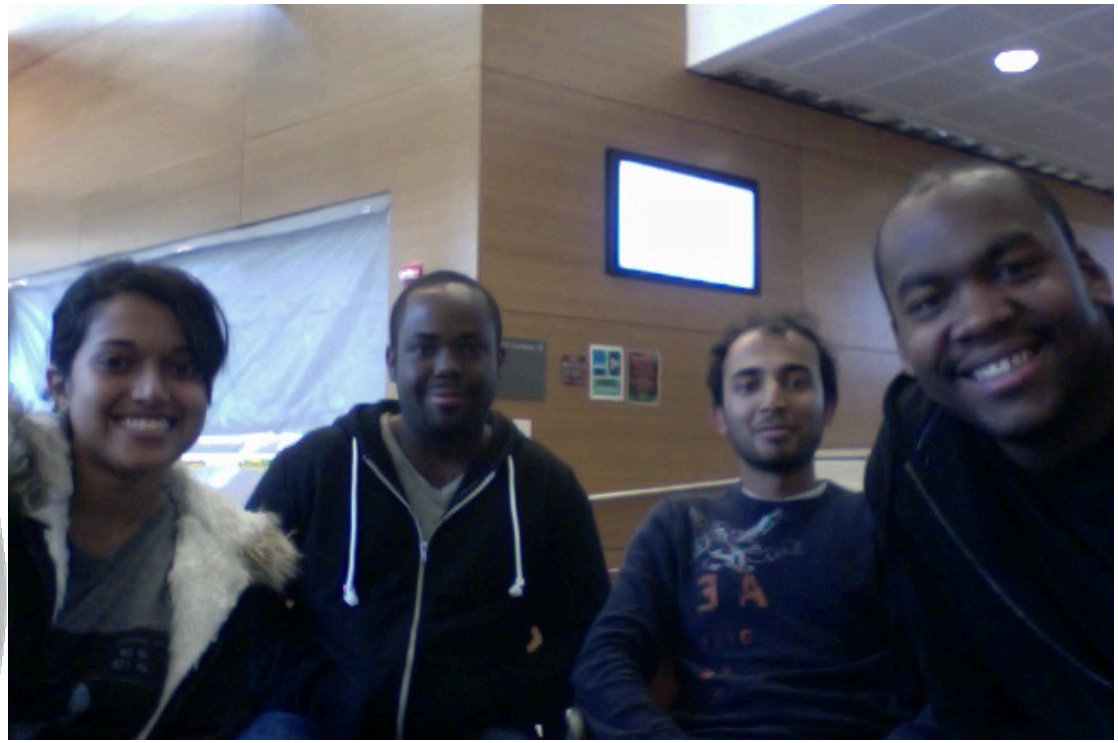
UMassAmherst

ClockAide



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Outline

- Project Overview
- Requirements Overview
- Demonstration – Main System
- Components Overview
- Challenges
- Budget
- Demonstration – Additional functionality

Project Overview

- ClockAide is an educational tool for special needs students in West Springfield
- Students of varying skill level will use our device to learn how to Set and Read an analog clock

Requirements

- Device will speak and display the current time to user when prompted
- Device will allow user to practice reading time
- Device will allow user to practice setting time
- Device will allow users lacking fine motor skills to turn knobs for easy setting of the hands
- Device size will not obstruct the normal use of the classroom and be approximately the size of a students' desk

Demonstration

- Normal Mode
- User Identification
- Set Mode
- Read Mode

Components Overview

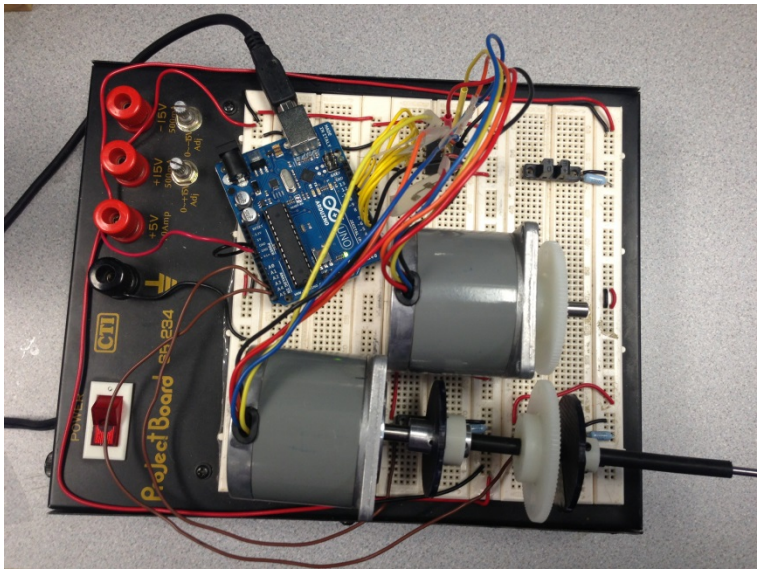
- Power Source
  - ATX Power Source
  - Breakout Board
- Raspberry Pi
- Stepper Motors
  - Arduino Microcontroller
  - Coaxial shaft for hour and minute hand representation
- Keypad
  - Arduino Microcontroller
  - Reverse engineered keypad matrix
  - Serial controlled 16x2 LCD screen
- Casing
  - Dual coloured acrylic sheets

