Divide and Conquer 2.0

Group F – Portable, Electrical Skateboard

Joshua Andrews - Computer Engineering

Danner De La Rosa - Computer Engineering

Project Description

In recent years, many new short-to-medium-distance transportation devices have become available such as scooters, electric scooters, bicycles, electric bicycles, skateboards, electric skateboards, and hoverboards. These are all great ways to go to the neighborhood's park or to go from class to class while in school; they save time and energy, especially since some classes may be just 10 minutes apart and very far from each other. However, these devices are controlled by humans and rely on human instinct. In addition, they required an inconvenient amount of space. Imagine if all the students in a class were to ride skateboards to class; students leave their skateboards against the wall, which can make 30 to 200 skateboards a very messy process to pick up one by one.

This is a proposal for a skateboard that possesses technology which is competitive with electric skateboards on the market today. This means that its motor and battery life will follow the average standards for its class. In addition, its body will be able to fold for storage purposes, and depending on the available time, this process may be automated to reduce human effort. The board may be aerodynamic and aesthetically pleasant and exciting to look at. LEDs are a huge attraction and luxury, and so we may implement LEDs for visual purposes and functionality, such as nighttime safety.

Table 1: Requirements and Specifications

Description	Value
Interface	
An application written in java or C# that must control the movement [forward and backwards] of the skateboard.	-
Application must display battery charge and estimated travel distance available.	-
Application must have full control of the LEDs	-
Application must have full control of the bluetooth sound system	-
Skateboard	
The board must be able to fold in half.	-
The board must be able to turn based on the riders lateral inclination.	-
Motor	
The motor must perform well with any rider under a certain weight.	250lbs
Motor top speed	15 - 20 miles
Battery	
The battery's charge must last enough to travel a certain distance	12 miles
Sensors	
Proximity sensor(s)	5 - 10ft
LEDs	
RGB display(s)	-
Frontal and rear LEDs that provide visibility in the dark	-
Bluetooth Sound	
Proximity distance warning sound	5 - 10ft
Entertainment audio	-

Table 2: Subsystems Overview

Subsystems and Responsibilities	
Control	Josh Andrews
Power	Danner De La Rosa
Mechanical	Danner De La Rosa
Sensor	Danner De La Rosa
LED	Josh Andrews
Sound	Josh Andrews

Control: Subsystem responsible for controlling all other subsystems through the mobile app.
Power: Subsystem responsible for storing and distributing power to each component that requires it, such as the motor; revolves around the battery and its circuitry.
Mechanical: Subsystem responsible for the movement of the skateboard by its motor.
Sensor: Subsystem that involves any sensors that will be integrated, such as the proximity sensors.
LED: Subsystem that involves any LEDs that will be integrated.
Sound: Subsystem that involves any sounds, such as warning sounds, that will be integrated.

Diagrams

Figure 1: System Design Responsibilities

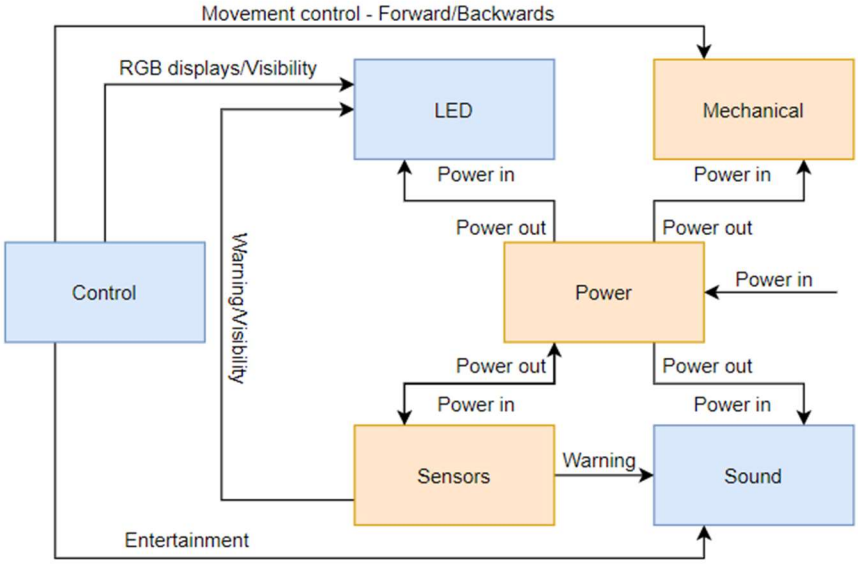
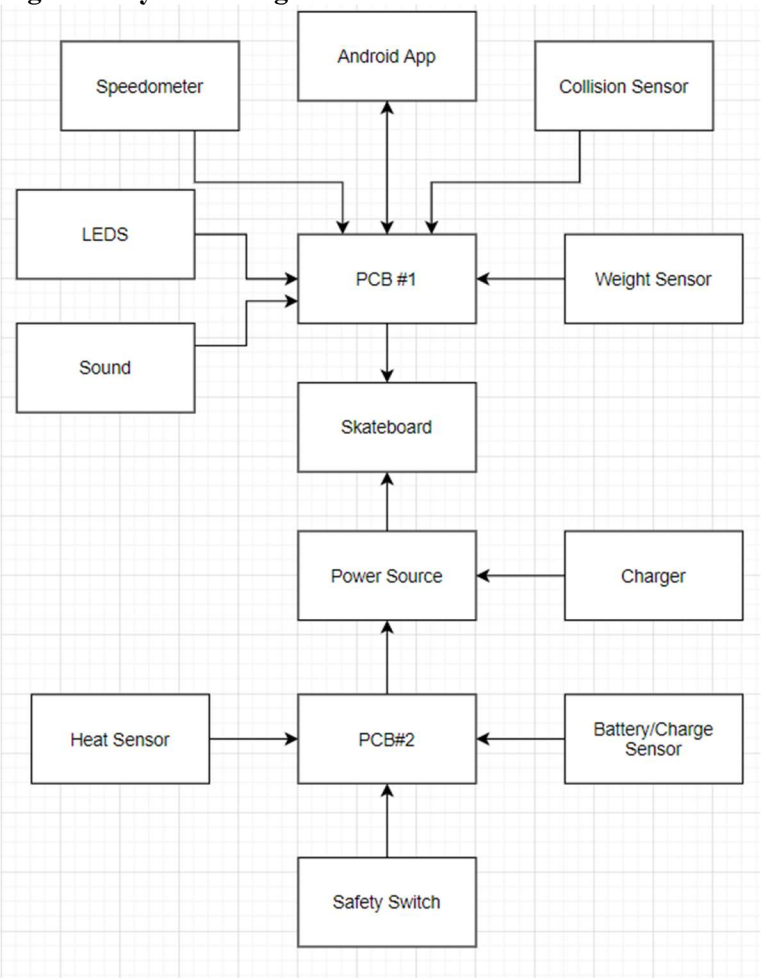


