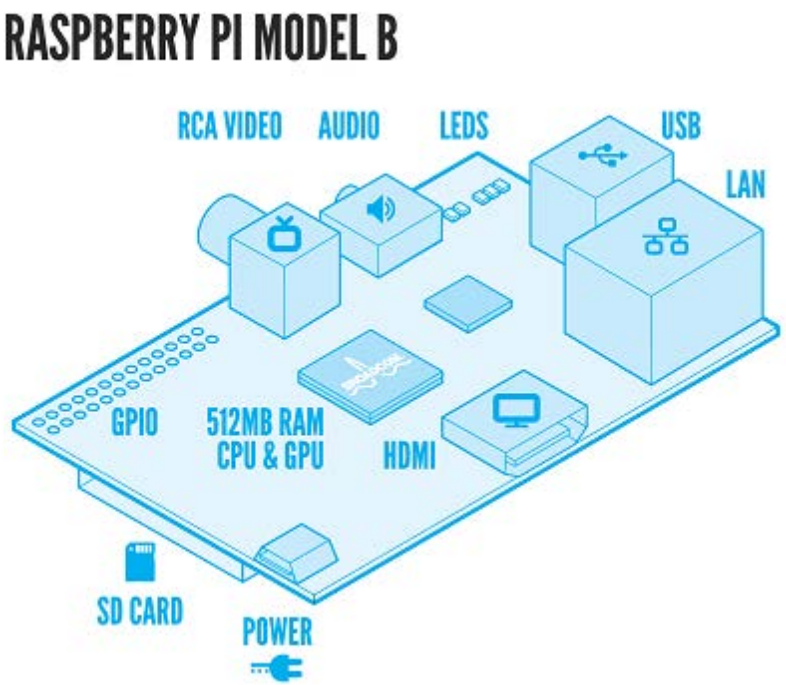
Tool Checkout Vending Machine

May 1416

The Project

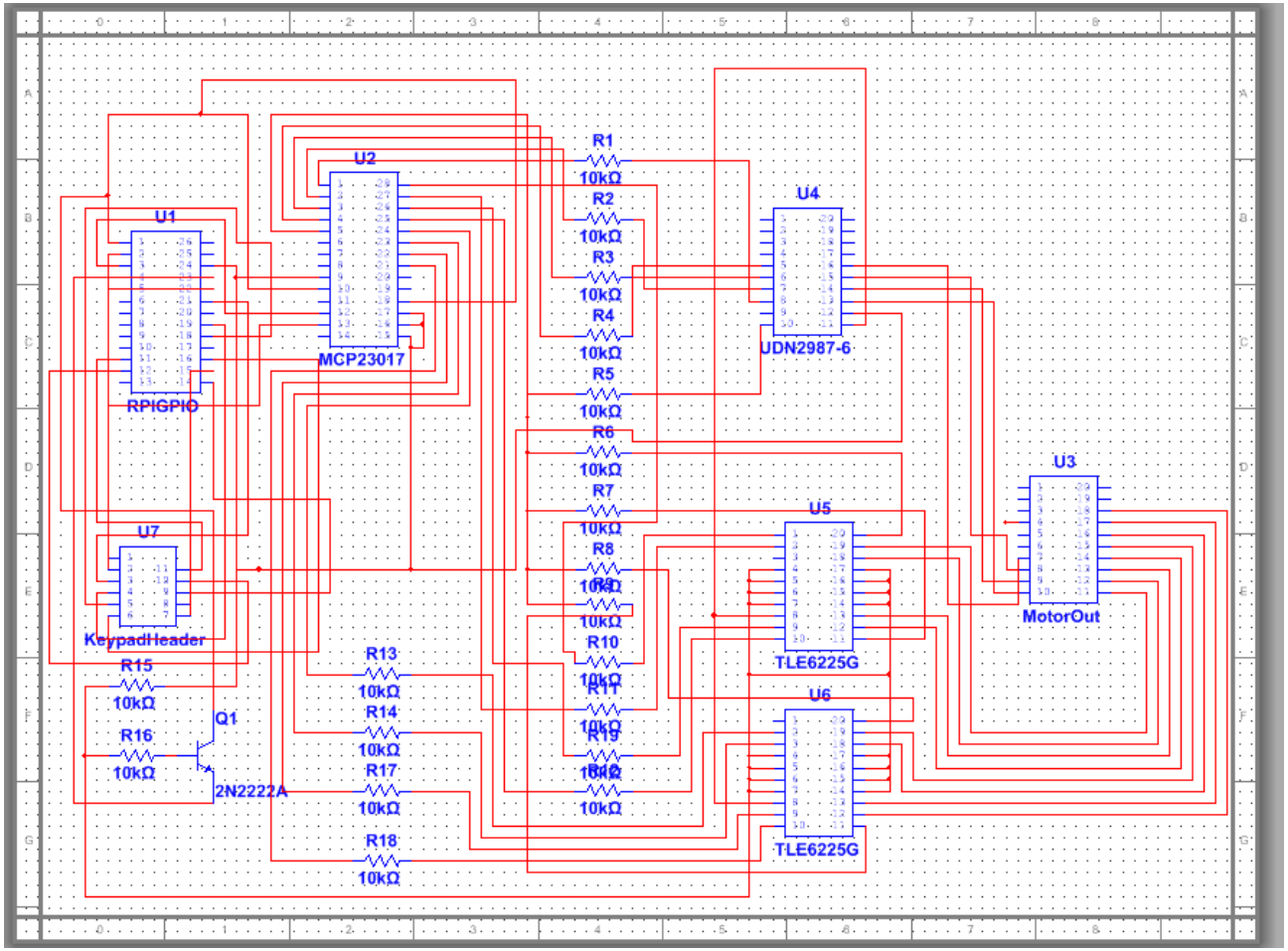
- Tool Checkout Vending Machine
  - Similar to a library lending arrangement
  - Students swipe ID and select desired product
  - Tool record added to authorized student database
  - Admin checks in returned tools in CSG electronic shop, modifies student database
  - Admin can modify tools and edit inventory

