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Automated Trolley System for Airport

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Abstract

Our Baggage Trolley System ensures that the user can easily access their trolley for transportation of their baggage to their respective terminals of the airport. Everyone would like to lower the high cost wherever it is possible. The amount of costs generated by the baggage loss within the air travel is maximum. As the aircraft can only take off if all the checked-in baggage has its owner on board. If not, the baggage has to be offloaded. In the proposed project the user need not to carry the luggage; the trolley will reach its pre-defined terminal. The trolley will be operated by the RFID card reader to identify the location. Load cell is used for the identification of weight of the luggage. This system will provide full security to the luggage. The costs generated by baggage loss are very high for both the airlines and the airports. The application of RFID technology would reduce these costs extremely. The RF transmitter and receiver are used to identify whether the trolley has reached its correct terminal if not the trolley is enrooted to the correct terminal.

Index Terms--- Automated Trolley, RFID, RF Transmission, Arduino.

I. Introduction

Trolley management and maintenance at the airport is very complex and utilizes maximum man power. The existing system is that the passengers have to take a trolley from the place where the trolleys are arranged and then to load up the luggage to take then where ever they go. This system is quite simple but the maintaining of this system is very complex. The proposed paper overcomes the above disadvantages. This drastically reduces the cost of man power and the maintenance. The proposed system uses RFID technology and has a predefined route for all terminals. When the trolley reaches its destination it is intimated by the RF transmitter that it has reached its correct destination else the trolley is enrooted to the correct destination.

II. System Design

A. Block Diagram

Transmitter

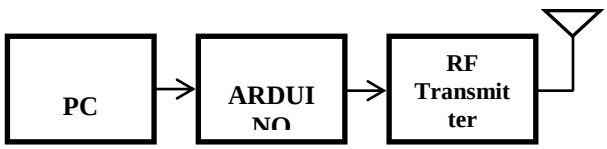


Fig. 1: Transmitter

Receiver

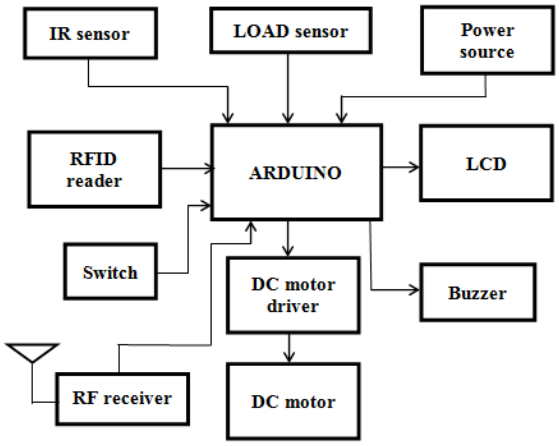


Fig. 2: Receiver

B. Methodology

IR sensor: In this system the optical sensor is used to detect the obstacle and trigger the buzzer. If obstacle is far away from sensor, it does not give reflected back signal and if obstacle is in range of sensor then it will get the reflected signal then obstacle is detected.

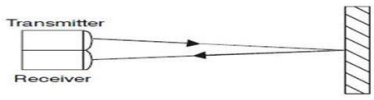


Fig. 3: Optical Sensor

Load sensor

In this system load sensor is used to measure and display the weight of the luggage continuously. Incase if the luggage is accessed without authorization then the load cell senses the reduction in weight and triggers the sensor.

Fig. 4: Load Cell

RFID Reader

The RFID reader is used to read identification cards (RFID cards) using radio waves. This has a receiver transmitter module with antenna and 2x5 male connectors that enable connection with development systems. 125 KHz voltage power is supplied on the antenna. The passive card doesn't have its own power supply; it features a coil where the voltage is automatically induced by the approaching card to the RFID antenna.

