Solar Powered Golf Cart

Group 9

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Project Description

The main objective of this project is to design and build a solar-powered, energy efficient electric golf cart inspired by and using resources from a previous Senior Design project. The desired outcome of this development is to have an electric golf cart that will efficiently harvest power from sunlight in order to power the electric motor and onboard electronic systems while providing the user with options for total energy consumption. In order to reach this outcome the cart will implement the following three different modes of energy operations: standard, max performance, and max efficiency. The standard mode of energy operation will provide the motor with enough of energy for 80% of maximum output as well as supply the onboard electronics with enough power for operations and medium brightness levels. When the user switches to the max performance mode of operation the motor will receive enough power for 100% maximum output and electronics will perform operations while at maximum brightness levels. If the max efficiency mode is selected then the engine will only receive enough power necessary to run at 60% output and onboard electronics will still perform operations but displays will be set to a more dim brightness. The golf cart power monitoring system will automatically switch to max efficiency mode if it should detect the battery charges dropping below 25% in order to conserve power for the longest amount of time possible. The power that will be required to run the cart's motor and onboard electronics will be supplied by batteries that will receive the necessary amount of charge from the solar panels or a wall outlet. There will be a monitoring system that will accurately display the remaining power in the batteries as well as check for any defects in the battery power storage. The onboard electronics will feature two touch-screen displays for various user information display. One screen will display power mode options, charge remaining, and current speed. The other display will have a gps system to provide the user with a map of their current location and also give any necessary navigational directions based on user location.

Project specifications and requirements

1. Must have a top speed of at least 15 mph
1. Must have 3 modes of operation allowing for user control of modes
2. Must run off of a 36V or 48V battery storage bank
3. The batteries must be able to charge from solar panels or a wall outlet
4. Must automatically go into power saving mode at 25% battery capacity
5. Must have two touch-screen displays for user information
6. Must provide navigational aid to user
7. Must provide charge remaining, power mode options, range left, and current speed

Milestones

September 19, 2014 - Clearly defined complete list of tasks

October 17, 2014 - Completed list of hardware chosen to use

November 21, 2014 - Completed designs for each subsystem and corresponding documentation

December 1, 2014 - Finalized documentation done

January 23, 2015 - Initial subsystem testing and integration started

February 20, 2015 - Subsystem integration done

March 27, 2015 - Entire system mounted on golf cart

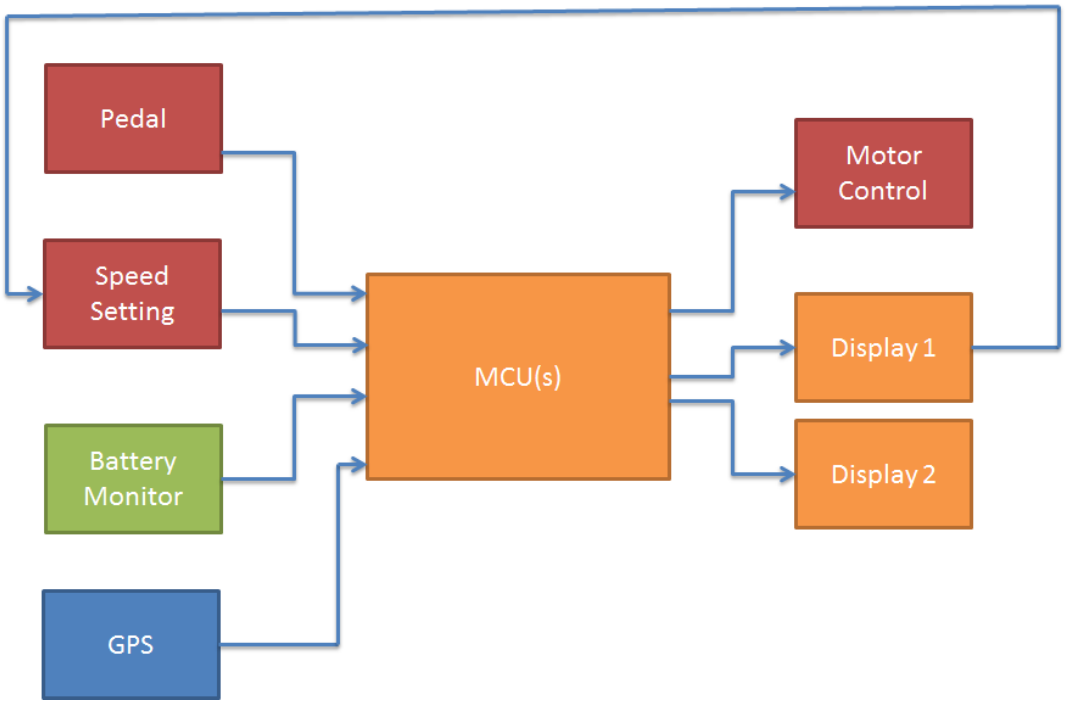
April 13, 2015 - Finished troubleshooting and making weatherproof

