Design of a Baggage Handling System in Khartoum Airport

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Abstract

In this paper, we apply the transformations found there to a particular system, namely a Baggage Handling System (BHS) of airports, focusing especially on the sorting processors area, as one of the main challenging points. By means of an historical case study, we demonstrate how the method can be successfully applied.

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 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 KRT (Khartoum 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 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.

Keywords: RFID, BHS, Tracking, Airport.

1. Introduction

1.1 Background of the study

A baggage handling system (BHS) is a type of conveyor system installed in airports that transports checked luggage from ticket counters to areas where the bags can be loaded onto airplanes. A BHS also transports checked baggage coming from airplanes to baggage claims or to an area where the bag can be loaded onto another airplane. There is an entire process that the BHS controls. From the moment the bag is set on the in-bound conveyor, to the gathering conveyor, through sorting until it arrives at the designated aircraft and onto the baggage carousel after the flight.

The BHS has control over the bag. In some of the airports the BHS system that is installed is consist of a conveyors and a handler that handle the bag sorting and that makes the job hard and faces certain problems one of the problems are the lost of the baggage’s sometimes the handler doesn’t handle the baggage well or lose the luggage and that is a big deal for the airlines that the traveler travel with the traveler my file a sue case against the airlines Once your bag is declared officially lost, you will have to submit a claim. This usually means you have to fill out a second, more detailed form. Check on this; failure to complete the second form when required could delay your claim. Missing the deadline for filing it could invalidate your claim altogether.

The airline will usually refer your claim form to a central office, and the negotiations between you and the airline will begin. If your flight was a connection involving two carriers, the final carrier is normally the one responsible for processing your claim even if it appears that the first airline lost the bag. Airlines don’t automatically pay the full amount of every claim they receive. First, they will use the information on your form to estimate the value of your lost belongings. Like insurance companies, airlines consider the depreciated...
value of your possessions, not their original price or the replacement costs. If you’re tempted to exaggerate your claim, don’t. Another problem is the damage that accrued to the luggage when it is handled not well. If your suitcase arrives smashed or torn, the airline will usually pay for repairs. If it can’t be fixed, they will negotiate a settlement to pay you its depreciated value. The same holds true for belongings packed inside. Airlines may decline to pay for damage caused by the fragile nature of the broken item or inadequate packing, rather than the airline’s rough handling. Carriers may also refuse to give you money for your damaged items inside the bag when there’s no evidence of external damage to the suitcase. But airlines generally don’t disclaim liability for fragile merchandise packed in its original factory sealed carton, a cardboard mailing tube, or other container designed for shipping and packed with protective padding material. When you check in, airline personnel should let you know if they think your suitcase or package may not survive the trip intact.

Before accepting a questionable item, they will ask you to sign a statement in which you agree to check it at your own risk. But even if you do sign this form, the airline might be liable for damage if it is caused by its own negligence shown by external injury to the suitcase or package. If you and your suitcase don’t connect at your destination, don’t panic. The airlines have very sophisticated systems that track down about 98% of the bags they misplace and return them to their owners within hours. In many cases they will absorb reasonable expenses you incur while they look for your missing belongings. You and the airline may have different ideas of what’s reasonable, however, and the amount they will pay is subject to negotiation. If your bags don’t come off the conveyor belt, report this to the airline before you leave the airport. Insist that they fill out a form and give you a copy.

Even if they say the bag will be in on the next flight. If the form doesn’t contain the name of the person who filled it out, ask for it. Get an appropriate phone number for following up (not the Reservations number). Don’t assume that the airline will deliver the bag without charge when it is found; ask them about this. Most carriers set guidelines for their airport employees that allow them to disburse some money at the airport for emergency purchases. The amount depends on whether or not you’re away from home and how long it takes to track down your bags and return them to you. If the airline does not provide you a cash advance, it may still reimburse you later for the purchase of necessities.

