Initial Project and Group Identification Document
Divide and Conquer

Group #30 Presents: ABC Leaf Car

Android Bluetooth Controlled Leaf Car is a mobile robot that will be controlled by an Android device, implement obstacle detection and avoidance, and will be powered by solar-charged lithium ion batteries.

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I. Sponsorship

Group #30 will be seeking sponsorship from Duke Energy.

II. Project Description

According to the National Highway Traffic Safety Administration, there were 2424 traffic fatalities in Florida in the year 2012. Many traffic accidents are caused by texting and driving, driving while under the influence, or by human error. To reduce the amount of traffic accidents, a collision detection and avoidance system can be developed to halt the car before an accident occurs.

Pollution from cars continues to be an ongoing problem. One solution is to operate cars with clean, renewable energy. A source of clean and renewable energy is sunlight. The energy from the sun can be harvested using solar panels, which converts the solar energy into electricity.

The goal of this project is to create a solar power robot that is capable of obstacle avoidance. The robot will be controlled by an Android phone and be able to avoid colliding with obstacle using various sensors mounted on the front and rear. During the day it will use solar panel to charge the batteries to extend runtime.

The ABC Leaf Car robot will essentially be an RC car that is controlled by the user through the use of an Android device. The controls will involve tilting the Android device forwards, backwards, and to the sides to tell the robot to move forwards, backwards, left and right. The built-in accelerometer in all Android devices will allow acceleration and deceleration of our robot.

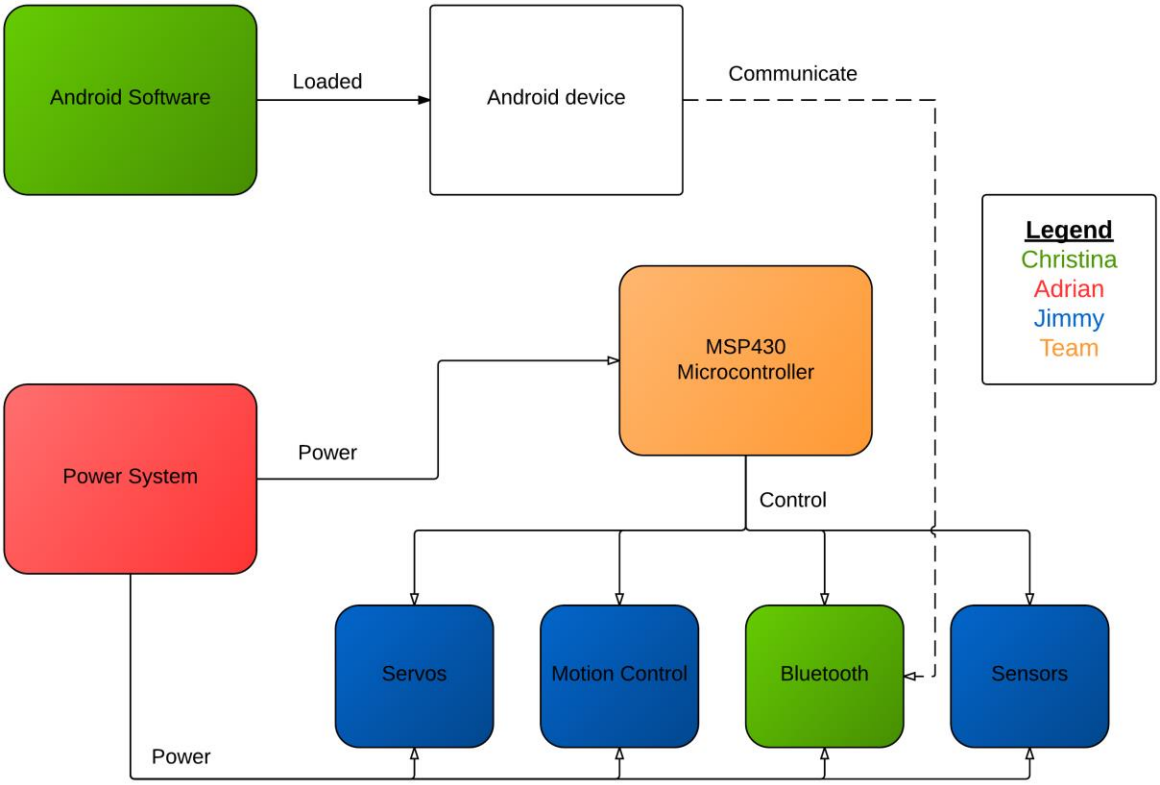
The next feature that we will include in our robot is obstacle avoidance. To prevent the user from trying to crash the robot into a wall or other obstacle, the robot will not move forward if there is an impassable object blocking the path it wants to travel in. When the user tells the robot to move in a direction, it will first check to make sure there is no impassable obstacle in the way before moving. If an obstacle exists, or should one appear while the robot is moving, it will stop and alert the user of the obstacle in its path.

