www.mwftr.com

E-TRIKE

By:

TiAuna Dodd,Breyonna Pinkney,
Mercy J. Daniel-Aguebor, Felicia Long,
Adaugo Anyamele, Kasandra Price

Advisor: Tim Brown

Background : Why an Electric Tricycle?

- Clean energy transportation
- Less expensive
- Conveniency of a vehicle and efficiency of a bicycle
- Eases stress for Commuters, people of older age, people who have trouble balancing a bike
- Comfortability

Problem Formulation

Target Users: Commuters, people of older age, people who have trouble balancing a bike

Problem Definition: To create a mainstream source of transportation that is safe and reliable. This is the Recumbent Electric Tricycle

Primary Objective: Make the bike user friendly

Constraints

- Sociocultural: Consideration of users with different smartphones and the type of connectivity
- Financial: The total cost of each part $800.
- Intellectual: No prior experience in app development
- Size: Battery is less than 750 watts

Standards and Regulations

- The Consumer Safety Product Commission (CSPS)
  - Does not require a license or registration
  - wheels at least 16 inches in diameter
  - a source of power no more than 20 mph.
  - Class 2 Bike
- Code of Federal Regulation
  - 16 CFR 1512 "FEDERAL HAZARDOUS SUBSTANCES ACT REGULATIONS REQUIREMENTS FOR BICYCLES"
- USPTO
  - The E-trike must not infringe on the rear axle Tricycle Apparatus pattern

Design Requirements

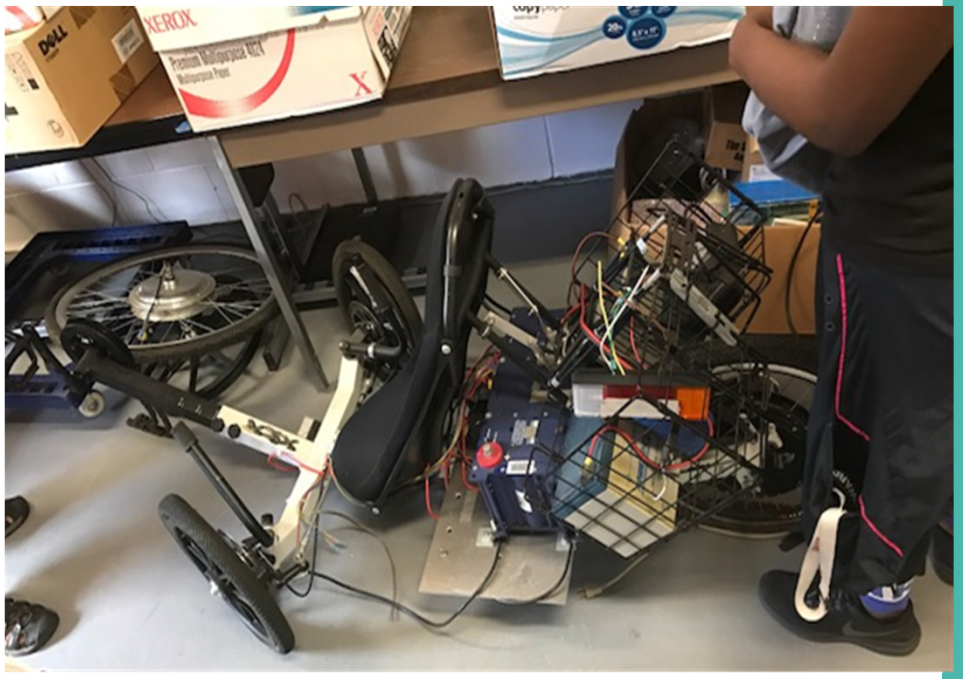
- Have a lithium battery that weighs less than 5 pounds and at least 700W
- The entire trike should weigh between 80-100 pounds
- Go at least 10 mph on a single charge and the max speed must be 20 mph
- Be rechargeable in a safe and user friendly way

What is on the market now?

- Price - $2,200
- Est. Max Range - 15 miles
- Pedal Assist

- Price - $12, 985
- Est. Max Range - 65 miles
- Capability for Solar Charging

Current State of Art

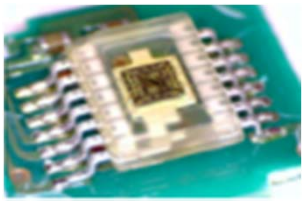


- Cheaper <$1000
- Comfortable and safe to ride
- Not exposed to the elements
- Cool Factor

Solution Approaches - Design 1

BLUETOOTH/
WIFI

- Buttons
- Signals
- Throttle Assist
- Light Signals



BATTERY
MANAGEMENT

Solution Approaches: Design 2

Dashboard

Solar Panels

Lithium Battery

BATTERY MANAGEMENT

- Battery level Indicator
- LED battery display
- GPS
- Input Function

Solution Approaches: Design Matrix

	Weight	Design1	Score	Design2	Score
Functionality	5	Tricycle, battery, App,lights	5	Solar panels, seat belt	5
Connectivity	3	App, Sensor	5	n/a	0
Weight	2	Heavy due to battery	3	2-4lbs per sq ft. solar panels+mounting equipment	1
Power	5	lights=more power	3	Solar Panels	4
Convenience	2	High-has an App	4	No phone needed	3
Price	5	High: <$1,000	3	Higher: >$1,000	1
TOTAL			111		83