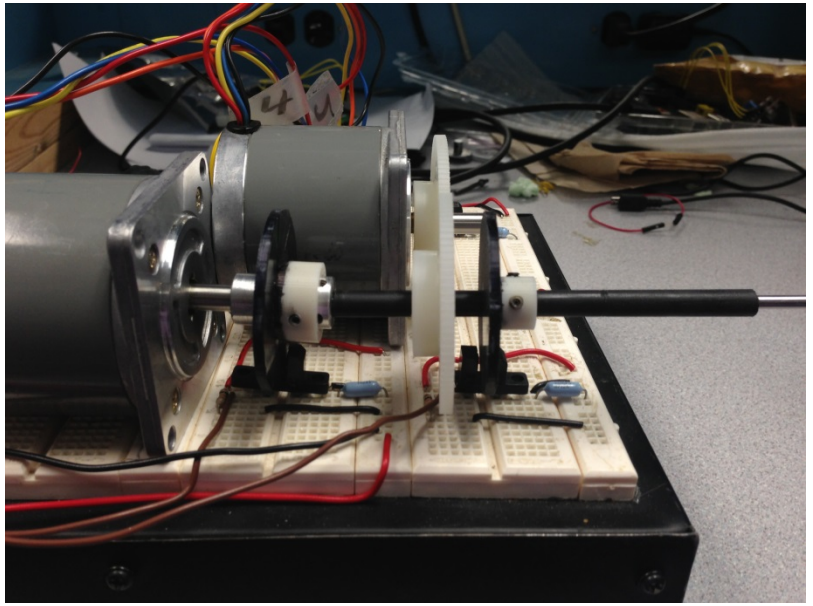
Components – Raspberry Pi

- Implemented a finite state machine for control of ClockAide
- Real Time Clock for system time
- Coding done in Python
- Implemented Serial Communication interface for communication with motor and keypad microcontrollers
- Determined logic to correctly select and play the appropriate sound sample for user prompt

Components – Mechanical Drive System

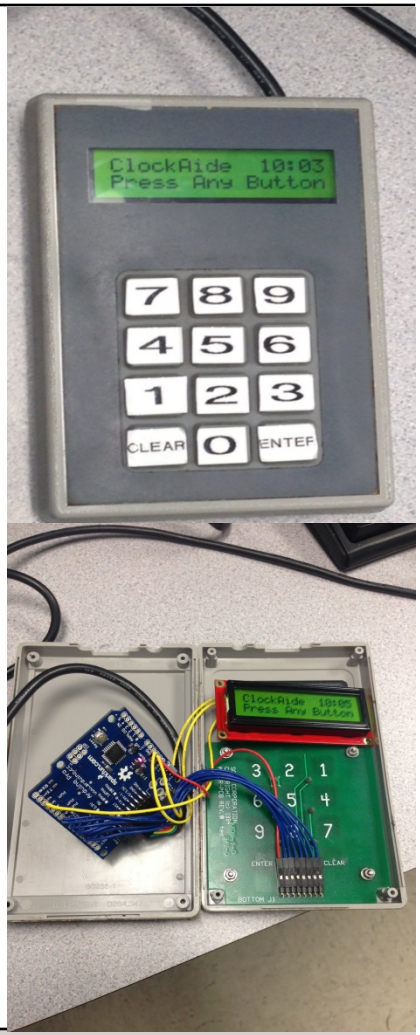
- Stepper Motors
- Arduino Microcontroller
- Coaxial gear driven shaft
- Hand and Minute Representation





