PROGRESS REPORT FOR

ROLADA, ROLLATOR WITH CONTROLLED BRAKING SYSTEM

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Table of Contents

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Automatic Braking System

Motor driver

Xotro has completed the testing phase for the communication between the microcontroller and the motor driver board. The microcontroller can specify the direction of the linear stepper actuators and the amount of displacement. The motor driver boards have now been fitted with heatsinks attached to the IC to provide protection from overheating. All components associated with the motor driver have been subjected to a stress test for heat, minor shock and continuous operation.

Force-sensing resistor

The circuit used to detect braking force is a simple voltage divider between the force-sensing resistor and a regular resistor. An op-amp with the unity gain configuration is used to act as a buffer between the circuit and the microcontroller. This circuit has been tested and gives a wide range of values that will help determine the braking force applied.

Accelerometer

There was an unexpected problem that occurred while testing the tilt angle algorithm. That is, the accelerometer can give false readings when there is a sudden shift in acceleration. After some research there are two alternatives in reducing the false readings. One method is to create a low pass digital filter for the incoming readings. The other method is to read the data from both x-axis and y-axis when the accelerometer is mounted sideways, and the readings will be passed into an *arctan*(x/y) function where in it determines the angle of tilt. Both methods will be tested thoroughly and the most effective method will be selected. Effectiveness will be judged according to the amount of processing required, accuracy and reliability.

Speed limit control knob

The circuit speed limit control knob consists of a rotary switch connected with four different resistors connected to a common resistor (as a voltage divider) to form a discrete-level potentiometer. It has been constructed and tested with the microcontroller when outputting four distinct voltage values.

Speed sensing system

The speed sensing system uses IR emitters and IR sensors from a ball mouse as an encoder. We are currently testing the accuracy and the correlation between the actual movement speed of Rolada and the speed sensed by the system.

Night Lighting System

Ambient light sensor and LEDs

Using LEDs, ambient light sensor and transistors, the electronic aspect of the lighting system has been successfully designed, tested and constructed.

Obstacle Detection System

Ultrasonic sensors

The obstacle detection system uses ultrasonic sensors to detect distances of objects in their path and emits a warning tone to the user when necessary. To date, the system has been programmed to emit beeps using the buzzer and vary the frequency of the beeps depending on the distance of the detected obstacle. An attempt to develop a method to also detect negative obstacles such as dips in the terrain or lowered steps is being made.

Mechanical Work

Electronics attachment

Since the implementation of the electronic systems is nearing completion, the team is almost ready to mount them onto the rollator. The fabrication of fibreglass boxes for the components has begun.

Frame modification

The necessary frame modifications (door wheel and seat bar) will also be performed shortly.

Other Tasks

Budget

Currently, the Xotro financial budget is consistent with the original estimation of the project. Xotro is intent on investing in further mechanical work and electronic components, and that can cause the overall budget to be over the previous budget. To cover this deficit we will apply to the Wighton Fund and enter the Solution Exhibition contest. So far, 80% of our budget has been used for the ABS (Automatic braking system), sonar detection and LED lighting system.

Human Resources

Cooperation among group members has been excellent as each group member is involved in the project. There are at least two schedule group meetings per week to update the progress of the project and clarification of technical problems.

Conclusion

Throughout the course of the project, the team has solved many challenges that were encountered, from practical design issues to resource problems. Once each system is verified to be functional, they will be attached to the rollator and testing can begin. At this point, the project is well on its way to completion.