There are more problems that happened that why we came up with an answer to all this problem an answer that ease the sorting of the baggage. A sorting system that uses a RFID to sort the baggage’s the system consists of motors conveyors and the RFID scanner or the reader to sort the luggage that may ease the treating of the luggage and ease the damage and it is faster than the old system this is a general views of our project but we will go through a whole and a lot of features that can show u the details of our project.

1.2 Theoretical Framework

The embedded system development of an RFID tag reader that identify the baggage and guide the baggage to the right conveyor leading it to the right place where it is loaded to the airplane. In the last few years, Radio Frequency Identification (RFID) has become one of the most promising research areas and has attracted increasing attentions. The fundamental RFID system is composed of three components: Transponder/Tag, Reader and Backend Application.

The tag consists of a microchip that stores data and antenna. It is assigned a unique serial number to identify the object item and can also store information such as price, time, date, manufacture, and product composition. Some tags are even featured with certain computing capability to realize simple data cryptograph and access control. The reader consists of the RF module, control unit, and coupling element to interrogate tags via RF communication. It also has a secondary interface to communicate with backend systems for the transmission of the information stored in tags. The backend applications not only aggregate, filter, and calculate the data gathered by readers but also process the dynamic product data (e.g. location, history and current analysis). The RFID virtually creates a remote database which travels with the items by making use of RF communication to exchange data between tags and backend applications. To unite all this components you have to own a central (or sometimes distributed but clearly distinguishable) part of the machinery that controls its operation, provided that a piece of machinery is complex and organized enough to contain any such unit. One domain in which the term is specifically used is the area of computer design like a PC or a Microcontroller to drive this entire system.
1.3 Conceptual Framework

![Conceptual Framework Diagram]

Figure 1: Conceptual Framework

We are going to propose and analyze a prototype for RFID-based automatic baggage handling system that can be implemented for deployment in the airport. We are confident that the system will help resolve some issues, but first let us discuss the scenarios of the project and what it contains, first of all the most important part of the project is the RFID reader. RFID is widely deployed in many business domains. It especially provides obvious benefits to the supply chain owing to its low cost as well as flexibility. RFID has advantages such as contact-less, multi-object recognition, non-line-of-sight, long distance, large store memory, programmability and penetrability.

The most significant meaning embedded in the RFID technology is the fact that all the existing physical objects can enter the virtual world built by the networked RFID system. The tag can be recognized as a unique entity in the internet of physical things. So the RFID identify the baggage so the signal moves from the reader to the control unit that has to control the whole system.

The Control Unit can be thought of as the brain of the system itself. It controls based on the instructions it decodes, how other parts of the system and in turn, rest of the systems should work in order that the instruction gets executed in a correct manner. So when the control unit response to the signal it controls the motor and the motor they drive the conveyors the conveyors go through different stages the scenario goes like this the RFID reader identify a certain luggage and by the control unit the RFID and the motors connect and a significant motor moves according to the tag that has been identified and this is the end of the scenario.

2. System Development

In this system we developed the overall method in the targeted devices can be controlled by sending text messages sent by user.

Methodology

2.1 Design Process

![Design Process Diagram]

Figure 2: Design Process

2.2 The Scenarios

This project goes through certain scenarios This Figure shows overall system functions:

2.2.1 Scenario A

At the first the baggage is routed along the designated unloading passageway or the conveyor it goes through the RFID checking the tag reader acts as a baggage identifier that reads the baggage information from the electronic label on the baggage and sends this information to the monitoring software running on a control unit (microprocessor) On receiving baggage information, including the designated passageway, the monitoring software decides whether the baggage should be diverted along the passageway or not. That scenario is called the sorting.
2.2.2 Scenario B

The second scenario is when the luggage is not identified; the conveyor acts as a closed loop that goes around and comes back to be identified again until the baggage is in the right way.

2.3 The Design Process

2.3.1 Software

The software part includes the codes and the database e.g. (each in airport each plane baggage has a tag and we all know there is a lot of baggage so we must make a database to all this luggage’s) and the source code should be in C/C++.

