time is consumed in check-in for flyers and luggage handling for airport / airline staff. Radio-frequency identification technology (RFID) has revolutionized baggage handling technique to improve these processes. For increasing the ability for luggage tracking, dispatching and conveyance, usage of RFID is preferred for improving the management efficiency and the flyers satisfaction. An instant overview of the position of bags can be traced and tracked with real time by RFID-enabled system. Due to customer requests this system has been developed for providing a significant improvement in communication between the baggage handlers and flyers that will help to reduce the number of short-shipped or misrouted items. This will improve passenger security and satisfaction as well as reducing flight delays caused by mishandled baggage.

1. Aim And Objective Of The Project:

An automatic baggage handling and sorting system has been designed using microcontroller for cheap implementation on a small size terminal with a low cost and avoid issues faced at airport by airline industries.

- To improve baggage tracking and delivery.
- To improve security.
- To provide better services to premium customers.
- To ensure better services to track passenger progress through airports, reducing the number of flyers arriving late at the gate and thus ensuring that planes depart on time.

Fig.1 Actual View At Airport

2. Literature Survey:

The development of global associations and dual transfer flights increases the passenger and baggage volumes creating big challenges to airports and airlines. Existing baggage handling system relies on an aging Barcode system with high error percentage.

In this system, transport operation is conducted at very low speed and precision. For reading and control of barcodes, barcode readers need to carefully read barcodes in direct sun light. Current bag tags include a bar code. These bag tags are printed using thermal or barcode printers that print on an adhesive paper stock. This printed strip is then attached to the luggage at check in. This allows for automated sorting of the bags to reduce the number of misrouted, misplaced or delayed bags. The limitations of this technology were apparent when a fully automated cart-based system significantly delayed the airport's opening. While the inability to reliably read all barcode tags in the installation was a part of the problem, it was one of several technical reasons for the delayed opening. Nevertheless, automated sorting of baggage using laser scanner arrays, known as automatic tag readers, to read bar-coded bag tags is standard at major airports. Bar codes cannot be automatically scanned without direct sight and undamaged print. Forced by reading problems with poorly-printed, obscured, crumpled, scored or otherwise damaged bar codes, radio-frequency identification (RFID) chips embedded in the tags can be very useful.

Thus airline requires a highly efficient method to handle the increasing passenger and baggage volumes and thus the trending RFID technology has drawn the attention of the airline. Barcode reading problems cause 9.7% of all mishandled baggage and failures to receive a baggage status message contribute to a further 11% of mishandled baggage.

Fig.2 Main causes of luggage delays[1]

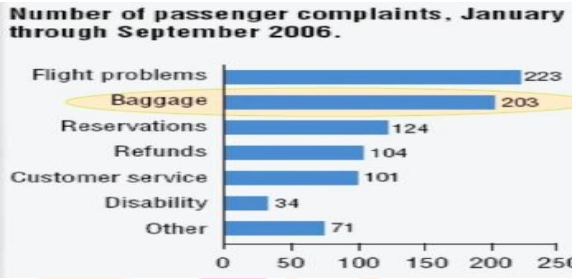

Fig.3 No. of passengers complaints[2]

3. What Is RFID?

RFID is the abbreviation of Radio-Frequency Identification. It is a small electronic device which consists of a small chip and an antenna. This chip is capable of carrying data upto 2000 bytes. The RFID is similar to barcodes and magnetic strips on the back of credit cards or ATM cards. It provides a unique identifier number and similar to barcode, it should be scanned to retrieve the identifying information.

Fig.4 RFID Reader and Tag

How Does RFID Work?

RFID mainly consist of three parts:

- A scanning antenna
- A transceiver (i.e., RFID reader) with a decoder for interpretation of data.
- A transponder (i.e., the RFID) tag has been programmed with information.

The scanning antenna gives radio-frequency signals in a short range. Two things are done by RF radiation:

- Means of communication is provided with the transponder.
- It provides the RFID tag with the energy for communicating.

