P11001:Balance Training Bike

BACKGROUND

This project originally began in the winter quarter of 2007. It was revisited in the winter quarter of 2009. This was designed to help patients at the Nazareth College Physical Therapy Clinic be able to bridge the gap between stationary bike and an outdoor bike in a safe way. Prior iterations of this project have experienced several performance issues with regards to the pedals, tilt mechanism and display. The bicycle needed a better way of accomplishing the tilt resistance as the current method allowed too much slack at the center position. Additionally, the pedaling resistance mechanisms needed work to avoid the jittery performance the user is currently experiencing. Lastly, the display mechanism needs to function correctly.

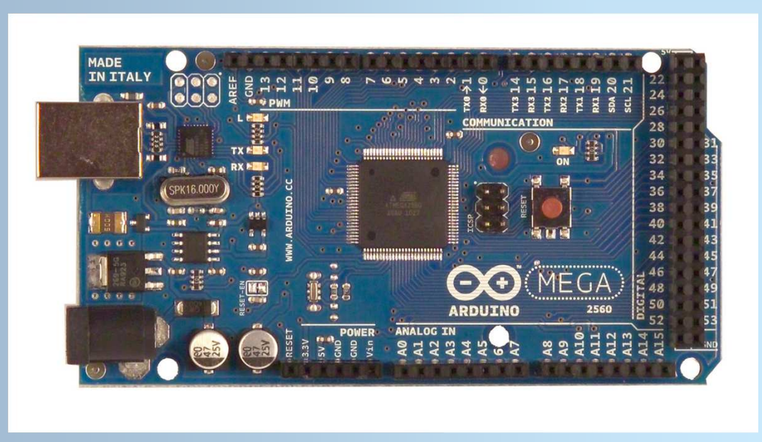
Costumer Needs:
- Consistent tilt resistance
- Consistent pedal resistance
- Larger and more accurate display
- Add a fall counter

PEDAL DESIGN

Benefits of Magnetic Resistance:
1. Quiet - no gears means less noise
2. Smooth motion - leg motion is fluid
3. Longest life of available pedal resistance mechanisms

We chose a commercial off the shelf magnetic pedal resistance mechanism because it saved on both time and money as opposed to creating a mechanism from raw materials. We modified this mechanism by cutting the feet off the bottom and attaching it to the crossbar of the bicycle with four bolts, four steel plates, and a bar through the lower channel to use friction to hold the system in place.

DISPLAY DESIGN



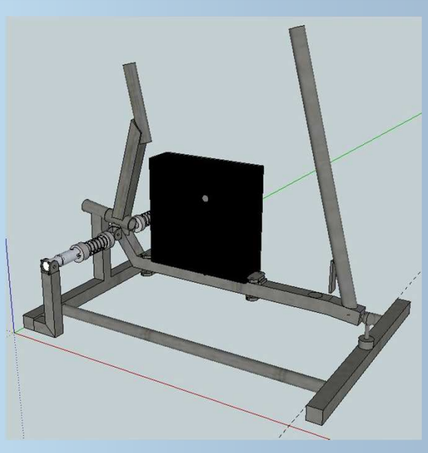
We decided to use a microcontroller to power the electronic aspects of our design. This gave us the ability to do almost anything to the design and moved some features of the design to software, so that we could make changes later in the design cycle. Our choice was the Arduino Mega 2560 as this board gave us any and all functionality we needed. The board controls an array of LEDs, two buzzers and two seven segment displays. It is directed using data from a Reiker Inclinometer and it utilizes several switches to control its actions.

TILT DESIGN

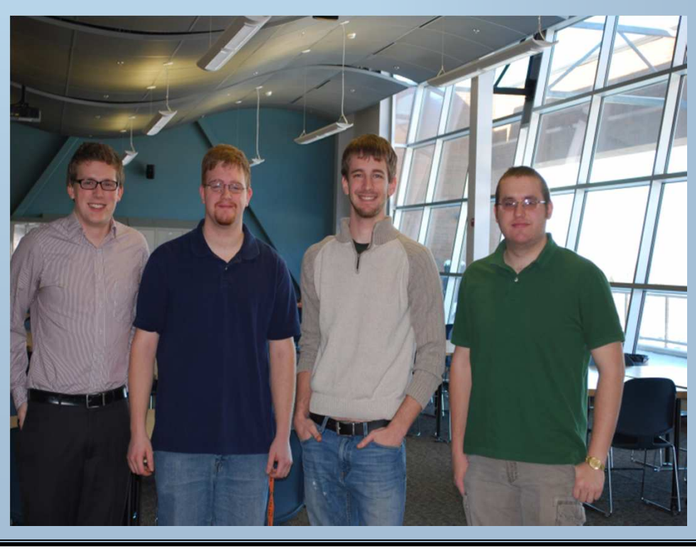
For the tilt design we chose to use a rear mountain bike shock. The a bike shock consists of a spring and a damper. The damper is used to slow the speed of the person falling to the left or the right. The spring is to help the physical therapist lift the person back upright if he/she cannot center his/her self. The shock we chose was a 2008 Manitou Metel R. This was chosen because it met all of the characteristics needed as well as it was fairly priced.

FINAL DESIGN

The bike has magnetic resistance pedals that make it easier to pedal and gives consistent pedal resistance. The Tilt resistance is now consistent by using the bike shock to stabilize the left and right movement. The display system is larger and more accurate because of the microcontroller that was used and the LEDs that we used. Also a hit counter was added to that tells the rider if they would have fallen off the bike.



TEAM



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