The Bionic Glove

Overview
Our sponsor, Keith Parsons, is a man who has sustained a spinal cord injury resulting in an inability to perform gripping actions with his hands. Since he still has muscle control in the upper portions of his arms (biceps, triceps, shoulders, etc.) he is still able to enjoy the act of weightlifting; however, his limited gripping ability makes this activity difficult to perform independently. Currently, to aid in his workout Keith uses ActionLife gloves, which employ Velcro straps to fasten various pieces of weight-lifting equipment to his hands. Because these gloves are difficult for Keith to put on, take off, and use without the aid of a third party, our sponsor presented our team with the challenge of creating a prototype for a glove that will allow Keith to work out more easily and independently by using his voice to control the mechanized opening and closing of said glove.

Objectives
- Construct glove that provides mechanical opening and closing actions using voice commands as controls
- Make glove easy to put on and take off
- Facilitate secure gripping of a dumbbell weighing up to 50 pounds

Approach
- Met with Keith and his doctor to gather customer needs
- Reviewed relevant patents and previous project designs
- Went through process of concept generation, alternative evaluation, and concept selection
- Chose design that uses microphone and voice recognition chip to get commands and forward them to an Arduino microcontroller where they are interpreted before sending power to two linear actuators that open/close the glove by retracting/extending
- Created design sketch of prototype
- Fabricated a single prototype
- Tested prototype functionality and ability to hold 50 pounds
- Test results were good – successful opening and closing of glove around the grip of a dumbbell as a result of corresponding voice command, thumb loops added to glove straps to facilitate ease of putting on and taking off the glove, glove was able to securely hold a 50 pound dumbbell

Outcomes
The sponsor will be able to work out more easily and independently and with a reduced set up time for each upper body exercise he wishes to perform.