Homework 2: Design Project Proposal

Due: Friday, January 18, at NOON

Team Code Name: The Two Wheel Deal **Group No. 12**

Team Members (#1 is Team Leader):

#1: Greg Eakins **Areas of Expertise: Electromechanical Interface**
#2: Eric Geier **Areas of Expertise: Software/Interfacing**
#3: Pete Dudash **Areas of Expertise: Controls Theory/System Modeling**
#4: Jeremy Gries **Areas of Expertise: Controls/PCB Layout**

Project Abstract:

The Two Wheel Deal is a compact, two wheeled, self-balancing personal transportation device. It will serve as an economical and practical alternative to most forms of short range transportation, including cars, bikes, and walking. Having only two wheels gives the Two Wheel Deal a small footprint for enhanced mobility over conventional means of transportation. Additional features such as high speed motors, emission free electric drive, and a zero turning radius make the Two Wheel Deal like walking, only better.

Design/Functionality Overview:

The idea for this project stemmed strongly from our mutual interest in digital controls theory. The Two Wheel Deal embodies the classical and difficult controls problem of the inverted pendulum in a fun and practical package. The Two Wheel Deal is designed to make life easier for the time-stressed individual by automating the strenuous and time consuming act of walking.

The Two Wheel Deal will be a personal transportation vehicle. As the rider leans forward the motors turn in proportion to the angle of lean to try and keep the wheels under the center of gravity. This in turn will move the rider forward. The same process will work when the rider leans backward enabling the vehicle to go in reverse. Turning will be accomplished using a knob on the handlebars. Turns will be made by differing the speeds of the individual wheel motors. It will also be able to balance itself when a rider is not on it as well as shut down if the rider falls off. Finally it will have an LCD screen for a human interface to display various important information.

Table 1: Cost Estimate

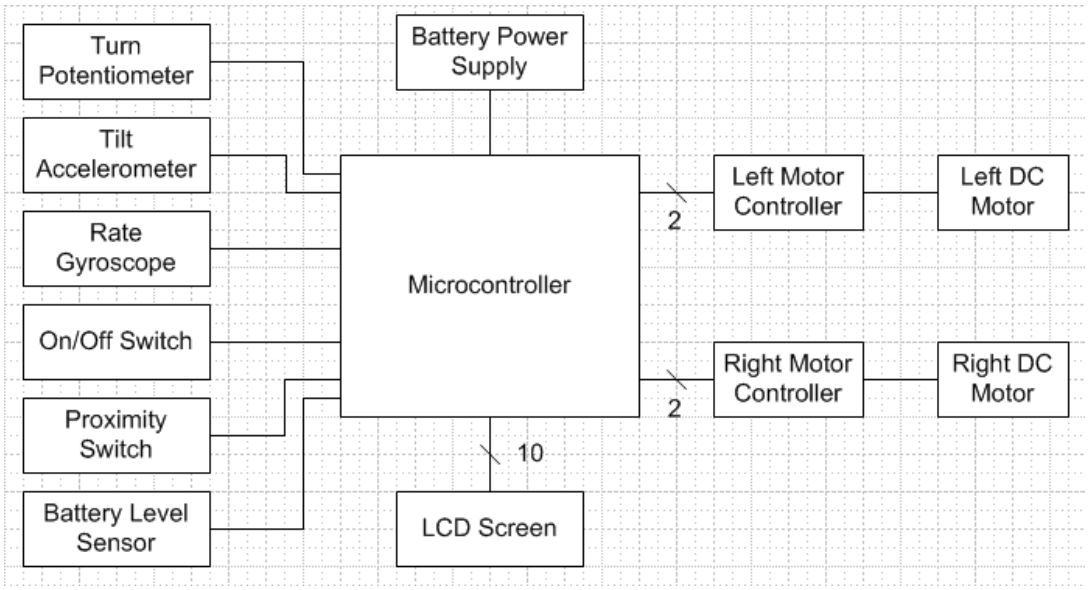
Component/Part	Quantity	Price	Cost
NPC-T74 DC Motors	2	$324.00	$648.00
SLA Batteries	2	$50.00	$50.00
Motor Controllers	2	$120.00	$240.00
Angular Rate Sensor	1	$100.00	$100.00
Dual Axis Accelerometer	1	$70.00	$70.00
Aluminum and Fasteners	1	$150.00	$150.00
Wheels	2	$50.00	$100.00
LCD Screen	1	$50.00	$50.00
Proximity Sensor	2	$30.00	$60.00
			Grand Total
			$1468.00

Pete with his expertise in controls theory/system modeling will help determine the controls algorithm for the controller software as well as well as determining the overall packaging design. Greg with his expertise in electromechanical control will be designing the motor controllers and interfacing to the motors. Eric with his expertise in software/interfacing will design the controller model and software program as well as interface to LCD. Jeremy with his expertise in controls theory/PCB layout will assist in determining the controls algorithm as well as designing the PCB layout.

Project-Specific Success Criteria:

1. **An ability to independently control two high current electric motors.**
2. **An ability to shut down if no rider or low battery.**
3. **An ability to display sensor data to the rider on an LCD display.**
4. **An ability to balance a passenger with no intervention.**
5. **An ability to move and turn through use of the navigation controls.**

Block Diagram:



Division of Labor:

Design Component Homework		***Professional Component Homework***	
4-Packaging Design and Specs	Dudash	3-Design Constraint Analysis/Parts List	Eakins
5-Hardware Narrative and Prelim Schematic	Eakins	10-Patent Liability Analysis	Gries
6-PCB Narrative and Prelim Layout	Gries	11-Reliability and Safety Analysis	Dudash
9-Software Design Narrative	Geier	12-Social/Political/Environmental Analysis	Geier