Electric-Tricycle

BY:

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Problem

- Clean energy transportation
- Less expensive
- Conveniency of a vehicle and efficiency of a bicycle
- Change target market
- Comfortability
- Advanced design

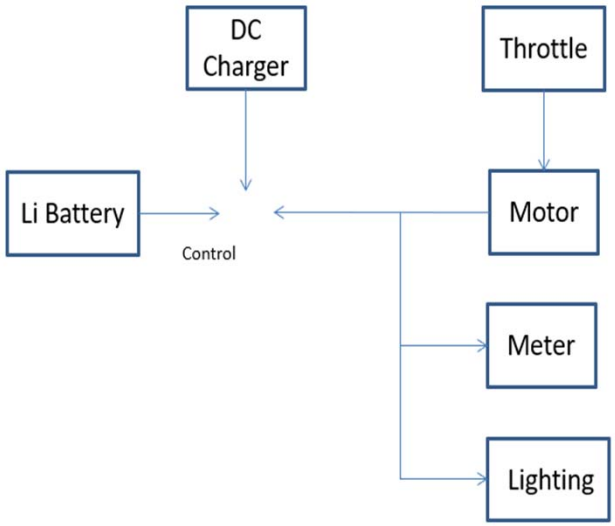
The Need

E-Trike 2016

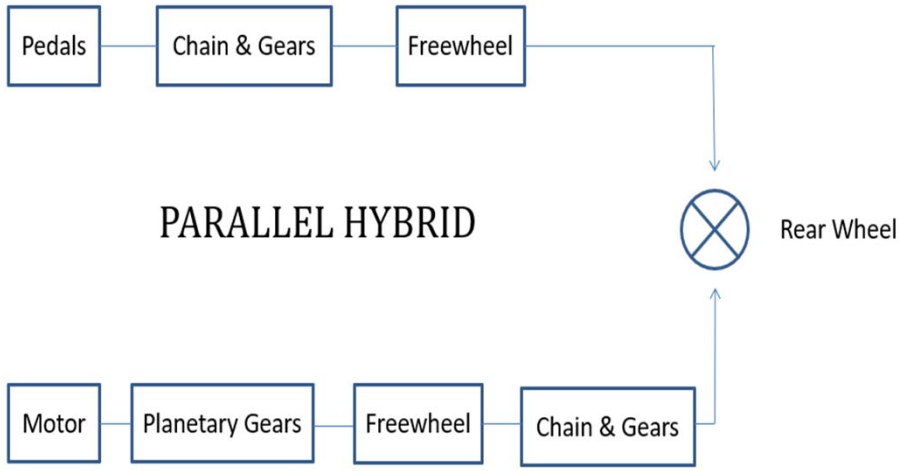
- Design
- Dashboard functions
- Safety
- Convenience

