

# DumbleDoor

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RFID security system

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**Preliminary Design Report**

**EEL 4924 – Electrical Engineering Design 2**

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## Abstract

Our project will involve the construction of an automated deadbolt door. The deadbolt slider mechanism in a standard door will be replaced with a servo that will activate the door. The door will then be opened via an RFID scanner. A PIR sensor will be used to detect an approaching person at which point, the microcontroller and RFID scanner will power up. Once the RF ID is scanned the code is transmitted wirelessly to the control center. The control center then logs the attempt and checks if the code is currently valid. If valid the control center sends a command for the deadbolt to unlock. The servo will power up and slide the deadbolt out of the door, allowing access. The lock will time out after a set time period and re-lock if the door has not been opened. Once opened, the deadbolt will be reengaged when the door is closed as detected by a reed switch. Once the door is re-locked the RFID scanner is powered down and the micro-controller is put into sleep mode.

Every time someone accesses the system to enter the building the time and date at which that happened is sent to a control center and logged such that it can be viewed by the administrator at any time to see who has entered or tried to enter the building. The control center will only be able to be accessed by both an RFID scanner and a coded series of knocks. The control center

will be used to access the logs and add or remove access permissions for people via a keypad which will also be used to enter the name of the newly registered person. The inside of the door will also feature a PIR distance sensor that will automatically open the door if a person gets within a certain distance of it. There will be a mechanical key entry failsafe for if the batteries on the device fail.

## Introduction

DumbleDoor has its application in secure door entry to homeowners, especially those who have scheduled work done such as cleaning people, etc. This lock not only allows for keyless entry but also for different people to be allowed access at different times. For example, residents of the home can enter at any time while the cleaning lady can only get in on Mondays from 8 to 5.

The advantage of this lock to most on the market is the added feature of different access times for different people as well as the added security of needing to both have the administrator RFID as well as knowing the secret knock to make any changes to the access log.

## Project Features

The users of this project will be able to :

- Scan an RFID to unlock door for entry
- Automatically unlock when someone approaches door from inside
- Add/Remove RFID access for specific times and days
- Control center requires Master RFID and a secret knock to makes changes