Top Solution Design - Crunching the numbers

Assuming: Total Weight [Bikers weight plus weight of bike] = 280 pounc

Constant speed, no gear/acceleration, optimal efficiency

$$P_{total} = P_{drag} + P_{R_c} + P_{hill}$$

Average power of an human pedaling is 400W

Using a Simulator

Human Provided Power	Range	Battery Power Needed
200W	32 miles	600W(47.5V)/25A
0W	25 miles	742W(46.8V)
400W	48.3	473W(48.3V)

Important Parts of the Electric Bike

Rear mounted Geared Motor

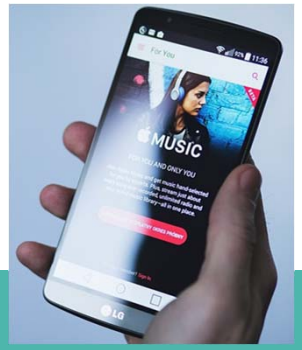
- Moves the bike
- Single rear wheel
- 700W, 48V
- Lightweight

18650 LIPO cells

- Powers the bike
- 700W, 48W
- Durable
- Lightweight

Arduino BT Microcontroller

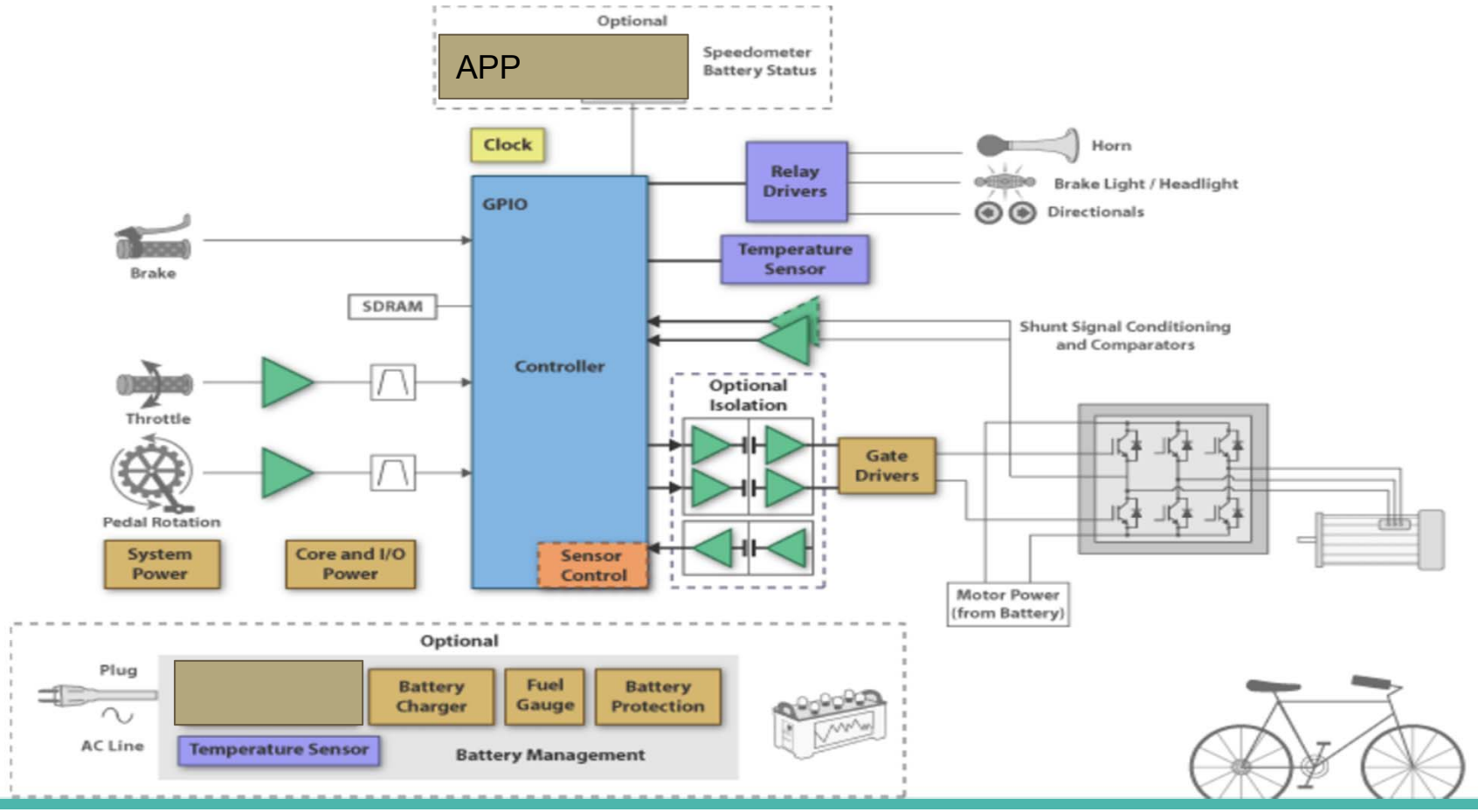
- Controls everything
- Cheap
- Easily customizable



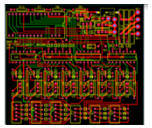
IOS Mobile Application

- Has potential for internet of things
- Improves user experience
- Fun!

Top Solution Design



Final Schematic

INPUT	PROCESSOR	OUTPUT
Battery 	Arduino 	Phone Application  • GPS • Speedometer • Battery Charge
Throttle 	Battery Management System   	Smart Lights  Signal Lights  Motor(Wheels) 

How the Final Product will work

- The principle stay the same but we will be decreasing cost
- Improving user experience
- And solving a problem to increase usage
- Improving safety
- And opening the limits for internet of things with bikes

THANK YOU