The Layout Design

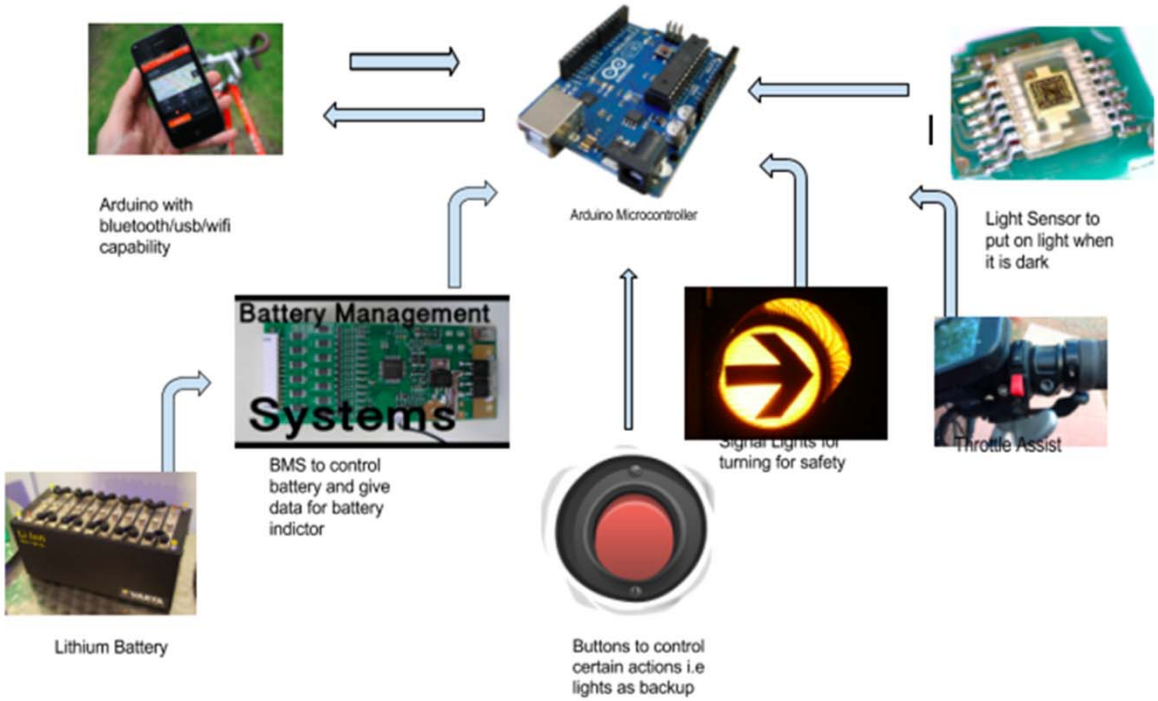
ELECTRICAL LAYOUT



MECHANICAL LAYOUT



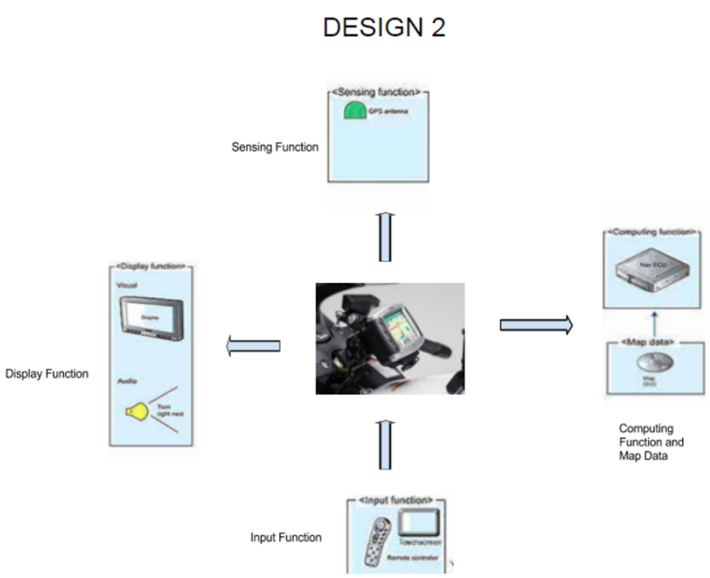
Design 1

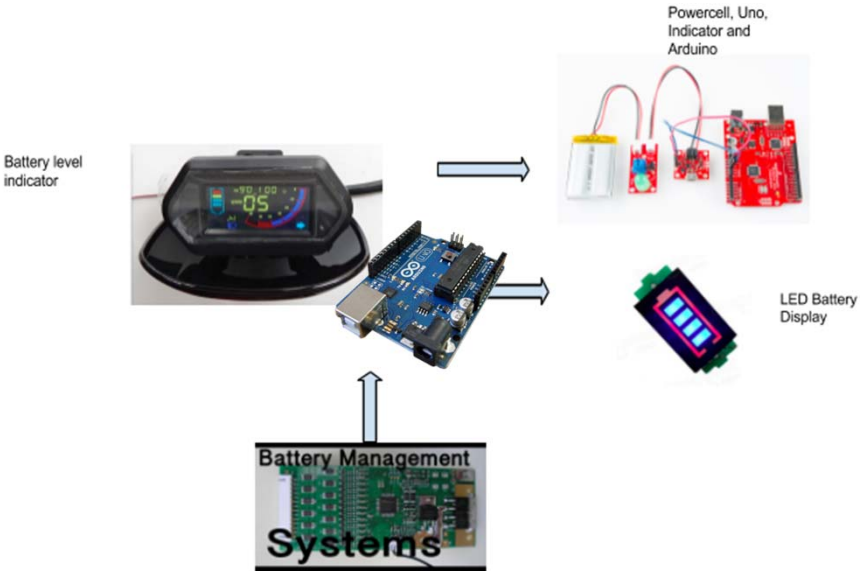

Arduino with bluetooth/usb/wifi capability
Arduino Microcontroller
Light Sensor to put on light when it is dark
Battery Management Systems
BMS to control battery and give data for battery indictor
Throttle Assist
Lithium Battery
Buttons to control certain actions i.e lights as backup

