Preliminary Design Report with Diagram(s)

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Project Title: Biometric Access Control System

Team Name: P & B Security Solutions

Team Members:

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Bilal Ahmed
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Project Abstract:

The goal of our project is to design and assemble a biometric access control system that uses fingerprint scanning and recognition to authenticate the user. Upon successful authentication, the user will be allowed to access the safe. On the other hand, if the access is denied, it will be reported to the center administrative console for audit purposes. The fingerprint scanning device utilizes serial communication. This device will be connected to our microprocessor using the UART ports. The system will consist of an Atmel Atmega32 microprocessor, LCD display, fingerprint sensor, electronic door strike, and MCU to USB PC interfacing. Software will be written for the PC that allows the owner to register and delete fingerprints and monitor door entry. LCD’s and LED’s will be used to display whether or not access was granted or denied. The biggest challenge that will be faced is figuring out how to interface the Atmega32 with a PC via USB and writing software that allows the owner to manage fingerprint access. If time permits a cell module will be used to alert the owner of a possible break-in attempt.

Figure 1: User interface when connected via USB to PC.
Features:

- A fingerprint sensor to scan and authenticate users.
- Electric door strike that unlocks when access has been granted.
- Backlight LCD that displays important information to users.
- Easy to setup via USB to PC.
- Software to enroll, delete, and identify users.

The Competition:

The FIRE-SAFE 3930 is a fingerprint safe that is sold at [http://www.homedepot.com](http://www.homedepot.com) for $341. This system costs nearly double ours and can only store 14 fingerprints. This unit also does not include an LCD or LEDs to indicate whether access was granted or denied. Our safe will cost approximately $200 and will be able to store over 100 fingerprints. Moreover, our safe can be easily setup by plugging into a PC using the USB.

![Figure 2: FIRE-SAFE Fingerprint Safe](image-url)
Introduction:

The biometric access control system we are designing is beneficial for a number of reasons. It provides high identification performance, low power consumption, and can easily be integrated into a wide number of applications such as a door lock system, safe box, simple access controller, vehicle control, and ATM. Our device will differ from other devices out on the market due to our system's ability to be interfaced with a PC via the USB cable. This feature will make setting up and securing the system easy.

Technical Objectives:

An Atmega324 will be used to interface all of the components in our system. The fingerprint scanner is controlled using RS-232 serial communication so this device will be connected via its UART pins to the microcontroller UART0. An FTDI serial-to-USB chip will be used to interface the microcontroller to the PC again using the UART1 pins on the microcontroller. It appears that interfacing the microcontroller with the PC will be the most challenging aspect of our design. Our goal is to write a visual basic program that will be used to enroll, delete, and audit fingerprints of our system.

Figure 3: Fingerprint Sensor
Cost Objectives:

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitgen Fingerprint Scanner</td>
<td>$129.99</td>
</tr>
<tr>
<td>Electronic Door Strike</td>
<td>$20.00</td>
</tr>
<tr>
<td>Atmel Atmega324</td>
<td>$6.00</td>
</tr>
<tr>
<td>Maxim Max232 Serial Level Converter</td>
<td>$0.90</td>
</tr>
<tr>
<td>FTDI Serial-to-USB</td>
<td>$7.99</td>
</tr>
<tr>
<td>LCD Display</td>
<td>$10.00</td>
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<tr>
<td>TOTAL COST (PROTOTYPE)</td>
<td>$174.88</td>
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</table>
Division of Labor

<table>
<thead>
<tr>
<th>PAOLO BRUNO</th>
<th>BILAL AHMED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Parts</td>
<td>Research Parts</td>
</tr>
<tr>
<td>Test Fingerprint Sensor</td>
<td>Door Strike Testing</td>
</tr>
<tr>
<td>Interface Sensor with µP</td>
<td>PCB Design</td>
</tr>
<tr>
<td>Interface µP with PC via USB</td>
<td>Mock Door Construction</td>
</tr>
<tr>
<td>Debug</td>
<td>Debug</td>
</tr>
</tbody>
</table>

Timeline:

Gantt Chart
References or Bibliography:

http://www.sparkfun.com

http://www.homedepot.com

Materials and Resources:

One major component that will be used is the fingerprint scanning and recognition device developed by Nitgen. It is a durable compact device with a fingerprint identification module that houses an optics based fingerprint sensor (Spark Fun).