Figure 2: System Design with Detail



Figures 1 and 2 show what we expect to need in the design of our project as of now. Figure 1 is more intended to show the responsibilities of each person. On the other hand, Figure 2 shows an estimate of the specific aspects needed within each module of the project shown in Figure 1. The "System Design Responsibilities" diagram is more permanent, the "System Design with Detail" diagram is more modifiable as we determine what components are more important to implement.

Table 3: Budget and Financing

Potential Parts	Estimated Cost
Battery	$50
Microcontroller and Sensors	$30-60
Skateboard	$30-40
Motors	$20
LEDs	$2
Handheld Bluetooth Remote	$10
Beeper	$2
TOTAL	$144-184

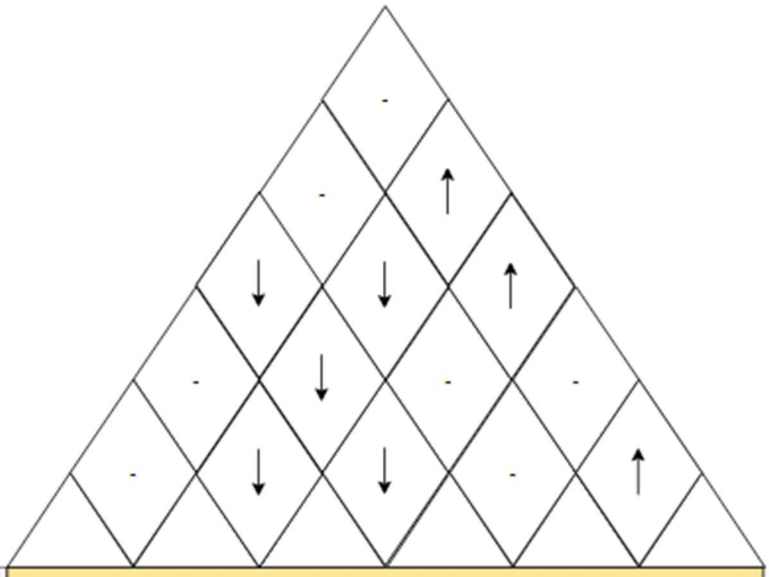
Table 4: Senior Design 1 Milestones

Milestone	**Due Date**
Research components	January 2020
Code structure	
PCB design	
Finalize the list of components to be used	
Firmware development	
Order main components	
Install motor and battery	
App development	
Functionality testing	

Table 5: Senior Design I Milestones

Milestone	Due Date
LEDs installation	TBD
Sensors installation	TBD
Program LEDs and Sensors in the app	TBD
Functionality testing	TBD
Install bluetooth audio system	TBD
Program audio system in the app	TBD
Functionality testing	TBD
Final corrections	TBD

Figure 3: House of Quality



		Engineering Requirements					
		Foldable	Battery Life	Top Speed	Maximum weight	Peripherals	DEV Cost
		+	+	+	+	+	-
Safe	+	-	-	↓↓↓	-	↑↑↑	↑
Manageable	+	↑↑↑	↑↑↑	↑↑↑	↓↓↓	↓	↓
Efficient	+	-	↑↑↑	↑	↓↓↓	↓	↑↑
Powerful	+	-	↓↓↓	↑↑↑	↓↓↓	-	↑↑↑
User Friendly	+	↑↑↑	-	-	-	↓↓	↑
Low Cost	-	-	↑↑↑	↑	↑↑↑	↑↑↑	↑↑↑
Target of Engineering Requirements		2 parts	12 miles @ max weight	20 mph	250lbs	LEDs Speakers Sensors	<$200