

# CS 152B Final Project: Multifactor Security System

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# Outline

- Project Introduction
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# Project Introduction

- We created a security system that uses 3 forms of authentication (2 things you have: phone, keycard. 1 thing you know: Bluetooth PIN)
- Interesting because security is becoming increasingly more important
- We are developing a business facing security center

# Real-World Constraints

- **Security** is usually the highest priority in a business facing security system, so our system must be robust enough to prevent fraud and theft. The components of our product must adhere to a high standard of protection.
- The two most important constraints in the real world are **Manufacturing Costs** and **Extensibility** - we must support large quantities of users and integrate into already existing systems

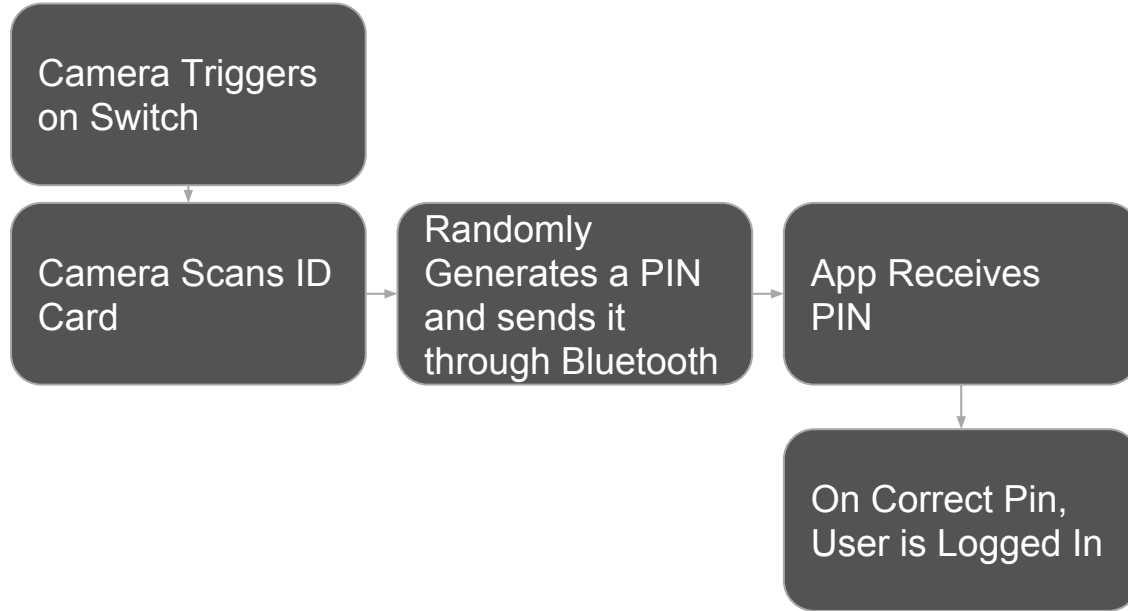
# Industry Standards

- Most modern forms of multi factor authentication utilize the user's phone (i.e. gmail, UCLA mfa, etc.)
- Intuitive Computer-Human interface, employing a simple visual scanner, keypad, and mobile app
- Wireless data sent over Bluetooth. Most industry applications use WiFi, but in our case Bluetooth is preferred due to physical locality

# Costs

- Major Development Costs: Image recognition algorithm, security design, UI/UX development, system architecture
- Advertising is very competitive, meeting the demands of a multimillion dollar industry
  - Target Addressable Market: Businesses which require secure access to grounds
- Human Costs: Engineering Labor
- Physical Components: system + peripherals, user mobile devices

# Project Description



**Pros:** Many forms of authentication, including mobile device which is a modern standard for security.

- Incorporates: keycard, physical location, bluetooth PIN, passcode on mobile device

**Cons:** Fraud can easily occur with our current implementation:

- **Image Processing:** elementary algorithm, consists of a 9 block grid.
  - Improvements: finer granularity, more complex keycard design, higher quality camera
- **4 Digit PIN:** fairly simple to brute force
  - Improvements: increase complexity of PIN to incorporate alphanumeric characters. Would require a more complex keypad.

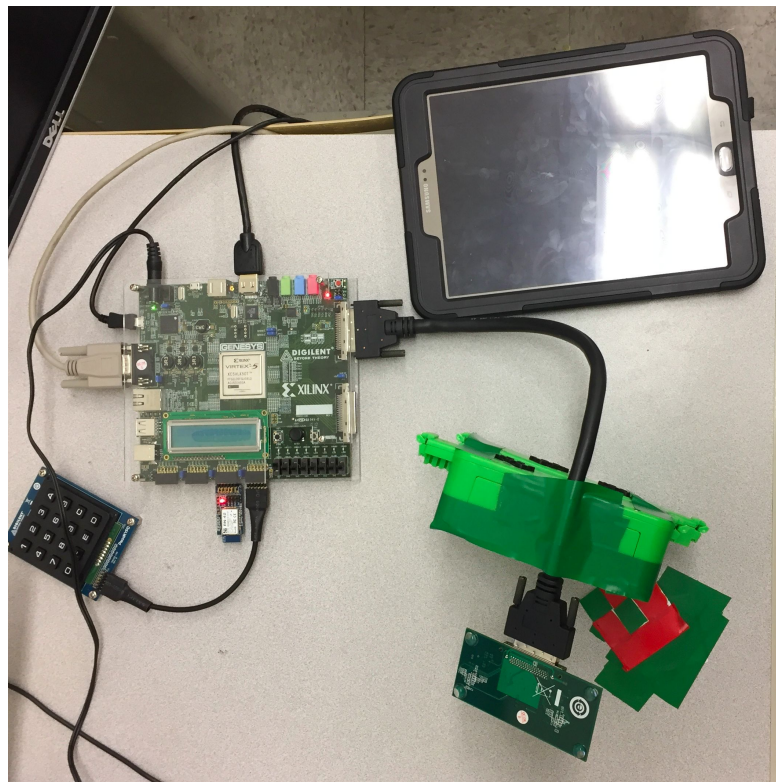
# Algorithms

- Image Detection and Processing (process.c)
  - Scans and averages rgb values in an select set of pixels
- Random PIN generation
  - Uses random pixel data to generate a 4 digit PIN
- GPIO, I<sup>2</sup>C, UART



# Hardware

- Camera
  - I<sup>2</sup>C
- Switch
  - GPIO
- Keypad
  - GPIO
- Bluetooth
  - UART16550



# Software

- Print to console - UART
- Camera setup - I<sup>2</sup>C
- Image processing - C code
- Switch - GPIO
- Keypad Processing - GPIO
- Algorithms - written entirely in software, which is more abstracted and simpler to prototype.

# Demonstration

The image features a background of rich red theater curtains. The curtains are drawn back on both sides, revealing a dark stage area. Each side has a gold-colored rope tie-back with a matching tassel. The word "Demonstration" is centered at the top in a white, sans-serif font.