Design & Construction of RFID Assisted Automatic Baggage Sorting System

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Abstract- *The These This project report incorporates all the details of 'Design and Construction of RFID assisted object sorting system using AVR microcontroller especially for distribution of baggage at airport terminals. It also involves fundamentals of embedded C language and description of various components used in this automation system that were studied during seven and eight semester of Bachelor of Engineering course provided by University of Pune.*

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 in a airport environment.

This is an automated system with RFID tags/detectors, intelligent control systems, sorting mechanisms and smart conveyor system. This study 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.

My main work focused on RFID technology which is used for the purpose of identifying products which lead 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 6V geared DC motor coupled to DVD writer used as pushing mechanism.

Keywords- Adaptive, heterogeneous networks, neural networks, reinforcement learning, video transmission control.

I. INTRODUCTION

We Baggage sorting is one of the major requirements for rapid processing in an airport. Airports at which hundreds of planes take off and land every day, around the clock, require an immense amount of planning and perfect coordination of complex processes for baggage sorting. Several thousand passengers move through the terminals every day and tons of cargo need to be handled.

The baggage handling system at an airport plays a crucial role in keeping travelers happy. It also can make the difference in an airport's ability to attract or keep a major airline hub.

A baggage-handling system has three main jobs:

- Move bags from the check-in area to the departure gate.
- Move bags from one gate to another during transfers.
- Move bags from the arrival gate to the baggage-claim area.

Baggage handling-

In the baggage handling system, belt conveyors transport the baggage items smoothly and reliably within the terminals. Airport baggage handling systems are often equipped with several kilometers of belt conveyors between the check-in counter and flight make-up or between the plane unloading point and the baggage reclaim area.

High-speed conveyors are of particular importance for spread-out transit airports. The baggage of transit passengers must be transported quickly and reliably from one terminal to another. But medium or small sized airports cannot take advantage of such systems because sorting is preformed at large space, handled by large size, high sped conveyor.

II. LITERATURE REVIEW

Now For larger airport automated system is must to match with the dynamic world. But there are over 100 small to medium size airports handling between 1.5 and 6million passengers a year, still haven't automated or have done so to only a limited extent.. For many of these airports, there are still big gains to be made in cost, time and efficiency and sorting quality by introducing automated sorting system.

The problem for many of those airports is finding the right systems to do the job. Because in many cases, solutions are designed primarily for the larger airports where much of the automation market is to be found are not cost effective for lower volume environments, and often those system cannot be accommodated within the space constraints of smaller terminal buildings many of which have to handle today's constantly increasing passenger and baggage volumes in facilities that were originally built for much lower traffic levels.
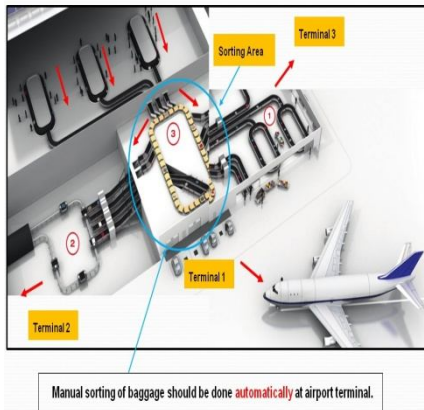
III. PROBLEM DEFINITION

Solutions designed for larger airports are not cost-effective for lower volume environments and often can't be accommodated in smaller terminal buildings.

IV. OBJECTIVE

Automatically Sorting of Baggage at Airport terminals to stated destination and logical control over a sorting system.

I am eager to find an easy and simple solution for those lower volume environments in this project work. In the present project, an automated baggage handling and sorting system has been designed using microcontroller so that it could be cheaply implemented on a small size terminal with a low cost. A small scale model of the project has also been constructed. The sorting system is based on RFID technology and tracking of baggage is done in a terminal.

Baggage coming from check in counter gets transported to airports terminals through distribution conveyors and sorted automatically with the help of microcontroller & distribution system.

V. BLOCK DIAGRAM

VIDEO SYSTEM DESIGN & WORKING:-

The first layer is a data capturing front-end system with IR sensors and RFID transponders and transducers. IR sensors are placed at the start and end points of the conveyors which are used for the detection of product presence on the conveyors and its positions.

Products are tagged with RFID transponders. Each tag consists of a unique identification number with 10digits. These identification numbers correspond to the product type. The products are identified using the RFID readers located in close proximity to the conveyors. According to the identified product type and details decisions are made to sort the products to   the relevant sub conveyors. The RFID system identifies the product type and sends signals to the control system to guide the product to the relevant conveyor line using the pushing mechanism. IR sensors are used to identify the product locations along the conveyor belts.
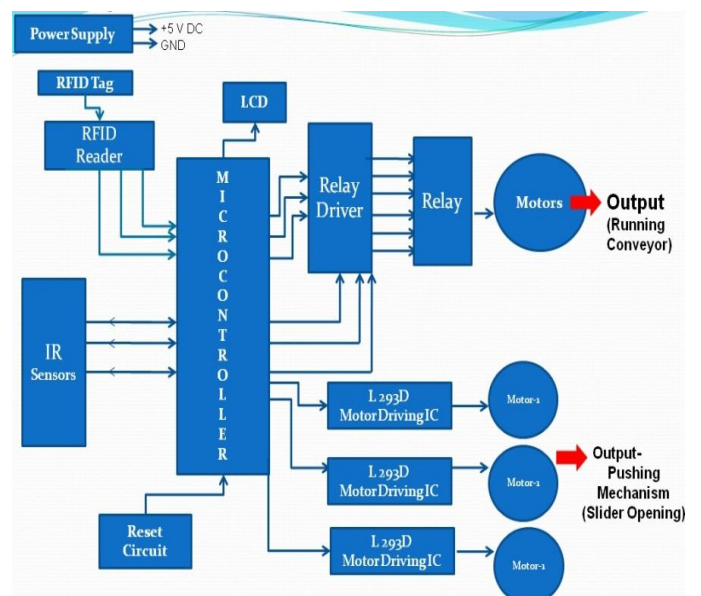

