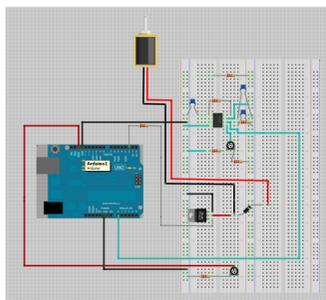


Objective

- Design a weight resistance system that allows for the user to safely and effectively work out. The system should also allow the user to access his data/records at any time.

Introduction

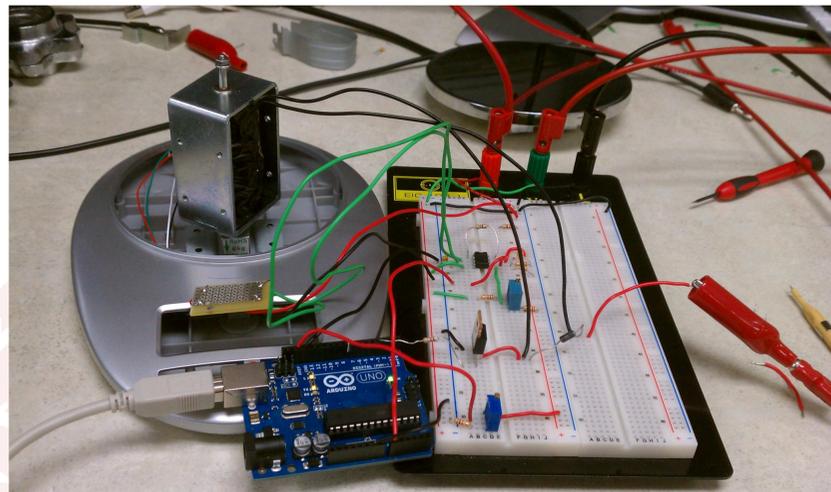
- Nearly all the machines used for resistance training are based around physical weights and heavy machines. Why not have a machine that has no weights and instead works electronically?
- CIWRF will allow the user to exert force upon the system and will allow the user to see the exact force that he is exerting upon the system.
- As there are no moving parts or weights, CIWRF is safer than the conventional weight lifting machine and it will also exact weight that the user is lifting or pushing against.



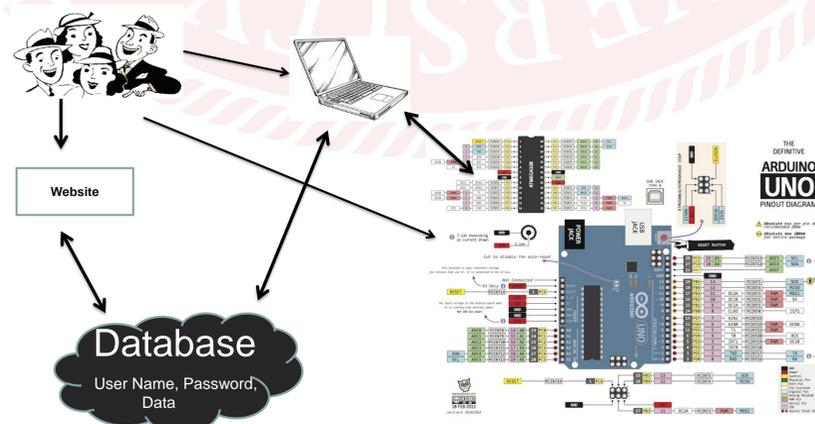
Future Work

- Redesign the GUI in another programming language to have better communication with the database and allow for seamless transfer of data.
- Choose more sensitive components, so that we get better data. Also, try building in large scale.
- Expand upon the website to include suggestions for better posture and other types of exercise that one can perform using the CIWRF.
- Have an Android or iPhone application which would be able to connect to the database and retrieve data and workout plans.
- Lessen the time it takes for the GUI to communicate with the Arduino, using another language should lessen the time and would allow for faster capture of data points. Matlab receives data slowly and takes at least 5-6 seconds to set up for the communication.