As RFID tag passes through scanning antenna field, it detects the activation signal from the antenna. That "wakes up" the RFID chip, and it transmits the information on its microchip to be picked up by the scanning antenna.

There are two types of RFID tag. They are:

- Active RFID tag
- Passive RFID tag

Active RFID tag:

An active RFID tag is equipped with a battery which is used as a partial or complete power source for the tag's circuitry and antenna. It can also be connected to an external power source.

Passive RFID tag:

Passive tags do not use batteries, power is supplied by reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory.

The RFID system supplies a real-time view of the baggage information and provides a stronger automated solution in baggage handling system. RFID is compatible with airports circumstances to lessen operational cost, to improve operational efficiency and maintain high passenger satisfaction level.

- In the airport baggage handling system, the RFID is superior to barcodes with its advantages such as long range, anti-jamming, item-level identifier, multi-recognition. The implementation to RFID will reduce cost of labour and create potential value. Replacement of barcode by RFID is an inevitable trend.
- Initial operational cost of RFID based BHS is much more. For that the airport should be responsible for the investment to set up the system and the investment for operating the system should be shared proportionally by airports and airlines.

More impacts and advantages are achieved in aviation industry by implementing RFID based system. Also, the privacy protection along the network across the BHS around the world can be emphasized in near future using Zombie RFID tags. They are the tags that can be deactivated when it leaves from the certain range of distance. The RFID scanner reads the tag and as soon as you leave the proximity region, you pass a special device that sends a signal to the RFID tag to "die". It is then no longer readable.

The "zombie" element comes in when you again come into the proximity. A special device especially made for that kind of tag "re-animates" the RFID tag, allowing the object to re-enter the supply chain.

II. COMPONENTS USED

- Atmega 16 microcontroller
- RFID
- 7805 IC
- IC L293D
- Power supply
- Bascom software
- Robokits software

Table 1 - Comparision Between RFID And Barcode

Attributes	**Barcode**	**RFID**
Optic view	Necessary	Antenna is reading from the distance
Read-rate accuracy	80-90%	95-99%
Read-write	Read only	Read-write
Updating	1 time	Anytime
Location	Top of bags	Everywhere
Removable	Easily	Impossible
Environments	Disposable	Reusable
Cost	Cheap	Tags are expensive + implementation cost
Manpowered	Manually	Automated

1. Block Diagram

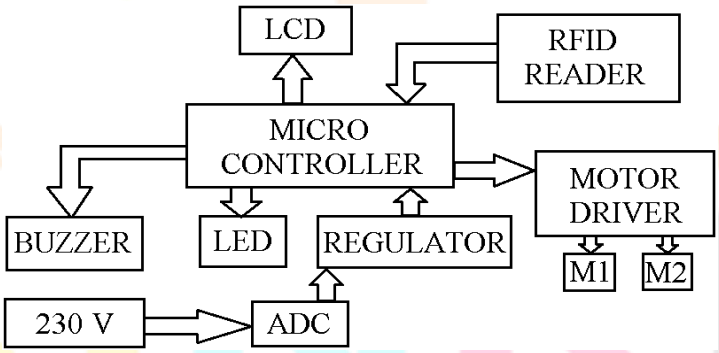

Fig.5 Block Diagram

Firstly the data will be captured by IR proxy sensor and RFID reader and tag. At the starting of the conveyor belt, IR proxy sensor will be placed which is used for the detection of luggage on the conveyor belt. RFID reader identify luggage located in near proximity to the conveyor belt. According to the identified luggage and details, decisions are made to sort the luggage to the relevant conveyor. The RFID system identifies the luggage and sends signals to the control system to guide the luggage to the relevant conveyor line using the pushing mechanism.

