Innovaflex

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Technology description

With people around the world spending millions of dollars on personal trainers, gym memberships, and exercise equipment, the need for better technology that improves workout efficiency and overall exercise experience is warranted. Team Innova-Flex has developed a new system that provides two major innovations:
1.A machine that combines improved muscle building practices, along with creating a mechanism for people to compete against one another from around the world while exercising.
2.An electronic, programmable system that provides integrated support, exercise coaching, advertising, nutrition information, and tracked exercises accessible through a gateway to an online exercise and healthy living forum will be created.

State of the art

The system that team Innova-Flex is developing includes a machine that uses electric motors to assist in the optimization of building muscle by fitting the Muscle Tension-Length curve to the movement of the machine for every user. With the use of optical encoders the machine measures where the user is during a repetition for a specified exercise and optimizes the resistance during each motion to maximize the effectiveness of the lift and minimize the stresses on the user¿s joints.
Additionally, an online fitness network will be created and gym members or home users can use their gym card or a user ID to connect to their online profile.Progress and performance tracking will be available to optimize their workouts as well as provide detailed analyses of their lifting practices and habits.Further direction can be given to users to identify the best exercises and routines to optimize their workout and time in the gym.

Problem definition

Most exercise systems that claim variable resistance use cam devices to vary the resistance during a repetition or are manually controlled through an input to a friction-based system. Our system provides complete force feed-back control in a system designed to optimize resistance and select weights as a function of a calibration repetition and pre-selected starting weight and number of repetitions. The

system can also determine when a deviation occurs in a repetition. By sensing these changes, the assistance or resistance can be adjusted to maintain optimal exercise even in the presence of fatigue. This technology may also be used to create better machines for rehabilitation and physical therapy. Neuro plasticity and muscle memory can be exploited with this system.

Technical approach

A working prototype of the system will be completed by April 2012. Therefore the hardware system and corresponding controls of the Innova-Flex will be designed and functional at that time. To help accelerate the process, the new prototype system will be adapted to an existing exercise machine so that time and effort can be put into developing the control system and other system components. To accomplish this we need to obtain a motor controller, encoders, sensors and develop a physical user interface. These will be integrated and controlled using an Arduino microcontroller and a National Instruments DAQ to collect and process information that will be displayed on the user interface. To develop the control system either LabView or Arduino software will be used.

Technology Commercialization

This technology has the potential of appealing to millions of gym users and individuals looking to build muscle faster and more efficiently. It also has uses for strength training with athletes, rehabilitation and strength training in the medical fields (Physical Therapy, Rehab., Post-Stroke, at home therapy and exercise).

Institution

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