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Baggage Tracing and Handling Systems Using MIFARE and IOE for Airports

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Abstract- **Main objective of this paper is to track the baggage and enhance the airport monitoring system. The proposed system consists of a MIkron FARE Collection System (MIFARE) tag and reader and Internet of Everything (IoE).MIFARE Readers would be installed at various location in the airport. When the baggage comes in the vicinity of the reader then location can be found which will send that location to the server. This system ensures that airport baggage tracing and handling system would be tracked properly and efficiently. This system can also generate detention list of the baggage. When passengers arrive at the airport they first head to the check-in section to deliver the luggage. At check-in section, the information of each and every passenger is taken and stored in the information bank (server). The information bank consists of four important items including the name of the airline, flight number, bag nature and mobile number of the passenger along with the identification number which is peculiar to each person. This identification number is stored in the memory of the MIFARE tag along with the other details of the passenger for any further investigation and referral to the information about the person and their luggage. It is a small scale application which is completely automated, easy to control, time saving and reliable.**

Index Terms- **Airport monitoring, Internet of Everything, MIkron FARE collection system.**

I. INTRODUCTION

An airport is an aerodrome with extended facilities, mostly for commercial air transport. Nowadays airport is the most international means of transport and it is observed that every year more than 30 million passengers and 35 million bags are influenced by baggage mishandling which has resulted in loss of $3,500 million to aviation industry. A Baggage handling system transports checked baggage coming from airplanes to baggage claims or to an area where the bag can be loaded on to another airplane. Although the primary function of a BHS is the transportation of bags, a typical BHS will serve other functions involved in making sure that a bag gets to the correct location in the airport. Sortation is the process of identifying a bag and the information associated with it, to decide where the bag should be directed within the system.

In addition to sortation, a BHS may also perform the following functions:

- Detection of bag jams
- Volume regulation (to ensure that input points are controlled to avoid overloading system)
- Load balancing (to evenly distribute bag volume between conveyor sub-systems)
- Bag counting
- Bag tracking
- Redirection of bags via pusher or diverter
- Automatic Tag Reader (ATR) (Reads the tags on the luggage provided by the airlines)

There is an entire process that the BHS controls. From the moment the bag is set on the inbound 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

II. EXISTING METHOD

In [4], Aviation industry is one of the areas which have a strong potential to benefit from Radio Frequency Identification (RFID) and the Internet of Things (IoT). The most common loopholes experienced in Aviation industry for Baggage Handling are mislaid baggage, lost baggage and damage to belongings. So for providing a better and secure system to the passengers, we have proposed a design of baggage tracing and handling system using smart RFID tags and IoT which is based on cloud server.

We have designed a prototype at two locations having both check-in and check-out processes. A more secured algorithm is used for generating tags that are attached to printed baggage label with the details of passenger and airline stored in it. RFID readers in the check-out areas facilitate step tracking of baggage which prevents baggage loss. The baggage's real time position is tracked and stored in a cloud using IoT and unique ID can be retrieved by the passengers wherever and whenever necessary. The same ID can be used while collecting bag at check-out counters. The system provided ensures less consumption of time, security for baggage and is economical hence provides customer satisfaction.

The RFID is a very effective, feasible and cost-effective technology for object identification. The fundamental RFID system consists of three components: Tag, Reader, and Backend Application. The tag consists of a microchip and antenna which is assigned a unique serial number to identify the object and can also store information such as including the name of the Airlines, flight number, bag nature and mobile number of the passenger.

The tag is passive and receives both information and energy to operate from RF signal. The tag specification is operated in the UHF range because UHF works well in the dry non-metallic environment and is usually used in aviation baggage application. RFID have its place in a group of technologies referred to as Automatic Identification and Data Capture (AIDC). AIDC methods automatically identify objects, collect data about them, and write those data directly into computer systems with little or no human intrusion. RFID methods utilize radio waves to accomplish this.

III. PROPOSED SYSTEM

The internet [6] has dramatically changed the way people take the normal course of actions. By the recent growth of the Internet, connecting different objects to users through mobile phones and computers is no longer a dream. Aviation industry is one of the areas which have a strong potential to benefit from the Internet of Things.

Among many problems related to air travel, delayed and lost luggage are the most common and irritating. Therefore, this paper suggests a new baggage control system, where users can simply track their baggage at the airport to avoid losing them. Attaching a particular pattern on the bag, which can be detected and localized from long distance by an ordinary camera, users are able to track their baggage. The proposed system is much cheaper than previous implementations and does not require sophisticated equipment

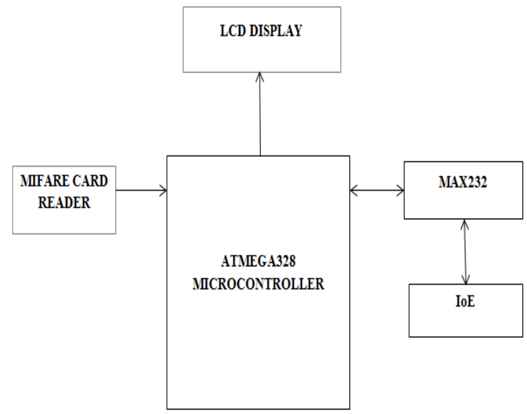

Fig1. Block diagram of luggage handling system

The Arduino Uno is a microcontroller board based on the ATmega328 datasheet. It has 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform. Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world.