Fig. Block Diagram

POWER SUPPLY DESIGN

The circuit diagram of power supply which gives output of 5V, as only that much is required for microcontroller. Its circuit diagram and designing calculation are given below.
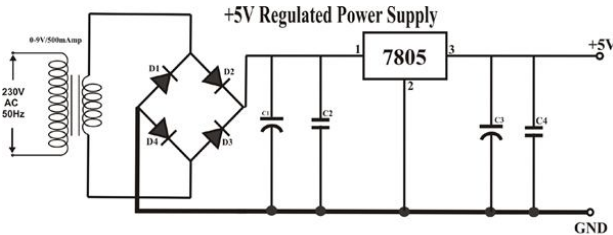


Fig. Regulated Power Supply

The +5 volt power supply is based on the commercial 7805 voltage regulator IC. This IC contains all the circuitry needed to accept any input voltage from 8 to 18 volts and produce a steady +5 volt output, accurate to within 5% (0.25 volt). It also contains current-limiting circuitry and thermal overload protection, so that the IC won't be damaged in case of excessive load current; it will reduce its output voltage instead.

The advantage of a bridge rectifier is you don't need a centre tap on the secondary of the transformer. A further but significant advantage is that the ripple frequency at the output is twice the line frequency (i.e. 50Hz) and makes filtering somewhat easier.

The use of capacitor c1, c2, c3 and c4 is to make signal ripple free. The two capacitor used before the regulator is to make ac signal ripple free and then later which we are using is for safety, if incase there is a ripple left after regulating, then c3 and c4 will remove it.

POWER SUPPLY COMPONENT DESIGN:-

Transformer Design:
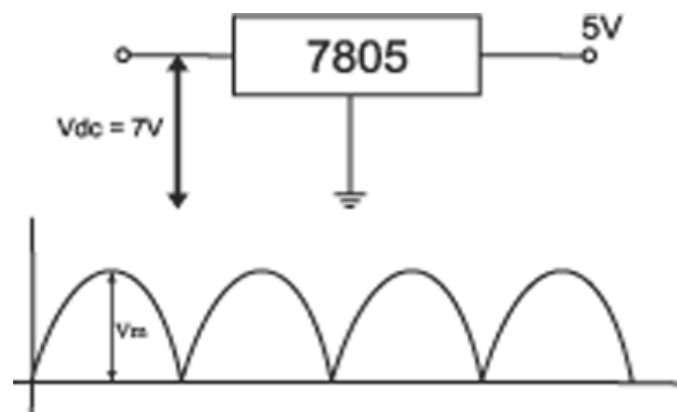
We require 5V at the o/p of the regulator.

The drop out voltage of the regulator is 2V As per the data sheet)

$$Vdc = 5+2 = 7V$$

So at the regulator input, the voltage applied should be of 7V. According to the formula,

$$Vdc = 2Vm/Pi$$

Assuming there is no ripple Capacitor from

$$Vm = Vdc .pi / 2$$
$$=7 x 3.14)/2$$
$$=10.99V$$
$$Vm= 10.99V$$

During one cycle, two diodes are conducting.Drop out voltage of one diode = 0.7V

$$Vim = Vm+ 1.4V$$
$$= 10.99+1.4= 12.39V$$
$$Vim=12.39V$$

$$Vrms = Vim/sqrt (2)$$
$$= 12.39/sqrt (2)$$
$$= 8.76V$$
$$Vrms = 8.76V$$

So we select transformer of 9V.
Similarly

$$Im=Idc x pi/2$$
$$Im=400m x 3.14/2$$
$$= 628mA.$$

$$Irms = Im/sqrt (2)$$
$$= 628mA/sqrt (2)$$
$$= 444.06mA$$
$$Irms = 444.06mA$$

So we select the transformer of current rating 500mA.

Considering the above transformer rating.

We take the transformer of 0-9V/500mA

TRANSFORMER - 0-9V/500mA Step-down transformer.

RECTIFIER DESIGN:-

PIV of diode = Vm = 12.39V

Im= 628mA

BRIDGE RECTIFIER- So, we select the bridge IC of 1Ampere rating.

ADVANTAGES-

1. Reduce time in baggage detection
2. Automatically handle the baggage
3. No chance of baggage missing
4. Eliminate the miss management in baggage sorting
5. Efficient identification system i.e RFID
6. Design by using low cost material with high strength.
7. Can be easily accomplished in bigger scale.

VI. CONCLUSION

We 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 in a airport environment.

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ACKONOWLEGEMENT

We have great pleasure in presenting a project report on "DESIGN & CONSTRUCTION OF RFID ASSISTED AUTOMATIC BAGGAGE SORTING SYSTEM"

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