Design

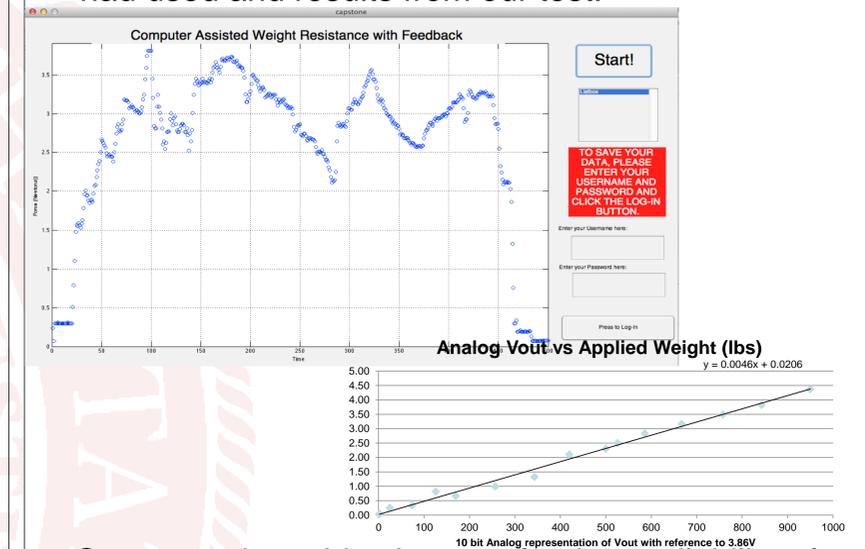


- The Computer Integrated Weight Resistance with Feedback Control system is comprised of a micro-controller connected to a linear actuator and a force gauge via a proto-board. A monitor displays workout information that is linked to a database and website that allows a user to access their workout information.
- The micro-controller receives the amplified voltage output from the force gauge and displays it on the monitor. The user's applied force is calculated from this data and then plotted in real time.
- This applied force is used to calculate the amount of current required to pass through the solenoid in order to create the appropriate resistance. This is accomplished by modulating the pulse width of voltage applied to the gate of the mosfet. The resultant on/off "switching" of the induced channel allows us to control the average current through the solenoid from source to ground and thus its force of resistance.
- Users have an option to set up an account that gives them the benefit of storing their past workout information in order to track their progress. This can be accessed via a computer or any of our workout systems.

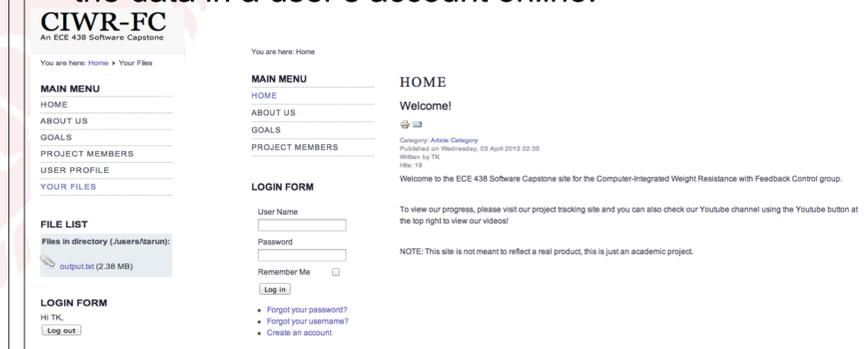


Results

- Our experiment was successful because we had achieved our primary goal. We set out to design a weight resistance system that provides the user with a resistance to which he can exert a force against and we were able to do it in a safe and controlled manner. We were also able to configure the communication between the software and hardware, the figure below shows the GUI that we had used and results from our test.



- Our secondary objective was for the availability of the data online and to that end we had developed a website and a database and the figures below shows the data in a user's account online.



Framework

- Hardware**
- Arduino Uno Microcontroller
 - Force Gauge
 - Solenoid
- Software**
- PHP
 - MySQL
 - HTML/CSS
- Development Tools**
- MATLAB
 - Arduino Environment