Finally, our robot will be run off of lithium ion batteries. However to extend the amount of time that the user can interact with the robot, we will attach solar panels to the robot in order to charge the batteries when outdoors. This will allow the user to maximize the time s/he can use the robot.

III. Project Specifications

Req. ID	Requirement Description
ABCLC-01	The software will be developed in Java for an Android device running version 4.0 or later.
ABCLC-02	The robot will be controlled by the user via an Android device.
ABCLC-03	The robot will receive its commands from the Android device using Bluetooth.
ABCLC-04	The robot's range of Bluetooth communication will extend up to 30m.
ABCLC-05	The robot will respond to the user's commands within 1 second.
ABCLC-06	The robot will have a maximum speed of 10mph.
ABCLC-07	The robot will have collision avoidance.
ABCLC-08	The robot will be powered by a lithium ion battery pack.
ABCLC-09	The robot's batteries will be recharged using solar power.
ABCLC-10	The robot will not exceed dimensions of 45cm x 45cm by 45cm.

IV. Block Diagram



V. Project Financing

Part	Cost Per Unit	Quantity	Total Cost
MSP430-F5529 Development Board	$13	1	$13.00
MSP430-F5529 Chip	$10	1	$10.00
RN41 Bluetooth Module	$45	1	$45.00
H Bridge (DRV8833)	$10	2	$20.00
Voltage Regulator	$4	4	$16.00
Android device	*Free	1	*$0.00
Lithium-ion battery pack	$40	2	$80.00
Lithium-ion Charge Controller	$5	2	$10.00
Solar panel	$160	1	$160.00
Brushless DC Motor	$25	2	$50.00
Servo	$15	2	$30.00
PCB Manufacturing	$80	1	$80.00
MPPT	$30	1	$30.00
Breadboard	$30	3	$90.00
Ultrasonic distance sensor	$30	1	$30.00
Infrared sensor	$15	2	$30.00
Wiring	$12	1	$12.00
Base rc car	$100	1	$100
Total Cost			$806.00

* A team member already owns this component, which will be used for this project.

VI. Project Milestones

Senior Design Project Plan	Duration (days)	Start Date	End Date
Select project and write proposal	7	9/2/14	9/8/14
Meeting to outline research	1	9/9/14	9/9/14
Research Bluetooth and comm with Android	14	9/9/14	9/22/14
Research Motors, servos, sensors	14	9/9/14	9/22/14
Research solar panels and batteries	14	9/9/14	9/22/14
Meeting to discuss sponsorship, progress	1	9/16/14	9/16/14
Begin design paper, continue research	14	9/23/14	10/6/14
Meeting to finalize sponsorship application	1	9/23/14	9/23/14
Continue design paper and research	7	10/7/14	10/13/14
Meeting to discuss design	1	10/14/14	10/27/14
Design Solar Panel / Power Management	21	10/14/14	11/3/14
Design Motion and Sensor System	21	10/14/14	11/3/14
Design Software and Bluetooth System	21	10/14/14	11/3/14
Meeting to discuss progress, problems	1	10/21/14	10/21/14
Meeting to discuss progress, problems	1	10/28/14	10/28/14
Research/Learn Eagle PCB Software	7	11/4/14	11/11/14
Finalize System and order parts	7	11/18/14	11/25/14
Finalize Senior Design I paper	7	11/18/14	11/25/14
Winter Break		12/10/14	1/11/15
Begin SD2, inventory, meeting to discuss plan	1	1/12/15	1/12/15
Design/Test Software	21	1/13/15	2/2/15
Prototype Bluetooth and comm system	28	2/3/15	3/3/15
Prototype power system	28	2/3/15	3/3/15
Prototype motion system	28	2/3/15	3/3/15
Prototype sensors and feedback system	28	2/3/15	3/3/15
Weekly progress meeting	1	2/10/15	2/10/15
Weekly progress meeting	1	2/17/15	2/17/15
Weekly progress meeting	1	2/24/15	2/24/15
Test/Debug Bluetooth and comm system	19	2/24/15	3/15/15
Test/Debug power system	19	2/24/15	3/15/15
Test/Debug motion system	19	2/24/15	3/15/15
Test/Debug sensors and feedback system	19	2/24/15	3/15/15
Weekly progress meeting	1	3/3/15	3/3/15
Weekly progress meeting	1	3/10/15	3/10/15
Integrate all systems	14	3/16/15	3/29/15
Test ACB Leaf Car	14	3/30/15	4/12/15
Finalize documentation and presentation	10	4/13/15	4/23/15
Final Presentation	5	4/20/15	4/24/15