The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

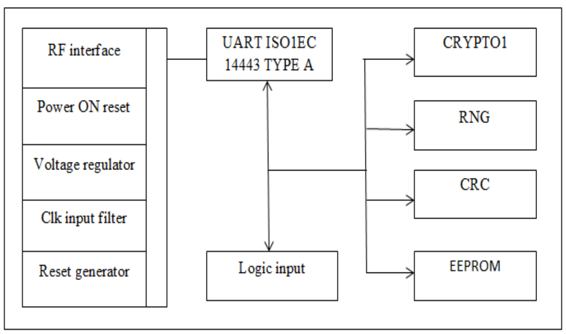

Fig 2. Block diagram of MF1S50yyX/V1

The MF1S50yyX/V1 chip consists of a 1 kB EEPROM, RF interface and Digital Control Unit. Energy and data are transferred via an antenna consisting of a coil with a small number of turns which is directly connected to the MF1S50yyX/V1. No further external components are necessary. The commands are initiated by the reader and controlled by the Digital Control Unit of the MF1S50yyX/V1. The command response is depending on the state of the IC and for memory operations also on the access conditions valid for the corresponding sector.

In the anti-collision loop the identifier of a card is read. If there are several cards in the operating field of the reader, they can be distinguished by their identifier and one can be selected (select card) for further transactions. The unselected cards return to the idle state and wait for a new request command.

After selection of a card the reader specifies the memory location of the following memory access and uses the corresponding key for the three pass authentication procedure. After a successful authentication all commands and responses are encrypted.

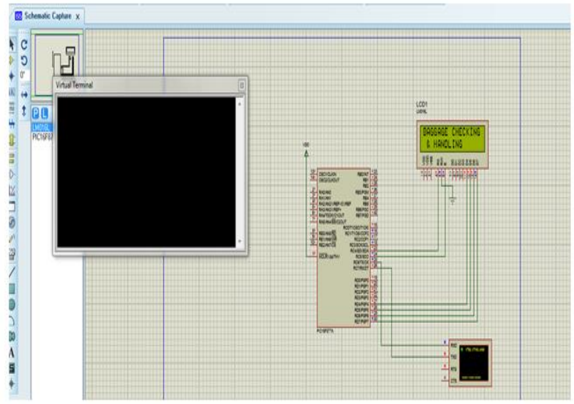

Fig 3. Generation of unique identification number

The proposed project is embedded with IoE. The IoE provides user-generated communications and interactions with the global entirity of networked devices. The Internet of Everything (IoE) is a concept that extends the Internet of Things (IoT) emphasis on machine-to-machine (M2M) communications to describe a more complex system that also encompasses people and processes. The concept of the Internet of Everything originated at Cisco, who defines IoE as "the intelligent connection of people, process, data and things." Because in the Internet of Things, all communications are between machines, IoT and M2M are sometimes considered synonymous. The more expansive IoE concept includes, besides M2M communications, machine-to-people (M2P) and technology-assisted people-to-people (P2P) interactions. The Internet of Everything brings together people, process, data and things to make networked connections more relevant and valuable than ever before - turning information into actions that create new capabilities, richer experiences and unprecedented economic opportunity for businesses, individuals and countries. The “Internet of Everything” builds on the foundation of the "Internet of Things" by adding network intelligence that allows convergence, orchestration and visibility across previously disparate systems. The explosion of new connections joining the Internet of Everything is driven by the development of IP-enabled devices, the increase in global broadband availability and the advent of IPv6. The network plays a critical role in the Internet of Everything – it must provide an intelligent, manageable, secure infrastructure that can scale to support billions of context-aware devices. IOE is the intelligent connection of people, process, data and things.

Fig 4. Location of baggage

Fig 4 represents the graph plotted for finding the location of the baggage. Here x-axis represents the date and time and the y-axis represents the random number. When the MIFARE card is read the details of the passenger are entered and stored in the cloud server. Once the details are entered the location of the baggage can be determined from the graph.

IV. RESULT

A simplified version of the airport baggage handling system was proposed in the model and was simulated using proteus tool. For this experiment we used IoE and MIFARE and Arduino software. We tested a set of models and as a result the location of the baggage was found from the graph. In this paper IoE was used in thingspeak through which the bag can be detected and also the occurrence of theft is minimized.

V. CONCLUSION AND FUTURE WORK

In this 21st century, the high security of luggage is of big concern in aviation industry due to repeated loosing, delay and stolen baggage of passengers. The proposed research work focuses on research to develop a working model of a baggage handling system using MIFARE card and IoE which will track bags.

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