

EEL 4924 Electrical Engineering Design (Senior Design)

Project Abstract with Diagram(s)

18 January 2011

Project Title: **Pneumatic Exercise Machine**

Team Members:

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Project Abstract:

Our project is an electro-pneumatic pulley resistance system. Designed for exercise functions in mind, the system will allow the user to digitally control air pressure resistance the handles of attached cables. This allows the user to remain stationary throughout the course of an exercise routine. No weights are to be dealt with and changing resistance will be very convenient. Additionally, the system will be able to wirelessly communicate data with PC software. Air pressure resistance could be automated from a pre-established workout routine entered into the computer. Resistance and repetition data could be tracked by the software and graphed or analyzed for useful feedback to the user.

Introduction:

The domains of this project include pneumatic regulator and cylinder system and digital control system. The digital control system must be able to control the numerical weight using the pneumatic system on the base of this project.

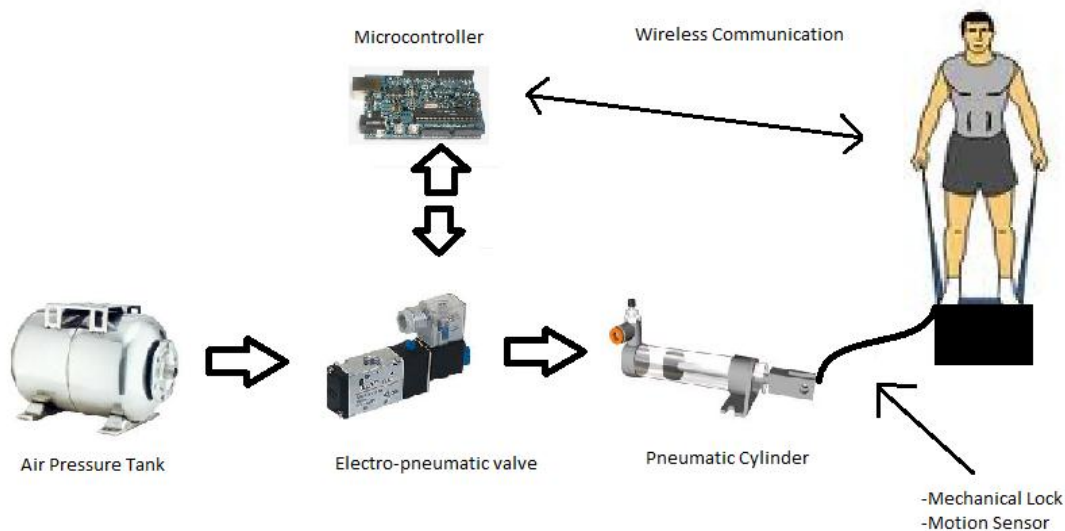
The purpose of the project is to design a weight-lifting/workout band. The user will be able to stand on a base that houses the pneumatic system and work out by lifting the bands. These two bands that the user can hold with his/her hands will be connected to this pneumatic system in order to control the amount of weight digitally. If we have more time and resources, then our team will incorporate other body parts' work out system using this one prototype.

Technical Objectives:

The main objective of our project is to design a system that can quickly and accurately regulate air pressure.

- The first issue is the design of the air pressure regulation system. A tank must provide air pressure to an electro-pneumatic valve regulator. The valve regulator outputs pressure to a pneumatic cylinder. A cable with handle at one end will attach to the pneumatic cylinder. The resistance to pull the band will depend on the air pressure rating in the cylinder.
- A microcontroller will send and receive signals to and from the pneumatic valve. An LCD could be used to display the current PSI rating received from the valve. Controls from the user will include "increase resistance" and "decrease resistance". These controls to the microprocessor will tell the valve to increase or release air pressure to the cylinder.
- A "lock" function could be integrated into the cable system as well using the same microcontroller. It would be a simple command to a mechanical switch, telling it to lock the cables in place while air flow is in progress.
- A wireless RF transmitter will be employed in the handle to send messages to the microcontroller. This avoids messy wires running the length of the cable.
- The microcontroller will require a wireless transmitter to be able to send PSI resistance data to a computer.
- A sensor could count number of "pulls" or repetitions and relay this data to the microprocessor.

This is a preliminary estimation of how the components will be connected and function together.



Cost Objectives:

We expect the price of the Pneumatic Cable Machine to be under \$200. The primary costs will most likely come from the mechanical design of the project which includes the pneumatic control system.

References or Bibliograph:

<http://mil.ufl.edu/4924/>

Materials and Resources:

We will need pneumatic mechanical parts as well as a microcontroller with built in wireless transmitter, a basic electronic sensor, and a sepearte wireless transmitter.