Project Block Diagrams

Color	Member
Red	Jake
Orange	Jacob
Green	Matt T.
Blue	Matt R.

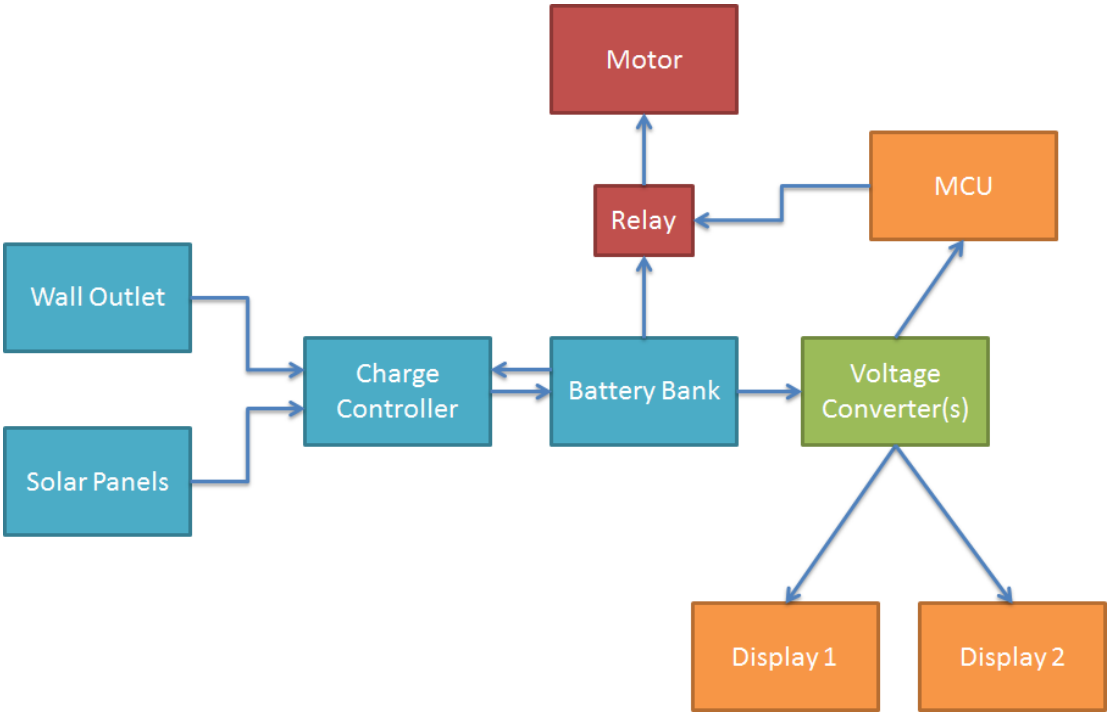
At this stage in the development, every block is assumed to be designated as “To be acquired”. Our project can be broken down into a few sections. System control, power systems, and software. The MCU makes a decision of how much power to apply to the motor based on the speed setting, position of the pedal, and percent of battery left. The battery monitor will calculate the range left on a charge and report it to the status display. The speed setting is decided by the user through display one touch screen interface.

