Tool Check-Out Vending Machine
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Requirements Specification

Problem Statement

Students who need specific tools or components to complete Computer Engineering work are currently forced to conform to normal working hours to obtain these items from the shop in Coover Hall. This can lead students to incomplete projects or late entries on a short deadline, directly impacting a student's course success.

Students need access to necessary items on a moment's notice, and waiting until the next day, or further if the student's schedule does not permit it, to obtain these items is becoming an impractical exercise.

Block Diagram
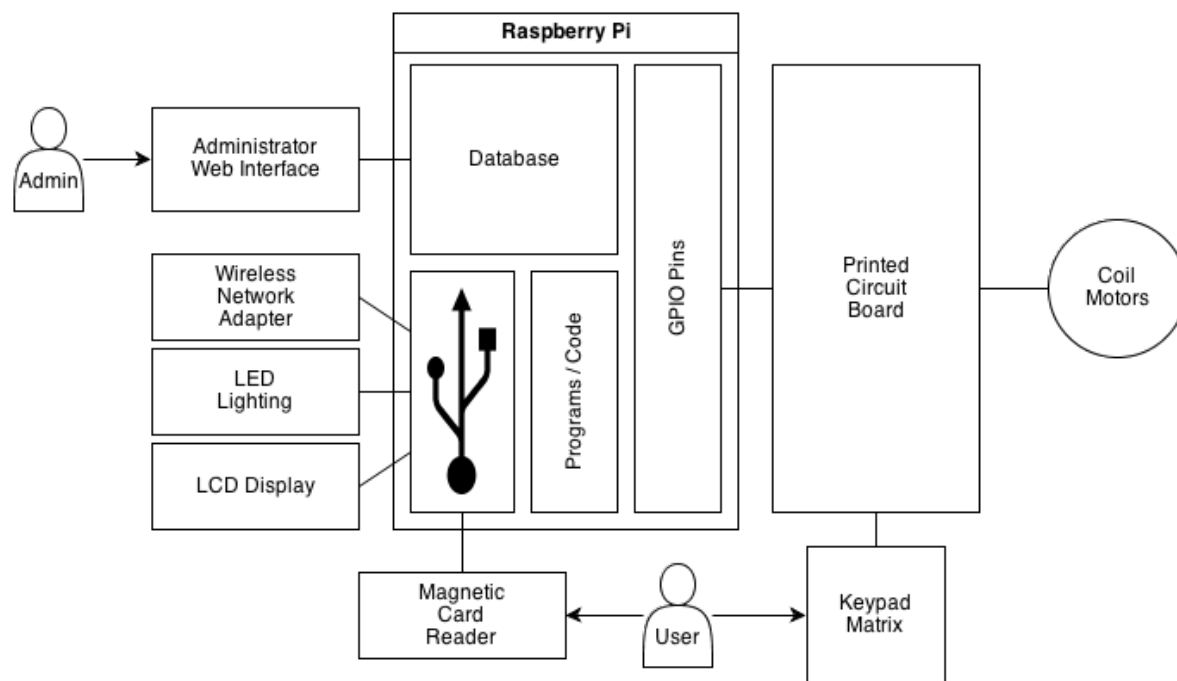
System Description

Our design will be a vending machine that will operate at all times, allowing students to obtain the tools and components necessary at any time of day. The system will vend these items to the student based on a set of conditions, namely that the student only has a few items checked out at a time and the student is authorized to obtain items from the department.

Operating Environment

The machine will be placed in the hallway of Coover Hall, near the current location in which students obtain desired tools and components. The machine will run off of standard 120 V power outlets and connect to existing wireless network access points.

User Interface Description

There will be two main users for our system. The primary users are the students who will be utilizing the machine. Students will use three main interfaces to interact with the system :
1. *Magnetic Card Reader :* Students will swipe their student ID to authenticate with the system
2. *Matrix keypad :* Students enter the row and column value for the item they would like vended
3. *LCD Display :* The machine will communicate necessary information with students. Such notifications include user authentication failure, invalid keypad selection, empty trays, and other vend details.