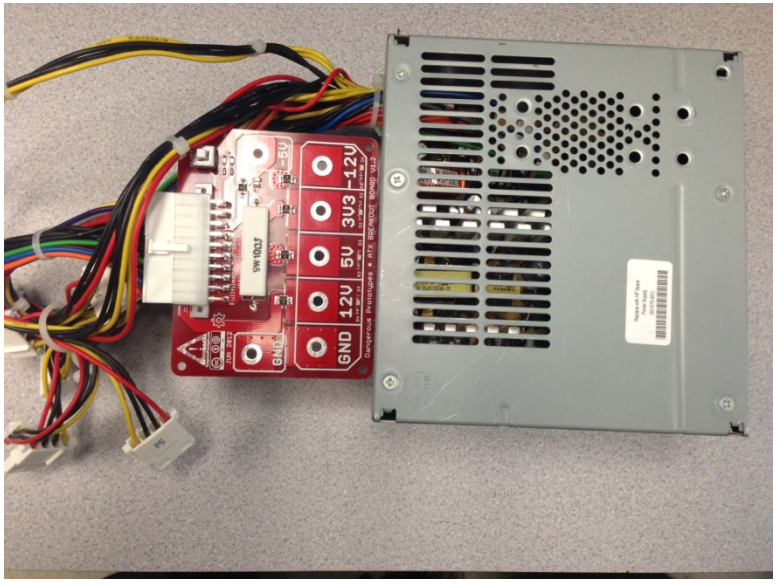
Components - Keypad

- Arduino Pro
- Reverse engineered the keymap matrix
- Serial LCD Screen



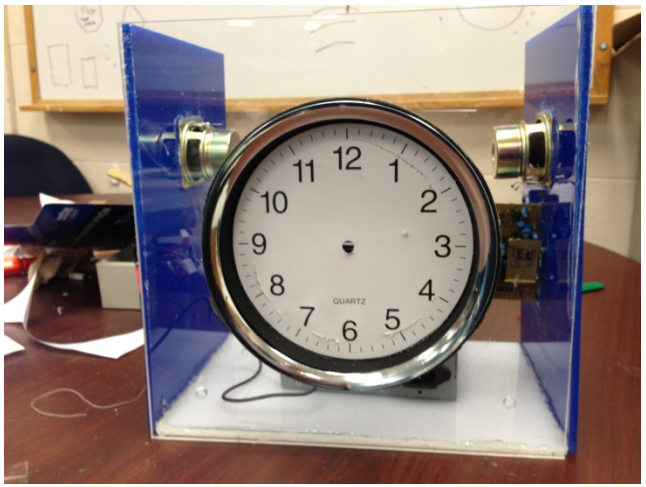
Components – Power Source

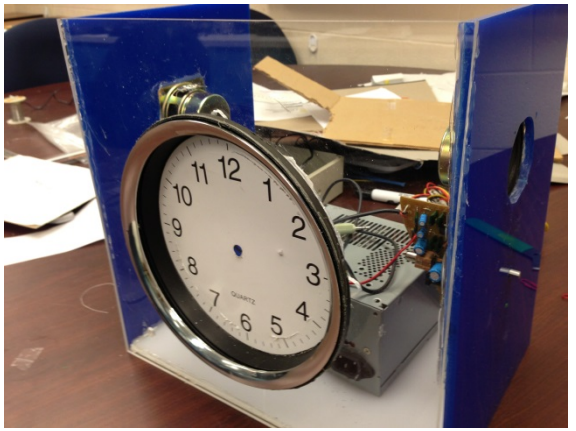
- ATX Power source
- INPUT: 100-127V /6A
  - 200-240VAC/3A 50/60 Hz
- Output: +5VDC / 20A MAX
  +3.3VDC / 17A MAX
  +12VDC / 15A MAX
- ATX Breakout board
- Output: +5VDC
  +3.3VDC
  +12VDC



Components – Casing

- Dual colored acrylic sheets representing W. Springfield Middle School colors
- Extensive machine shop work to cut sheets into desired shapes
- Integrated Speakers
- Built shelf for part placement
- Size of a students' desk





Challenges

- Integration
- Robust communication between Raspberry Pi and peripherals
- Keypad
- Stepper motors
- Raspberry Pi was continuously resetting – challenge at CDR (fixed)
- Arduino processing time
- Encoders Broken – Set mode
- Feedback will be integrated in time for delivery – end of May

Updated Cost

8GB SD cards (2)	$12.38
Arduino MP3 Shield	$39.95
Raspberry Pi	$69.85
RTC	$21.73
LCD Screens (2)	$27.90
Gears +Piping	$20.00
Casing	$60.00
PCB	$70.00
Encoders	$18.00
Subtotal	$321.81
Shipping	$38.90
Total	$378.71
Percentage	**75.74%**

Deliverables

- Feedback system
  - Implemented not integrated
- CSV file to excel for accessing data
- Set Time feature
- PCB

Demonstration

- Feedback System
- CSV

Thank You!