Fig.6 Scanning of RFID tag

Luggage is tagged with RFID tags. Another tag is provided to its respective owner. Each tag consists of a unique identification number. Each baggage is tagged with a passive RFID tag which enables identifying of the baggage. When passenger scans its tag, the RFID reader identifies the baggage on the main conveyor and the database is automatically updated as signal is sent to microcontroller. On basis of input signal, Microcontroller decides baggage destination by sending signal to D.C motor. Then baggage on moving conveyor stops at corresponding gate and microcontroller send signal to L293D Motor driving IC to push that baggage. The sorting movement of the mechanical pusher is assisted by DC motor coupled to DVD writer used as pushing mechanism.

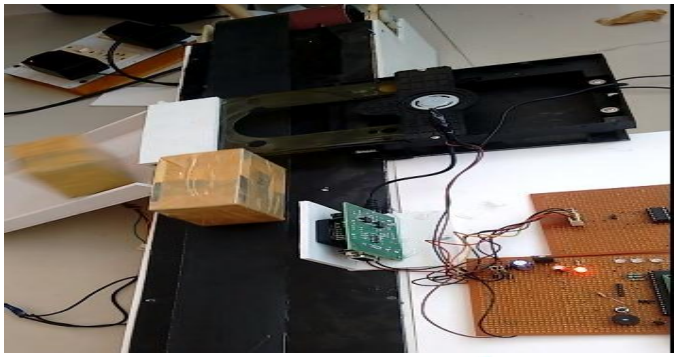

Fig.7 Pushing Mechanism

III. CONCLUSION:

In present project, an automated baggage sorting system that has been designed using AVR microcontroller so that it could be cheaply implemented on a small size airport terminal with a low cost. A prototype conveyor system is developed with the integration of Radio Frequency Identification (RFID) technology and sorting mechanism is used instead of a robot hand for baggage handling at airport environment. This is an automated system with RFID tags/detectors, intelligent control systems, sorting mechanisms and smart conveyor system. This demonstrates the significance and benefits of a smart conveyor system with the integration of RFID technology for product identification and handling, specifically in Airport industry.

Main work is focused on RFID technology which is used for the purpose of identifying products which leads to a better identification than existing barcode systems. Furthermore, large data could be embedded in to the tag and could be placed inside the product to avoid damages. Each baggage is tagged with a passive RFID transponder which enables identifying of the objects and sorting. As the RFID reader identifies the objects on the main conveyor, the inventory database is automatically updated. The sorting movement of the mechanical pusher is assisted by a DC motor coupled to DVD writer used as pushing mechanism.

The adoption of the RFID technology for the sorting and handling of baggage along the global supply chain provides a Win-Win-Win for the three main stakeholders, the airlines, the airports and the passengers.

IV. FUTURE SCOPE:

- The project can be extended by tagging the passenger itself. By tagging the location of passengers with the RFID cards, customized services can be offered to boost the customer satisfaction and create a positive impact on the sales turnover. Via the information on the RFID embedded card of the premium passengers, they can be greeted in the language they prefer, and can be offered their favourite newspaper and drinks once they enter the premium passenger lounge. This RFID card can also be a tracking device to help the airline better understand its passenger's profile. By tracking which duty free shops passengers visit, which restaurants they go to, etc can be a source of information for the Customer Relationship Management System(CRM), which in turn can allow custom made programs to enhance business performance and improve customer loyalty.
- We can use a CPLD chip instead of a Microcontroller as the CPLD incorporates many more features than a Microcontroller. VLSI/VHDL can be used for CPLD programming.

V. ACKNOWLEDGMENT:

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REFERENCES:

[1] Source: SITA baggage report 2008
[2] Source: Air travel consumer report" Nov 2006
[3] "Application Of Rfid In Aviation Industry: An Exploratory Review" by A.Mishra and D.Mishra
[4] "Improving Baggage Tracking, Security and Customer Services with RFID in the Airline Industry**"** by Deepti Mishra, Alok Mishra
[5] "Improving On Passenger And Baggage Processes At Airports With Rfid" by Katalin Emese Bite
[6] "Automated Luggage Carrying System" by Md. Imran Khan
[7] "Rfid Based Airport Management System" by IAITO INFOTECH