Head On

Initial Design Proposal

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Narrative:

In recent years, vehicles have incorporated sophisticated electronic systems in order to improve the safety, comfort, and overall enjoyment of the ride. Notable features seen in newer vehicles include built in navigation, projected speed, directions displayed on the windshield, omni-directional cameras for a 360 view of the vehicle, and proximity sensors to detect nearby obstacles. Meanwhile, the two wheeled counterpart, the motorcycle, continues to lack an implementation of these features that would make riding more comfortable and safer for riders.

Using our in helmet system, we hope to give riders easy access to data such as the proximity of potentially hazardous objects, details of the bike (e.g. cardinal direction, speed), and general details (e.g time).

Marketing Analysis:

Currently in the market is a similar product called "Skully AR-1", which provides riders with a heads up display (HUD), rear view display, and GPS navigation; therefore, allowing the rider to "gain full situational awareness," according to their website. Our product will have a similar premise by helping increase the situational awareness of the rider. However, rather than showing the rider an image of the road behind him or her, our system will simply display a symbol on the screen indicating what direction the potential hazards are coming from.

Another similar product is a previous senior design project, named "Helmet Tracking System", which tracked the rider using GPS and sent out texts if he or she was in an accident. However, this system had no integrated display for the rider to interact with the system. Our product will allow the rider to be warned visually of the proximity of other vehicles, as well as display other useful information such as, speed, cardinal direction, and time. Hence, increasing the overall awareness of the bike and surroundings, and increasing the rider's safety.

Objectives:

- Useable during charge
- Easy to understand interface
- Non-obstructive display
- Easy to read display
- Ability to sense obstacles approaching from all directions
- Accurate time displayed
- Accurate cardinal direction indicator
- Accurate speed measurement
- Dual charging methods
- Utilize solar power

Requirement specifications:

Attribute	Value
Battery Life	Minimum 1 hour
Connectivity distance to onboard transponder	15 feet
Sensor measurement frequency	1.5 s
Number of sensors	4
Forward detection distance	Minimum of 15 feet
Lateral and rear detection distance	Minimum of 3 feet

Constraints:

- 49 CFR 571.218
- Available surface area on helmet for solar cell placement.
- Minimum helmet visibility as dictated by Department of Transportation Standard 218.
- FCC regulations of wireless transmitter.

Block Diagrams:

