Baby Guerrero Technologies

Progress Report for the Smart Stroller Braking System

ENSC 440/305 Capstone Project

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1 INTRODUCTION

Baby Guerrero Technologies are reinventing the way strollers brake. There has been far too many stroller related accidents that have occurred and Baby Guerrero technologies will no longer stand by and watch. The stroller is equipped with a sensor that detects the touch of the handle. When the touch is detected, the signal is fed to a microcontroller, which communicates to the motor to engage/disengage the brakes through a cable.

This document details the current progress of Baby Guerrero's Braking system's proof-of-concept prototype. The report accounts its progress by detailing the current Mechanical and Electronics progress and also by comparing original and current schedule constraints. Furthermore, proposed, current and future expenditure of parts and materials will be catalogued in this report.

2 SCHEDULE

Currently Baby Guerrero Technologies is about a week and a half behind schedule due to a number of unforeseen circumstances. The scheduled completion dates of significant stages of the project, which were defined in the proposal, are as followed:

Assemble Mechanical Components	Completed by October ~30
Build Electronic Components	Completed by October ~14
Design Control System	Completed by November ~23

The assembly of the brakes are completed and mounted on the base of the stroller. One issue that occurred was in our Design Specifications, our calculations were based on having control over the radius of the pulley attached to the worm gear shaft; however, we have considered a small design change to make this reliance less significant. By installing a lever which interacts between the pulley and the brakes, we are able to much more easily control the amount force applied. This change enables us to use a pulley of any convenient size, which will not need to be replaced/readjusted in the case of a lack of force on the brakes.

The electronic assembly had a minor delay due to an accidental burning of our microcontroller and the laptop. However, since a replacement has been purchased and we are currently about half way through the software development phase of the project.

3 FINANCIALS

The initial budget devised at the time of the proposal estimated a total cost of $834.00 for the project. Funding of $450 was obtained via the ESSS student fund and any additional costs hopefully will be covered by Wighton Fund. This budget was created anticipating potential accidents which would require replacement parts. Various design choices and part acquisition strategies were implemented in order to keep our stroller at a more affordable price to the consumer, and to reduce the cost of the proof-of-concept prototype. These strategies are listed in the table below:

Table 1 outlining the estimated cost of the components at the beginning of the project and the actual cost

Part	Estimated cost at proposal ($)	Actual cost ($)	Strategy
Stroller	250	60	Craigslist Find
Brakes	120	12	Design change (use of bicycle brakes)
Worm Gearbox	N/A	$70	Reduced cost of motor by having an external gearbox
Batteries	35	0	Found a donator
Battery Charger	40	25	Craigslist Find
Motor	45	100	Reduced cost due to using one motor and devising a way use the torque generated for both brakes
Electronic Components	77	55	Omitted the LCD from the design to reduce costs.
Building Materials	N/A	35	

4 PROGRESS

4.1 Mechanical Unit

The mechanical unit consists of the brakes, a base to mount the brakes and the actuator, the motor, the gearbox, the lever and the pulley.

As of today, we have designed a mechanically sturdy base to mount the actuator and the brakes in a safe and reliable way. For the braking part, we mounted bicycle brakes on top of the base, to apply braking on the rear wheels of the stroller. Currently we are designing a mechanism using a pulley and a lever that translates the motion from the motor and the gearbox to the brakes through cables.

4.2 Electronic Unit

As a result of lack of foresight on the part of Baby Guerrero, the IR sensor we originally planned to use for touch sensing was found to be unsuitable for our project. The VCNL3020 did not come packaged as we expected, and thus we were not able to integrate it into the electronic unit like we originally planned. In order to overcome this, we have decided to implement a capacitive touch sensor system to trigger the braking system, which will be discussed in the remediation section.

5 REMEDIATION

Due to accidental short circuiting between the Arduino board, power source and the laptop; the Arduino board and the laptop's motherboard suffered the consequence and was decommissioned from Baby Guerrero's inventory. As a result, a new microcontroller had to be selected. When considering the time constraints of this occurrence a decision had to be made to ensure that the overall budget and time schedule was met. It was decided that OSEPP Uno R3 was going to replace the Arduino Uno for the smart braking system. The selection was made due to the availability of the microcontroller at RP electronics at a discounted price.

As aforementioned in the project progress section, we are unable to use the VCNL3020 IR sensor, and thus have decided to implement a capacitive touch sensor circuit. Arduino provides a capacitive sensor library which facilitates the use of capacitive sensing on the development board. The simplicity of the circuit makes the prototyping of this sensing unit fast, allowing us to make progress on this sensing replacement without having to depend on shipping from any vendors. Furthermore, the simple nature of the capacitive touch sensor will greatly reduce the software development time for sensor integration, when compared to integrating the I2C interface VCNL3020 IR sensor

Due to the budget constraints imposed on to the prototype a singular motor was used. A mechanical design had to be devised to distribute the torque evenly between the two brakes. This factor resulted in a slight delay for new design drafting and parts acquisition. To rectify this situation, the members of the team have allocated more time and resources towards the project.

6 CONCLUSION

Baby Guerrero Technologies have spent endless hours designing, developing and debugging the smart braking system. Despite delays due to shorting a laptop, Arduino as well as design choices that were made to reduce cost; the schedule was remediated to ensure that the project will finish on time. Baby Guerrero technologies have full faith that the project will be completed in time for the final demo.