Current Design – Raspberry Pi



- Apache Server
  - Provides administrator websites
- Database
  - Student Information
  - Tool Inventory
- Python Scripts
- LCD Screen
- Wireless Network Adaptor
- Magnetic Card Reader
- GPIO Pins
  - Motors
  - Matrix Keypad

Current Design – Circuit Schematic



Current Design - Keypad

- 10-pin matrix
- Connected to GPIO pins on Raspberry Pi
- Functionality
  - Read pressed column
  - Read pressed row
  - Get value from pre-determined 2d array

Current Design – Card Reader

- Connects to USB port on Raspberry Pi
- Reads & parses student ID (9-digit) from ISU card
- Used to track users within database

Current Design - LCD

- Connects to RCA video output on Raspberry Pi
- Displays relevant information to user
- Content updated as main program runs

Current Design – Powered USB Hub

- Plugs in through standard wall adapter
- Supplies power to
  - Raspberry Pi
  - Wireless network adapter
  - Card Reader
  - Machine lighting
- Feeds data to computer through mini-USB cable

Current Design – USB Wireless Adapter

- Transmits network data from Raspberry Pi to IASTATE wireless network
- Uses
  - Admin webpages
  - Database backups

Current Design – Admin – Students

CprE Tool Vending - Database

Machine

Add Student ID:

Search By ID:

Tool	Date Taken	2
screwdriver	04/03/2014	Check In
screws	04/03/2014	Check In
		Check In
		Check In
		Check in

Current Design – Admin – Machine

CprE Tool Vending - Machine

Database

Position:[A 1] Product: Inventory: Edit

Position:[A 1] Inventory: Refill

Position	Product	Full	Left
A1	a1	10	6
A2	a2	10	10
A6	a6	10	10
A4	a4	10	10
B1	b1	10	10
B2	b2	10	10
B6	b6	10	10

Video

Path To Current Design

- Vending Machine
  - Free from donor
  - Missing circuits/logic
- Painting Decision
  - Switched from spray paint to oil-based paint
- Raspberry Pi Decision
  - Immediate video output (hdmi or rca)
  - USB attachments

Logistical Challenges

- Motor drivers
  - Burnt out during testing
- SD card corruption
  - Rebuilt OS from recent backup
- Parts reimbursement
  - Individually purchased components/supplies
- Machine touchups
  - Difficult to work on due to weather conditions

Testing Plan

- Parts functionality testing
  - Motors
  - Screen
  - Keypad
  - Computer
- Machine testing
  - All components work together correctly
  - Program does not fail over long periods of time

Possible Critical Scenarios

- Power Outage
  - Possible SD card corruption
  - Maintain OS & database backups
- Documentation of equipment and supplies necessary for future scenarios such as:
  - Dead equipment
  - Overheating
  - Vandalism

End

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