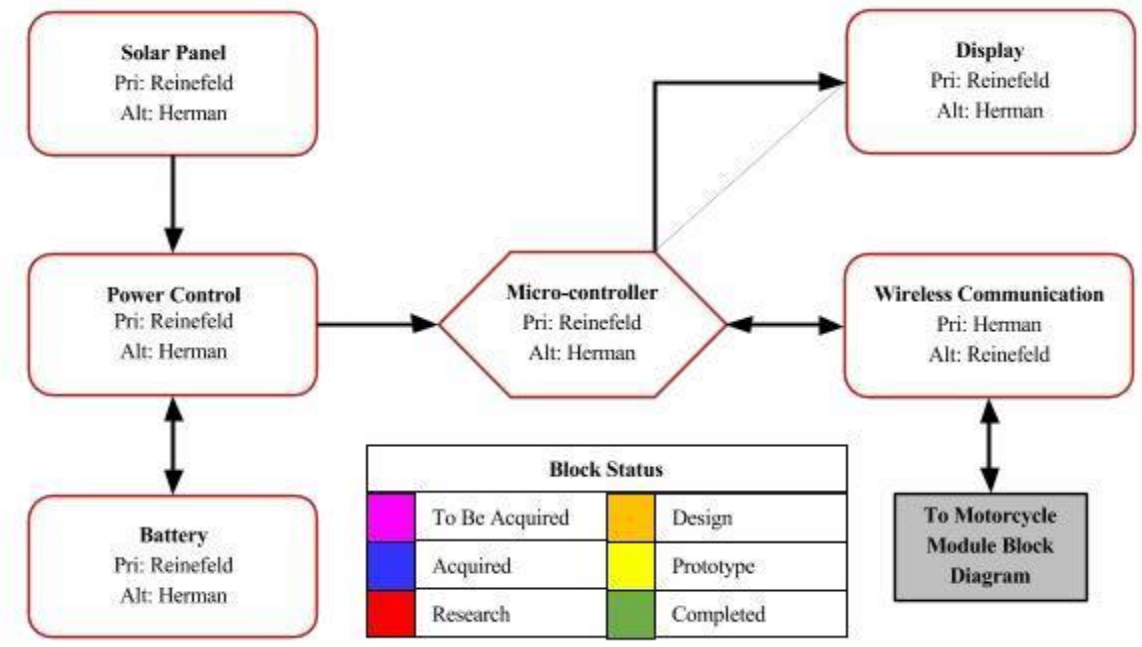

Diagram 1: Helmet Module Hardware

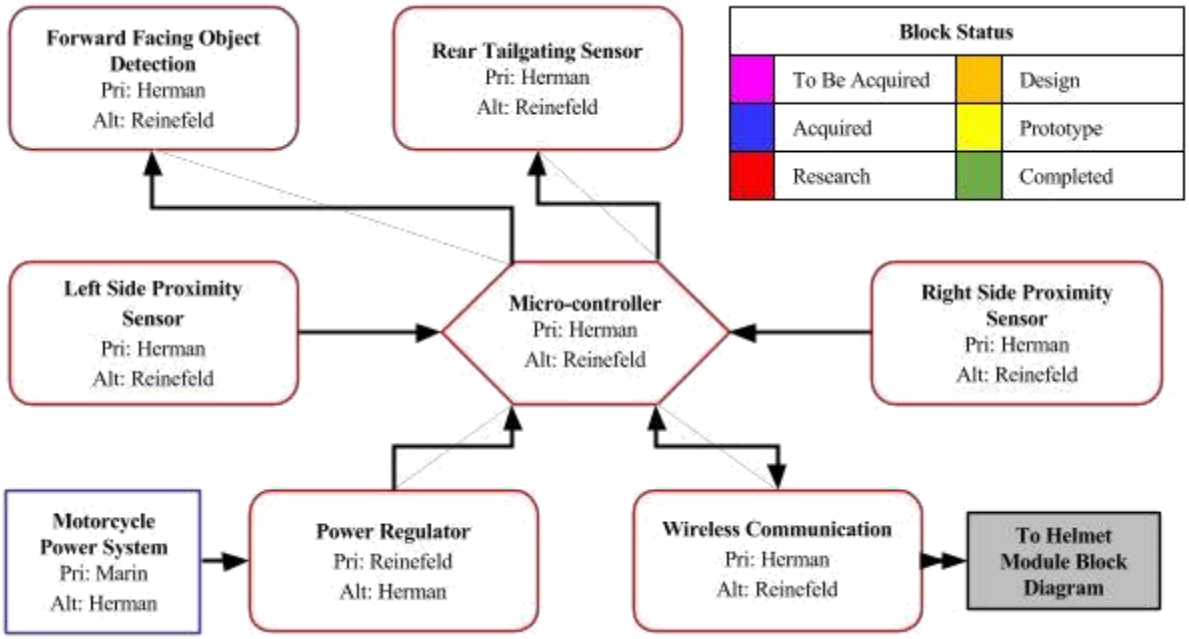

Diagram 2: Motorcycle Module Hardware

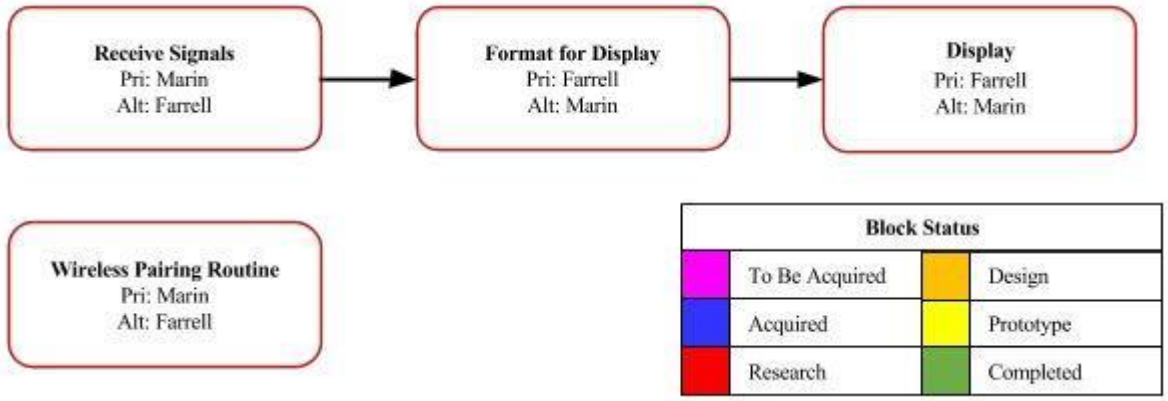

Diagram 3: Helmet Module Software

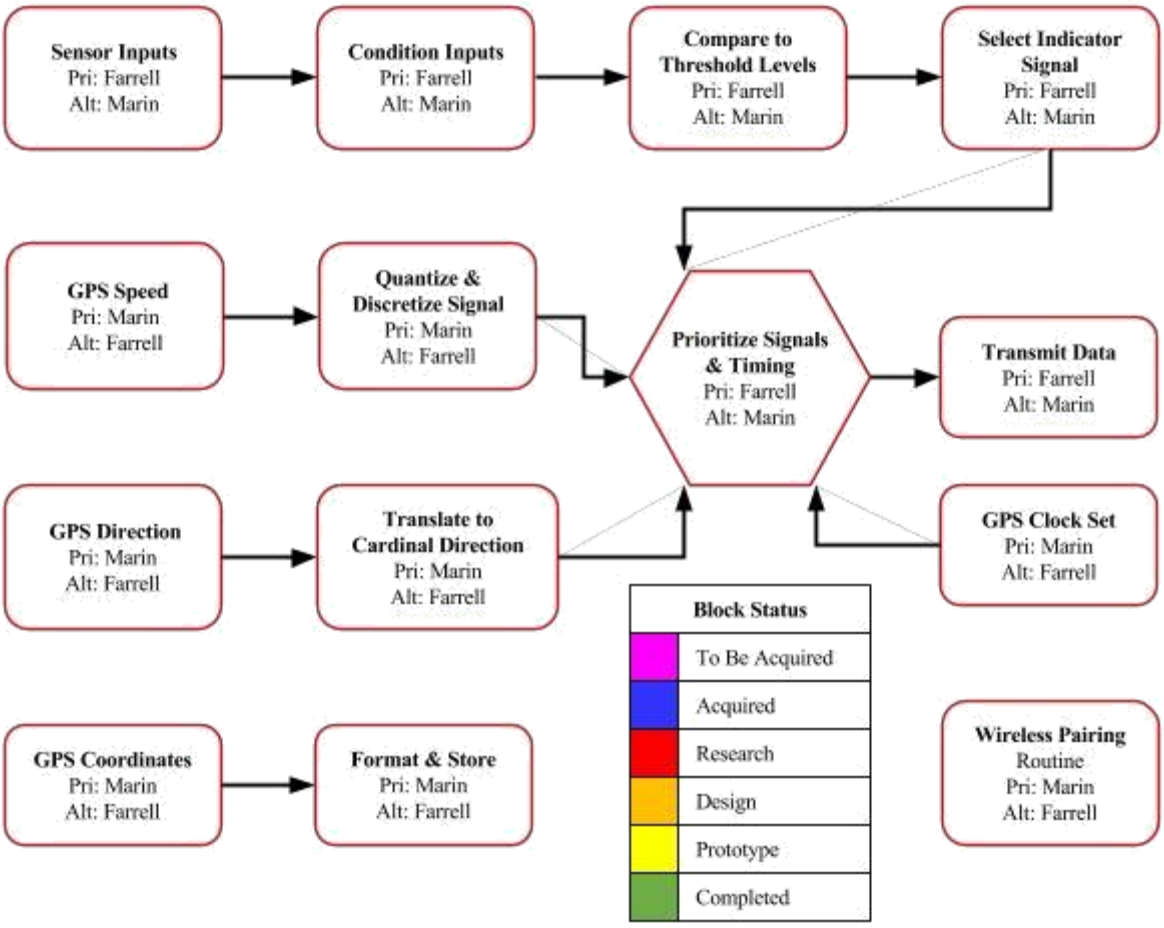

Diagram 4: Motorcycle Module Software

● Solar Cell Placement

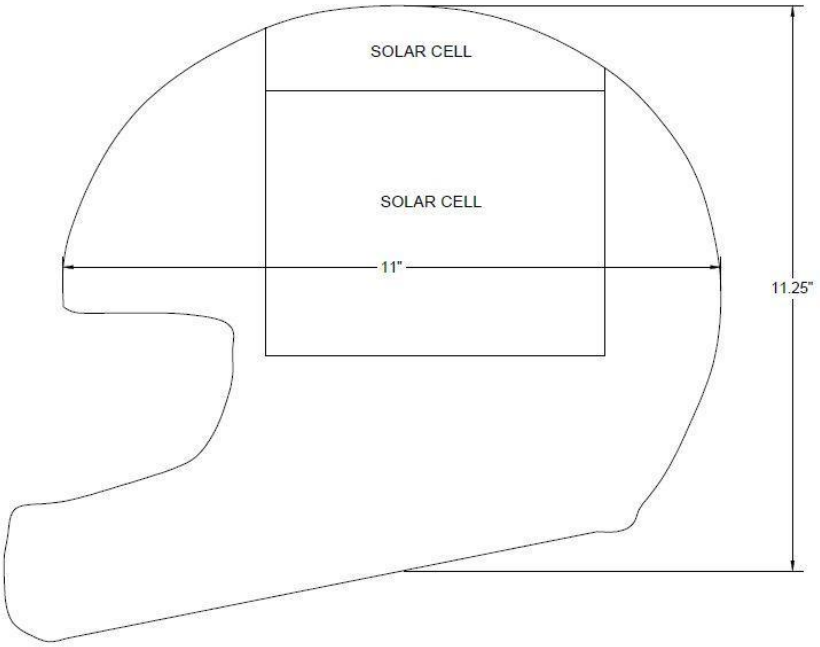

Image 1: Side View of Helmet

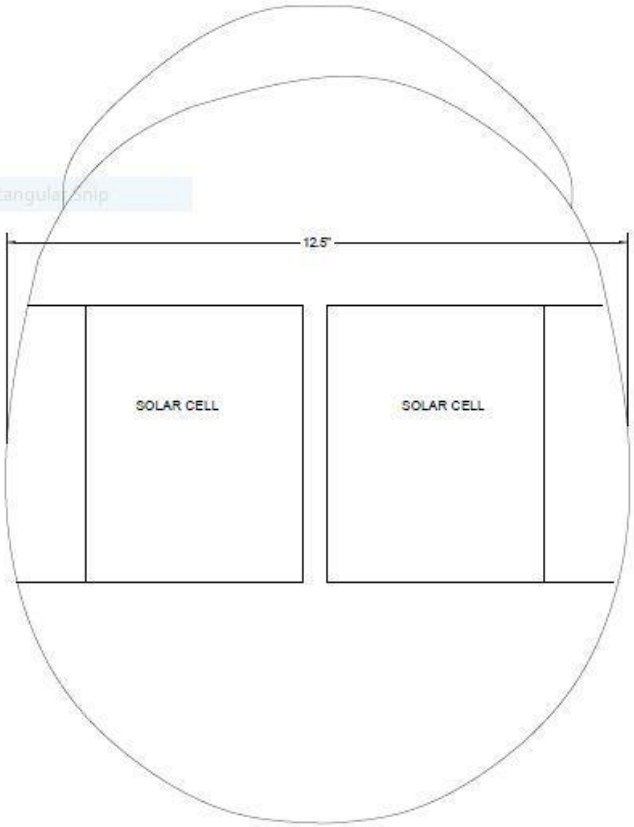

Image 2: Top View of Helmet

Budget and Financing:

Parts	Quantity	Cost (each)
Motorcycle for testing	1	Acquired
Motorcycle helmet	1	$50
Printed circuit boards	10	$5
Microcontrollers	2	$10
GPS module	1	$50
LCD display	1	$15
Solar panels	8	$15
Battery	1	$40
Short range sensors	3	$10
Long range sensor	1	$115
Wireless modules	4	$9
Power regulators	4	$15
USB TTL board	1	$6
Total:		$592

Milestones:

Senior Design 1	
Milestone	Deadline
Research possible project ideas	August 28, 2015
Choose project topic	August 31, 2015
Perform market analysis of similar products	September 9, 2015
Develop list of possible features	September 9, 2015
Research ways to implement the agreed upon features	September 11, 2015
Submit project proposal document	September 15, 2015
Propose idea to local companies for funding	September 22, 2015
Research and obtain chip and compatible modules	September 30, 2015
Design and obtain PCB for onboard motorcycle system	October 7, 2015
Develop prototype with all modules transmitting and receiving data	October 31, 2015
Finalize design of hardware and GUI	November 18, 2015
Finish research paper	November 30, 2015

Senior Design 2	
Milestone	Deadline
Build and program final product	January 30, 2016
Troubleshoot problems	February 29, 2016
Test for accuracy and make necessary modifications	March 31, 2016
Finish final documentation	April 15, 2016
Ensure all requirements set in senior design are met	April 29, 2016