Second Generation Bike

Problem Definition and Project Plan

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Overview

- Client
- Customer Needs
- Project Goal
- Objectives
- Constraints
- Testing Environment
- Quality Function Deployment (QFD)
- Project Planning
- Conclusion

Clients

- Dr. Srinivas Kosaraju
 - PHD Mechanical Engineering
 - Senior Design Professor
- Green Fund
 - Funded project in 2013

Customer Needs

■ The 1st Generation Charging Bicycle Station does not possess an adequate interactive display or an efficient energy storage system.

Project Goal

■ Goal: Complete and improve the 2013-2014 2nd Generation Bicycle Charging Station.

Objectives

- The bike should be able to power small electronics
- The touch screen should be able to sustain heavy use
- The bike should be durable and reliable
- The bike should have an efficient energy storage system
- The control system should be inexpensive
- The system should look aesthetically pleasing

Objectives

Objective	Measurement	Units			
Powers Small Electronics	Test with a Load Bank	Watts (W)			
Durable Touch Screen	Surface Roughness/Scratches	Number of Scratches			
Durable and Reliable Design	Maintenance Costs	Dollars (\$)			
Efficient Storage System	Test System Load Capacity	Watts (W)			
Inexpensive	Cost of Additional Components	Dollars (\$)			
Aesthetically Pleasing	Compare Survey Results	Survey			

Constraints

- Capable of charging common electronic devices in only a few hours
- Charging station must be capable of being converted from stationary to mobile in only a few minutes

Constraints

- Station must contain an interactive touch screen display that shows:
 - Power generated
 - Power used
 - Calories lost
 - Distance traveled
 - Total power generated over lifetime of the charging station

Testing Environment

- A Laboratory Experiment
 - Will be used to analyze the power output of the charging station (via computer program)
- A Field Test
 - Will be used to test durability and functionality of the charging station and display screen.

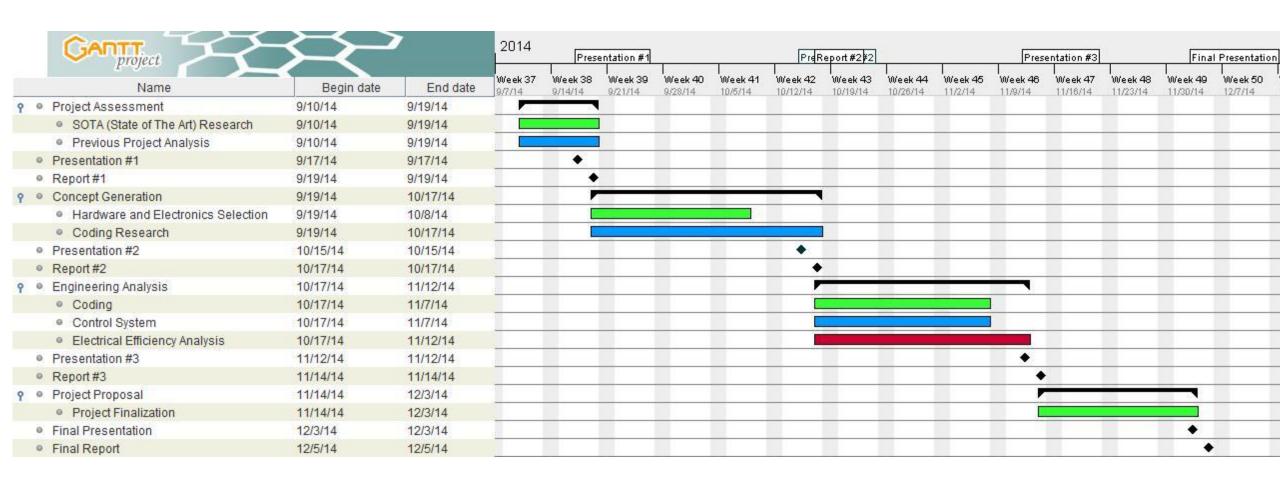
Quality Function Deployment (QFD)

	Legend: 1 = Weak 2 = Moderate 3 = Strong		Importance	Weight	Power Output	Cost	Maintenance	Accuracy
Ħ	Accessibility/Ease of Use		7	1		1	1	
ner	Interactive Display		10	1		3	1	2
er Requirements	Power Generation		10	2		2	2	3
	AC Power Capability		6	1	2	1	1	1
	Mobility		7	1		1		
	Aesthetic Design		8			1		
E	Multiple Charging Outputs		7			2		2
ustomer	Power Storage System		9	1		3	3	3
ū	Output Displays		10		1		1	3
			Score:	59	22	119	80	127
			Relative Weight:	14%	5%	29%	20%	31%
		U	nits of Measure:	lbs	Watts	\$	Hours	% error

State-of-the-art Research

- Raspberry PI http://www.raspberrypi.org/
- Arduino http://arduino.cc/
- Python https://www.python.org/
 - Beginning Python 3.0: Using Python 2.6 and Python 3.1 eISBN 9780470626641
- C++ Mastering Windows 8 C++ App Development
 - eISBN 9781849695039
- Super Capacitors http://batteryuniversity.com/learn/article/whats the role of the supercapacitor
- Lithium Ion Batteries -http://batteryuniversity.com/learn/article/lithium_based_batteries

Project Planning



Conclusion

- Engineering Design Process
 - ullet Improving upon the 1^{st} Generation Charging Station by adding an interactive display and a more efficient storage system
- Testing Environment
 - To be tested both in the field and in the laboratory
- Quality Function Deployment
- State-of-the-art Research
 - Research into the types of programming and microcontrollers
- Project Planning