



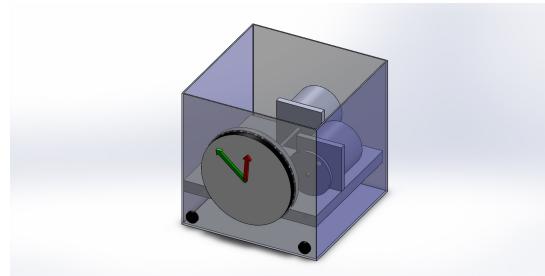
ClockAide

Joel Jean-Claude, Sachin Honnudike, Anita Ganesan, Eric Moore
Faculty Advisors: Professor T. Baird Soules and Professor William Leonard

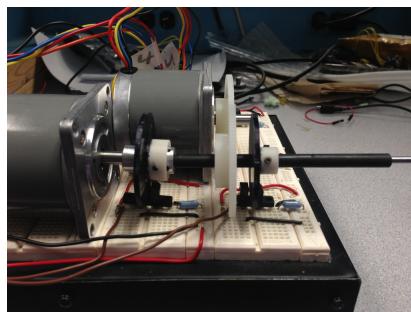


Introduction

ClockAide is an interactive device that helps students learn how to read and set time. With a detachable keypad, ClockAide can assist students by tracking their progress with a unique identification number for each student. ClockAide was an idea based on a presentation by Megan Ferrari, a West Springfield Middle School teacher. Her students, who have special needs, constantly need help when trying to read the time from an analog clock. In addition, she expressed a need for her students to practice entering their lunch identification numbers in a quiet environment, outside of the lunchroom. This requirement was integrated into ClockAide in the form of an authentication system that validates each student and stores his or her progress. ClockAide has two modes: Normal Mode and Quiz Mode. In Normal Mode, a student can press a button on the keypad to hear the current time. In Quiz Mode, ClockAide generates a random time of varying difficulty to test the student's knowledge on how to read and set time. With ClockAide, we believe that we can not only help the students of West Springfield Middle School, but anyone who has difficulty with this essential skill.

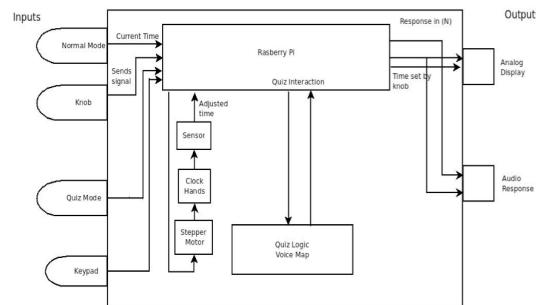


Above: ClockAide casing showing the analog clock face as well as the two knobs that are used to set the analog clock in Set mode



Above: The two unipolar stepper motors and the concentric shaft

Block Diagram



System Requirements

- Device will speak and display the current time to the 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

The Team



From Left to Right: Anita Ganesan, Eric Moore, Sachin Honnudike, and Joel Jean-Claude



Casing



Above: ClockAide Casing

The ClockAide casing is made using acrylic sheets representing the colors of West Springfield Middle School. The complete device is made to fit on a student's desk.



Above: Raspberry Pi and SD Card

The Raspberry Pi, an embedded Linux computer, is the heart of ClockAide. It runs the main software and controls the keypad, stepper motors, and audio feedback.

Cost

Parts List	Price - Development	Price-Production (1000 units)
Motors (2)	66.00	60.00
8 GB SD Cards (2)	12.38	9.00
Raspberry Pi	69.85	69.85
Real Time Clock (RTC)	21.73	20.00
LCD Screens (2)	27.90	24.95
Gears + Piping	19.65	13.43
Casing	46.88	46.88
PCB	70.00	50.00
Encoders	9.00	7.20
Subtotal	343.39	301.31
Shipping	38.90	38.90
Total	382.29	341.21

Feedback System

An additional feature of ClockAide includes the ability for the teacher to monitor the performance of the students in the class. Since a keypad is used to allow the students to practice entering their lunch numbers, we extended this functionality to log their activity using a SQLite database. This makes it possible for ClockAide to record the length of a session for a user, the individual responses they submitted in the Read and Set modes, a list of the student ID numbers, and other pertinent information. The data can be exported to a CSV text file, which can be imported into an Excel spreadsheet, which is what Ms. Ferrari preferred. To extract the data, a USB flash drive is plugged into the Raspberry Pi, and using the appropriate command, the data will be copied to the flash drive. Then, the drive is removed, then plugged in a standard PC or laptop. At that point, the teacher can open Microsoft Excel to open the file (using the appropriate filter settings).



Left – ClockAide Keypad

The user interacts with ClockAide via an external keypad powered with an Arduino Pro. The keypad plugs into the main system via USB. The LCD display above the keypad displays information related to the current mode

Megan's Students



Acknowledgements

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