System Control



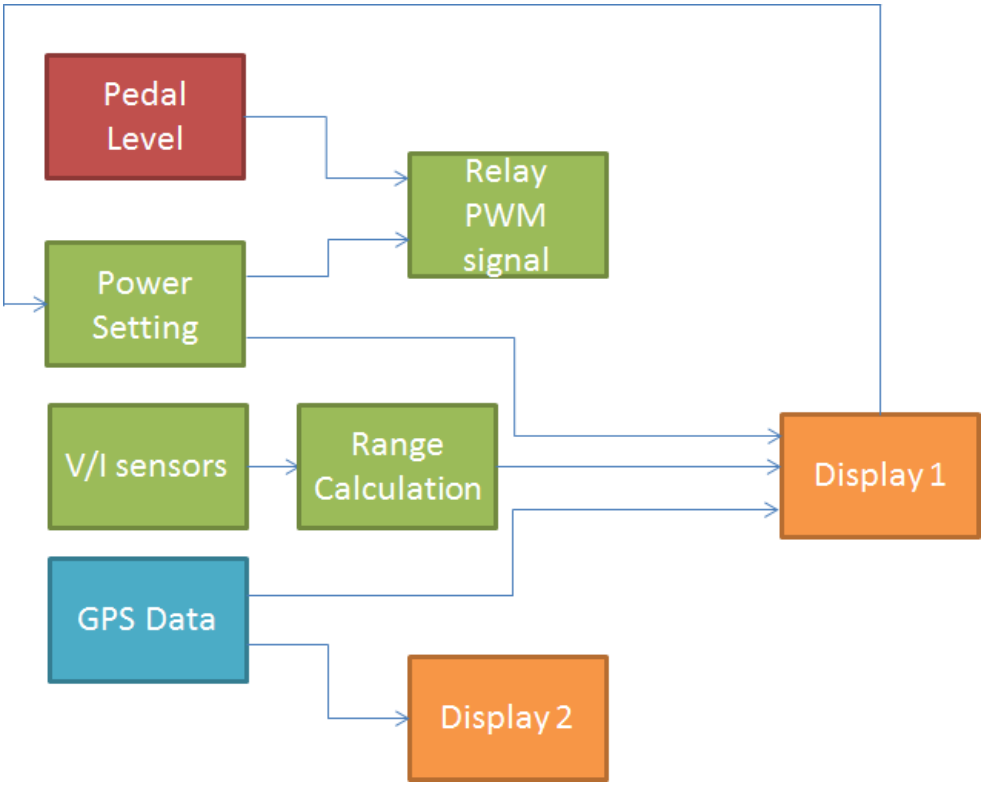
Power Systems

The solar panels will be used to convert energy from the sun to charge the battery bank. From the battery bank, the majority of the power will be used for the motor. A portion of the stored power will be converted and used to control the MCU and display subsystems.



Software

The input from the gas pedal is sent to the PWM to allow for variable speed. In addition, the voltage/current sensor will be used to test the battery levels and determine the maximum distance the vehicle can reach on the current charge. Incorporating GPS, we will be able to plot a destination and an algorithm will first determine if the destination is obtainable, then plot the best route using the most energy efficient drive mode. The GPS and vehicle performance will be displayed with a touch screen for the user.



Project Budget and Finance

Our current budget is dependent upon having a golf cart reused from a previous semester. These are rough estimates based on internet searches for a general price point. These are subject to change with the needs of our project. We will most likely keep the solar panels and batteries.

Part	Estimated Cost
Solar Panels	$600 (if necessary to replace)
Motor	$500 (if necessary to replace)
Batteries	$600 (if necessary to replace)
Charge Controller	$50-200 (designed pcb)
Microcontroller(s)	$150
Touch-Screen Displays	$120
Sensors	$150
Brakes	$50 (if necessary to replace)
Golf Cart	$0 (Reused)
Misc.	$100
Total	$2470 (maximum)