Pros and Cons

Pros	Cons
Smart Phone App	Requires internet connection
Arduino works with BMS to provide data to battery indicator	Requires power for microcontrollers
Signal Lights can eventually be programmed to come on if a turn is detected	
Light Sensor increases safety by coming on automatically	Switch is needed in case of error
Battery is lighter, smart and more efficient	
Arduino microcontroller is low-cost	It cannot be updated easily
Throttle Assist does not need pedaling, can be beneficial for disabled people	Reduces pedaling range

Design 2


DESIGN 2
Sensing Function
Display Function
Input Function
Computing Function and Map Data


Powercell, Uno, Indicator and Arduino
Battery level indicator
LED Battery Display
Battery Management Systems

Pros and Cons

PROS	CONS
Always Available	Depends on phone availability
Pedal Assist increases the range of the battery	Does not have the option for the user to stop pedalling
Dashboard does not rely on external features such as wifi/bluetooth to work hence increasing reliability	Dashboard drains additional power
Arduino works with BMS to provide data to battery indicator	Power required for two microcontrollers
Regenerative Brakes help to conserve energy, Dynamo included can produce energy	Twice as much energy is needed to pedal and charge at the same time.

Design Matrix

	Weight	Design1	Score	Agg.Score	Design2	Score	Agg.Score
Functionality	5	Tricycle, battery, App,lights	5	25	Solar panels, seat belt	5	25
Connectivity	3	App, Sensor	5	15	n/a	0	0
Weight	2	Heavy due to battery	3	6	Heavier-bike+solar panels	1	2
Power	5	lights=more power	3	15	Solar Panels	4	20
Convenience	2	High-has an App	4	8	No gas needed	3	6
Assistance Mode	4	Throttle Assist	3	12	Pedal Assist	2.5	10
User Experience	5	SmartPhone App	5	25	Dashboard	3	15
Price	5	High: <$1,000	3	15	Higher: >$1,000	1	5
TOTAL				111			83

BATTERY

Lithium Nickel Manganese Cobalt Oxide (LiNiMnCoO2 or NMC)

- Used by Tesla, stores large about of energy
- $300 for 300W
- Very Light

Nanophosphate® lithium iron phosphate (LiFePO4) batteries

- Does not lose charge as easily as other batteries
- More tolerant to full charge situations
- $300 for 300W
- Produced specifically by A123 systems - lighter than other batteries in the same range

Building our own battery with 18650 cells

- Cheaper, about $100 for just the battery
- Light
- Easily configurable

BATTERY DECISION MATRIX

CRITERIA	WEIGHT	LiNiMnCoO2	LiFePO4	18650
Weight	5	5	4	4
Price	5	2.5	4	5
Range/Energy	4	4	4	4
Safety	3	5	3	3
TOTAL(weighted)	21	68.5	65	70

System Design

Input

Mobile App
- Sends list of required item to processor

Accelerometer
- Alerts Processor when backpack moves

Tag Reader
- Sends RFID info from tags to processor

Sensors

Ultra Sonic Distance Calculator
- Distance from obstruent objects

Bluetooth Microphone
- Request for new directions
- Request for data and time

Data

Information

Output

Cell Phone
- Displays list of missing items

Vibrators
- Vibrates when an item is missing
- Alert of obstruent objects

LCD Screen
- Displays list of missing items on backpack

Bluetooth speaker
- Directions
- Date & time
- Low Battery
- Configuration of request

Internet
- Get time
- Access Google Maps

GPS
- Constantly monitoring location

OVERALL FINAL DESIGN