The second user type will be for an administrator. The administrator will have access to a web page hosted from the machine's internal computer. The page will allow for two main functions :

1. *Student Records :* Administrator will be able to pull up any student record from the database by student, which houses each item from the machine that the student has checked out. They will also be able to add and remove students from the database, essentially revoking machine access.

2. *Machine Status :* Administrator will be able to view inventory of the machine, update inventory as tools are returned, and change current tools and the overall inventory for each tool.

Functional Requirements

- Vend products to authorized students
- Authenticate students based on machine database
- Read student input regarded desired vend item
- Communicate information on an easy-to-read display
- Maintain safe operations
- Give administrator access to student and machine databases

Non-functional Requirements

- Clean up machine
- Paint & adapt machine to ISU theme
- LED lighting in machine

Market Research

- Similar scholarly projects
- Raspberry Pi peripherals

Deliverables

- Tool Checkout Vending Machine
- Administrator Interface

Project Plan

Work Breakdown

- Sean McCracken – Team Leader, Admin UI, Code Development
- Philip Goodman – Communication, Aesthetics, Mechanical Expert
- Kevin Wong – UI Logic, Code Development
- Mohd Zulkalnain – PCB Layout, Motor Operations
- Brian Sewell – Motor Operations, Code Development

Resource Requirements

- Repurposed Vending Machine
- Raspberry Pi
- SD Card
- Powered USB Hub
- Magnetic Card Reader
- Wireless Network Adapter
- LCD Display
- LED Lighting

Project Schedule
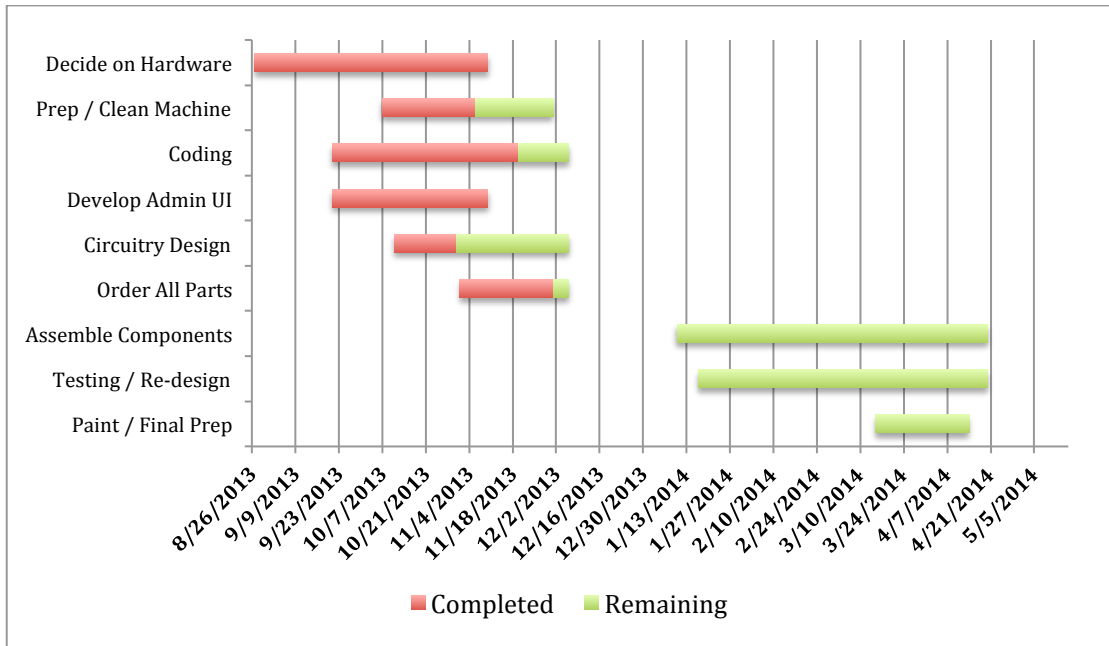
Risks

- Machine Breakdown / Malfunctions
- Power Issues
- Database Loss
- Mechanical Safety
- Logic Bugs