2.3.2 Hardware

I. RFID:

RFID technology is rapidly developing and has developed and implemented RFID on baggage in airports; it will be a great development with sorting information stored in the RFID tag. Making this possible is the 512 bit memory. The larger memory on the tag has made it possible to store all necessary sorting data and thus given airports the opportunity to develop this next generation RFID on Baggage. RFID tag readers are connected to the Motors which must accurately divert the baggage to the correct location based on its identifying the RFID.

RFID is a choice for many of the airports for the following reasons: better customer satisfaction security anti terrorism is also a major concern save money reducing the number of lost baggage’s more efficient RFID is better than barcode in many situations.

II. Control Unit:

To control the entire system you must need a Control unit to give the orders to the devices attached to it. This system consists of RFID tag reader and a conveyor. The tag reader acts as a baggage identifier that reads the baggage information from the electronic label on the baggage and sends this information to the Control Unit (Microcontroller). On receiving baggage information, including the designated passageway, Control Unit decides whether the baggage should be diverted along the unloading passageway in this junction or not. If it belongs to the unloading passageway in the current junction, the conveyor is actuated immediately.

III. Motors and Conveyors Belts

A conveyor belt (or belt conveyor) consists of two or more pulleys, with a continuous loop of material - the conveyor belt - that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler. There are two main industrial classes of belt conveyors; those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport industrial and agricultural materials, such as grain, coal, ores, etc.

Generally in outdoor locations. Generally, companies providing general material handling type belt conveyors do not provide the conveyors for bulk material handling. In addition, there are a number of commercial applications of belt conveyors such as those in grocery stores.

All of the motor-driven belt conveyors employed on the new inbound baggage-handling system, feature decentralized drive technology. The system comprises of the conveyor and features the latest in automated materials-handling technology, providing fast and efficient transfer of baggage from the Tarmac to the airport’s five baggage-collection carousels.

3. Structure of the System

Figure 3: The Full Structure of the System

In the previous section we explained the project in parts and divided into sections to ease the mission of explaining it. Now this is the full structure of the system starting from the RFID reader through the control unit the PC and at the end the motors.
3.1 Pseudo code

In this section, we the proponents are going to explain the steps of the system functionality:
For example we have an ID serial number ID1=05571, ID=05572
M1=motor number, M2=motor number2
And let’s suppose that X is the RFID identification
Begin
If X=ID1 then drive M1
Else no action taken
If X=ID2 then drive M2
Else no action taken

4. Analysis of Results

In the final test, we suffered from a simple problem that the motors use a single power supply 12v cause sometimes it goes through a complication between the voltage distribution between the stepper motors so we try to divide the voltage between them.

<table>
<thead>
<tr>
<th>Test</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test1</td>
<td>Baggage classified</td>
</tr>
<tr>
<td>Test2</td>
<td>One baggage not being identified</td>
</tr>
<tr>
<td>Test3</td>
<td>Baggage classified</td>
</tr>
</tbody>
</table>

Note: The result of Test2 due to the range of the RFID identification of the tag

5. Conclusion

In this paper we have aimed to mathematically ease the classification of the baggage in the luggage handling system of airports. Starting with using the RFID technology to identify the baggage’s as good as possible. The simple models provide a fundamental understanding of the basic mechanisms behind the handling systems. The simple illustrate o simple model or prototype of how the system going to be if its supported with an RFID readers. Solving the system classification by a manual system problem its going to be solved by this system clearly , we have found that this model exhibits another system of airport but not the same methods.
6. Recommendation and Future Work

Despite the research undertaken during the development of this project, there is still considerable scope for future work on this topic. Here is going to be more than one aspect would be to incorporate into the existing full model:

1. Build a sensor circuit that drives the motors when the baggage reach the motors to avoid the delay problem or specifically time problem.
2. Use a barcode because the RFID technology is expensive despite of its great functioning.
3. Increase the network of the system.

7. Acknowledgments

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References

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