INTRODUCTION

A rehabilitative tricycle was designed and constructed to promote rehabilitation and mobility for individuals with debilitated lower-body strength. Through a multi-mode system, the rider has the option to pedal the tricycle, drive it solely on electric power, or use assistive pedaling to reduce manual effort. This tricycle also incorporates an advanced therapy mode that further promotes physical improvement, by providing increasing pedaling resistance for lower-body muscle strengthening. While there are many electric tricycles on the market, none accommodates the rehabilitation of individuals with an impaired lower-body. Our tricycle helps these people recuperate and rebuild strength.

SUMMARY OF IMPACT

Mobility and physical activity can be challenging for people with impaired lower-body strength. Currently, most apparatuses that facilitate mobility result in a further decrease of the user’s strength and fitness. For instance, electronic wheelchairs provide a means of mobility, but they tend to reduce the user’s physical activities. While wheelchairs may be the only solution for certain disabilities, they can be disadvantageous to those individuals that retain some portion of their lower-body strength. On the other hand, rehabilitative devices that increase the user’s overall fitness tend to be constrained to a fixed location. Our design of the rehabilitative tricycle combines these two concepts and provides an accommodating solution for the aforementioned individuals. It can have a great impact on the lives of these individuals, by offering them both short-term and long-term solutions - mobility and rehabilitation.

TECHNICAL DESCRIPTION

The overall system works partly like a standard tricycle. In this respect, the user may use his/her leg power to rotate the pedals, which in turn, propels the tricycle. When the user’s leg power is not sufficient to propel the tricycle, a DC motor connected to the back axle through a chain-sprocket system turns on and aids the rider in reaching a desired speed.
This motor is mounted in an enclosure, which is in the place of a standard tricycle’s rear cargo basket. In this dual-function mode, the motor either solely powers the tricycle or complements the user input.

The other mode of this system is the advanced therapy mode. In this mode, the motor functions as a generator. The user can vary the inherent resistance of the generator by altering the position of a throttle. This produces a resistance that varies with respect to the actual magnitude of regenerative braking. The power that the user inputs is captured and charges a battery which powers the motor and electrical components in various modes.

To accomplish the proposed functions, the mechanical system of the rehabilitative tricycle was designed and fabricated by customizing a Schwinn Meridian Tricycle; an Arduino Uno microcontroller was used as the central controller to receive input from components, including thumb throttle, brake levers and switches, run the control flow, and command the motor through the motor controller.

The cost of the parts and supplies for this project was $1275.

Figure 4. Control Circuit