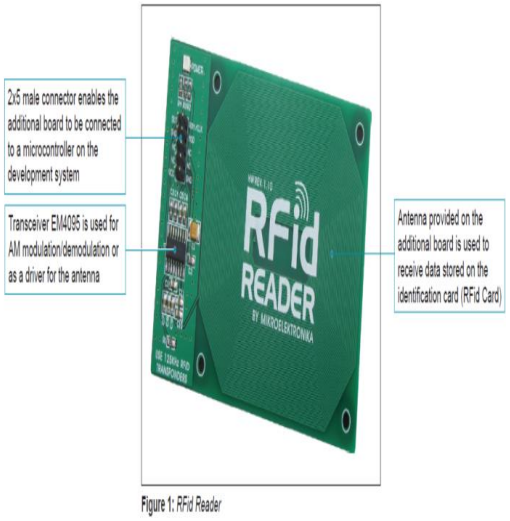


Fig. 5: RFID Reader

C. Hardware Design

1. Development Board

The development board consists of an arduino board. The duemilanove board features an Atmel ATmega328 microcontroller operating at 5 V with 2 Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executing about 300,000 lines of C source code per second. The board has 14 digital I/O pins and 6 analog input pins. There is a USB connector for talking to the host computer and a DC power jack for connecting an external 6-20 V power source, for example a 9 V battery, when running a program while not connected to the host computer. Headers are provided for interfacing to the I/O pins using 22 g solid wire or header connectors. The sensors such as optical sensor and load cell are interfaced to the microcontroller. RFID card reader which is used to read the RF card. The memory chip on the RFID card contains a unique identification code. This code is sent by the card when it is placed close to the RFID reader's antenna. This code is received via this antenna and it is sent to the arduino (microcontroller) for further processing. The motors used are controlled by motor drivers. The relays are used for controlling the direction of the motor. For a single motor two relays are used for forward and reverse directions. Hence for two motors four relays are used such that allowing the trolley to move forward, reverse, right, left. Two line LCD is interfaced to display the weight of the luggage. The power source is used is 12V-15V battery supply since the arduino and the sensors need only 5V supply to operate and the motors operate at 12V supply.

Benefits to the Customers: This trolley system has a predesigned route for each terminals so that the passengers can transport their luggage to their respective terminal automatically with ease and securely. Thus the passengers need not carry their trolleys wherever they go. This is applicable for both departure and arrival process.

User Friendly and Cost Effective: As this system uses microcontroller, it operate on less power and ire less space, it is user friendly and cost effective.

2. Hardware of RF Module

The RF TX-434 and RF RX-434 are extremely small, and are excellent for applications requiring short-range RF remote controls. The transmitter module is only 1/3 the size of a standard postage

stamp, and can easily be placed inside a small plastic enclosure.

RF TX-434: The transmitter output is up to 8mW at 433.92MHz with a range of approximately 100 foot (open area) outdoors. Indoors, the range is approximately 50 foot, and will go through most walls.

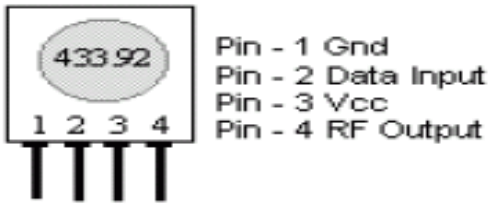
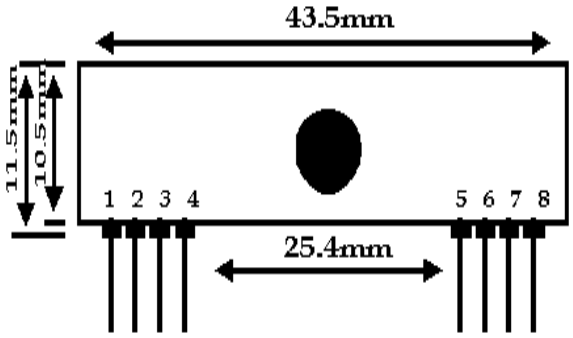


Fig. 6: RF TX -434 PIN Diagram

The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy. The TWS-434 is approximately the size of a standard postage stamp.