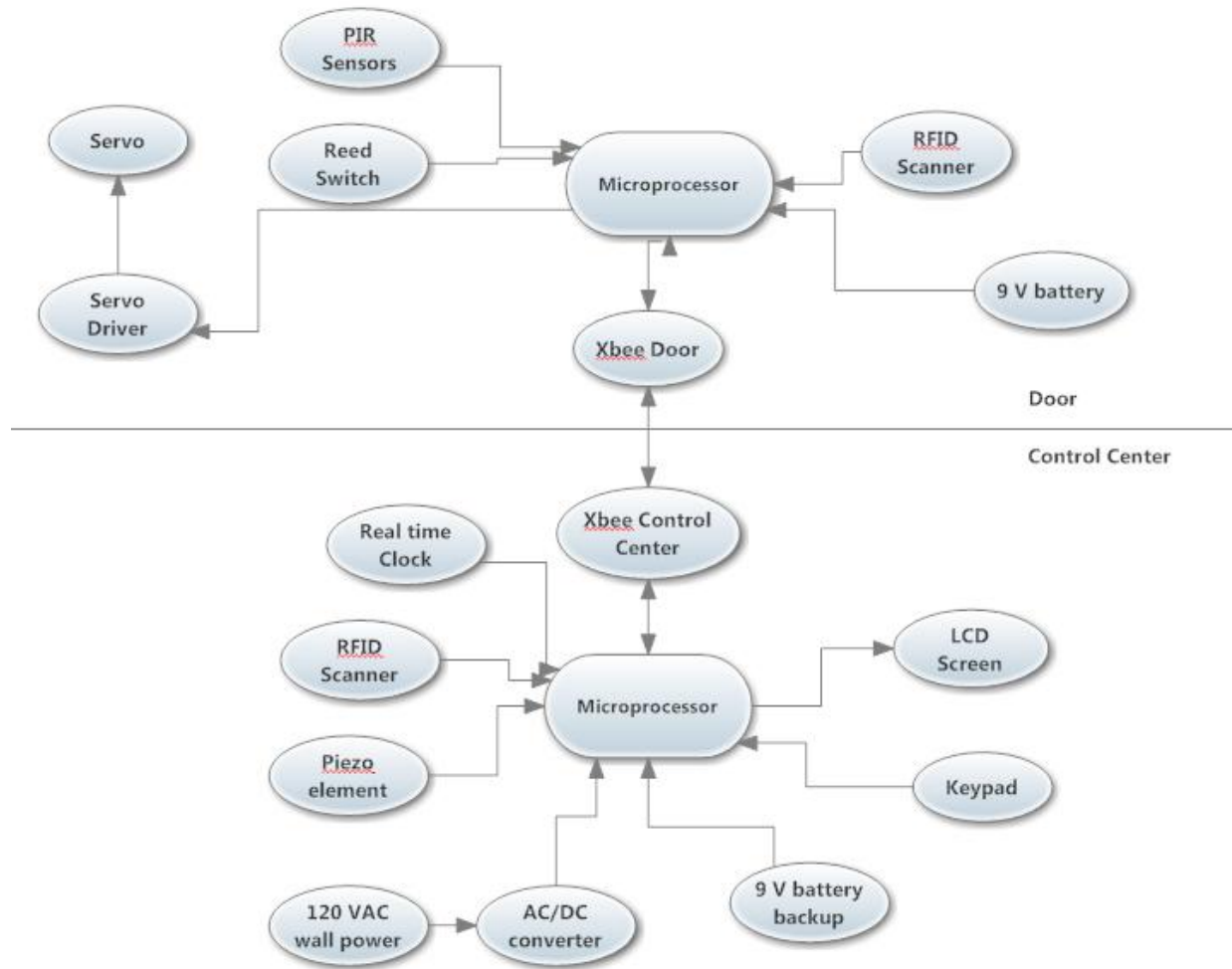


Figure 1 - Project Block Diagram

## Technical Objectives

### Digital Hardware

The microprocessor used in this project is an MSP430. This chip will be used because its low power consumption enables it to be easily implemented on the battery powered door device. The MSP430 will also be utilized for serial communication and the A/D converter.

This project will also make use of multiple Xbees for wireless communication between the door and the control center.

This project has multiple digital input sensors including motion sensors, RFID scanners, reed switches and a keypad for the user interface. The RFID scanner will have an serial output to the MSP430 while the reed switches and the keypad will have a digital output to the MSP430.

## **Analog Hardware**

The analog component will be present in the knock sensor. The piezo element will produce an analog voltage which will need to be conditioned before entering the ADC where software will determine if and when there was a knock for timing purposes

## **Software**

The software component will consist of communication between the door and the control center, verifying and logging door access, programming the MSP430 and programming for user input using a keypad.

## **Technology Selection**

The RFID scanner was chosen for this design because it is relatively cheap and unlike a fingerprint scanner, it doesn't require additional software running on a computer to work. The RFID was also chosen because it comes in a variety of forms such as cards, keychain device or implantable capsules. Furthermore, the use of an RFID scanner allows for the added functionality of only allowing entry based on specific time entries.

The piezo element knock sensor was added to the control center to provide another layer of security in case someone tries to break into the database. The knock sensor is useful because it requires both something you have on your person and something to memorize and it is more entertaining and fun than remembering a passcode.

A PIR motion sensor will be used to detect approaching people so that the device can power up.

## Division of Labor

	Mark Kampfer	Richard Robinson
Preliminary Research	50%	50%
Locking mechanism	50%	50%
User Interface	70%	30%
Knock Sensor	30%	70%
MSP430 Programming	50%	50%
PCB Design	50%	50%
Final Product construction	50%	50%
Test and Debug	50%	50%
Profit	50%	50%

Table 1 - Division of Labor

## Gantt Chart

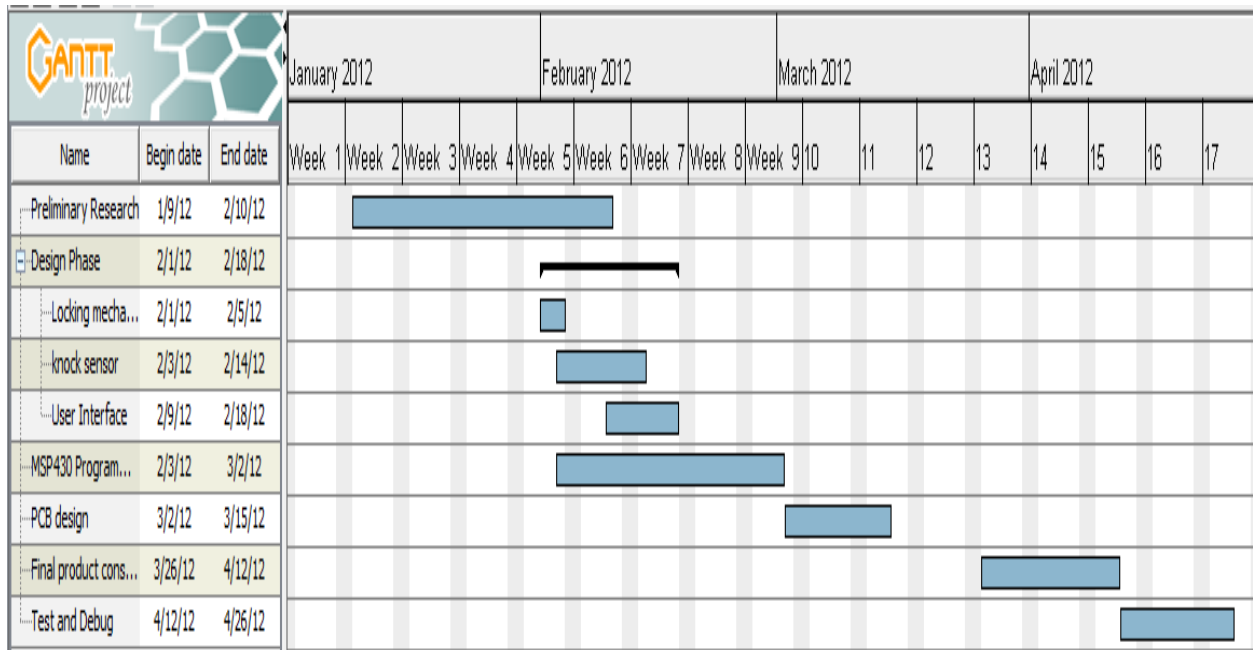


Figure 2 - Gantt Chart