RF RX-434: The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The RWS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs.



pin 1 : Gnd
pin 2 : DigitaL Output
pin 3 : Linear Output
pin 4 : Vcc
pin 5 : Vcc
pin 6 : Gnd
pin 7 : Gnd
pin 8 :Ant (About 30 - 35 cm)

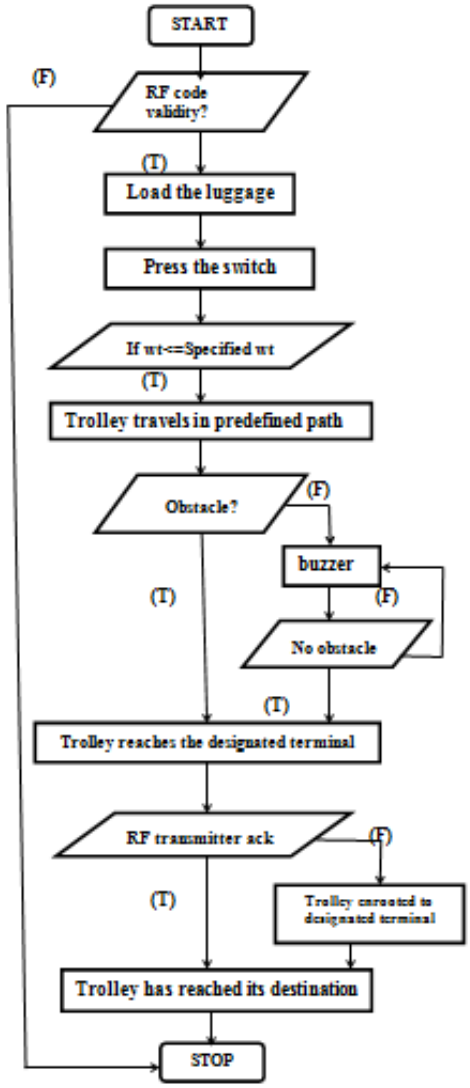
Fig. 7: RF RX -434 PIN diagram

D. Software Design

The software design is based on the Embedded C to program the microcontroller (Arduino).

III. System Implementation

Flow Chart



System Operation

Unique RFID card is decided for each terminal so that when the RFID reader reads the card it gets the destination and chooses the path according to the destination. The trolley is programmed with the predefined path, according to the destination like cargo, international terminal. The card should be shown to the RFID card reader, and then the luggage has to be placed over it. After the luggage is placed, the switch has to press to start the trolley. It will automatically reach the destination. The IR

sensor is used for the finding the obstacle. If obstacle is found, it alerts through buzzer. The trolley will stop until the obstacle is there and then it moves forward. It automatically stops when reaches the destination. If any one takes the luggage, there will difference in the weight and buzzer will alert it. The weight is displayed in the LCD. Then the person again shows the RFID card to take their luggage and after the weight become zero, the trolley will move to the arrival terminal were the passengers leave the terminal to get out of the airport. The trolley reaches its start position and then it stops. Thus this cycle is repeated. The passengers have to carry the card, and before leaving to the runway the passengers will have to drop the card in the collector box. After that only, the gate will be opened for them and all the card will be returned for the next day use.

IV. Result & Conclusion

The RFID helps in identifying the destination and the movement of the motor in all directions is controlled by the microcontroller. The sensors such as IR and load cell provide safety and security. The RF module helps in monitoring whether the trolley has reached its correct destination. The control of the whole system is located in the Arduino board which makes the implementation of this system possible. Thus the automatic trolley system enables the transportation of the luggage to the respective terminal and also provides full security.

V. Future Scope

This automated trolley system can be enhanced by using GSM module. Further it can be developed by determining the shortest path using network algorithms.

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