Automated Coil Gun

Initial Project and Group Identification Document

Group 1

Austin Akey

Joshua Sanchez

Donald Freeman

Brett Oden

Motivation

The group went through quite a few project ideas during the first few weeks of the semester including the idea of a coilgun project. As the group met to discuss the project ideas, someone would always joke around with the idea of adding a coil gun to whatever project we happened to be talking about. We always briefly entertained the thought because we all thought it would be a lot of fun to design and build a coil gun. In the end we decided to go with a fun project. One that we could enjoy while working through the engineering process. This led us to the coil gun project with the addition of a few special features. Some of the features we want to implement are mounting the coil gun on a turret and controlling it wirelessly. Adding these features distributes the design challenges among our group which consists of two electrical engineers and two computer engineers.

Goals and Objectives

The goal of this project is to create a coil gun capable of incorporating and demonstrating disciplines learned by each of our group members in their undergraduate studies. The coil gun will be designed and built using principles of electronics, power, control, and programming. Accordingly, we will design the coil gun to have a high rate of fire, different firing modes such as semi-automatic, automatic, and burst, and significant power (meaning projectile impact strength). In addition, the gun will include precision and accuracy control (meaning no jerking motions), motion and/or voice control and wireless capability, and easy portability (meaning no machines required for mobility or assembly). In summary, our objectives for the coil gun include;

- High fire rate
- High power
- Automatic, semi-automatic, and burst firing modes
- Precision and accuracy control
- Motion and/or voice control
- Wireless capability
- Easy portability

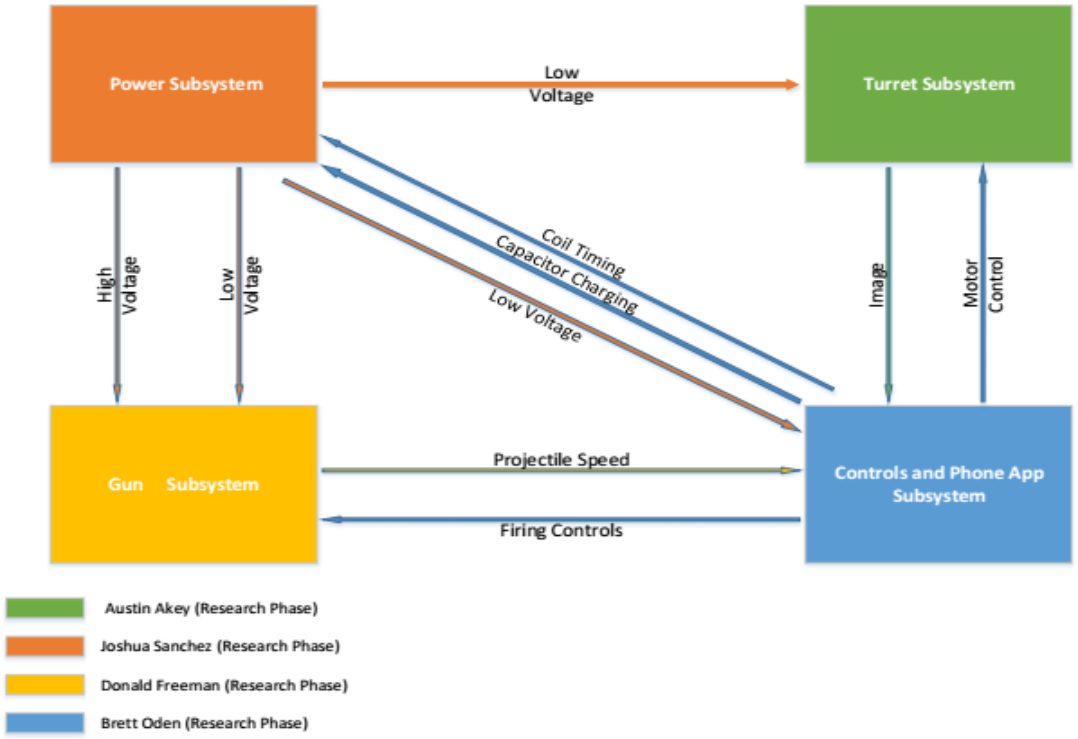
Function of the Project

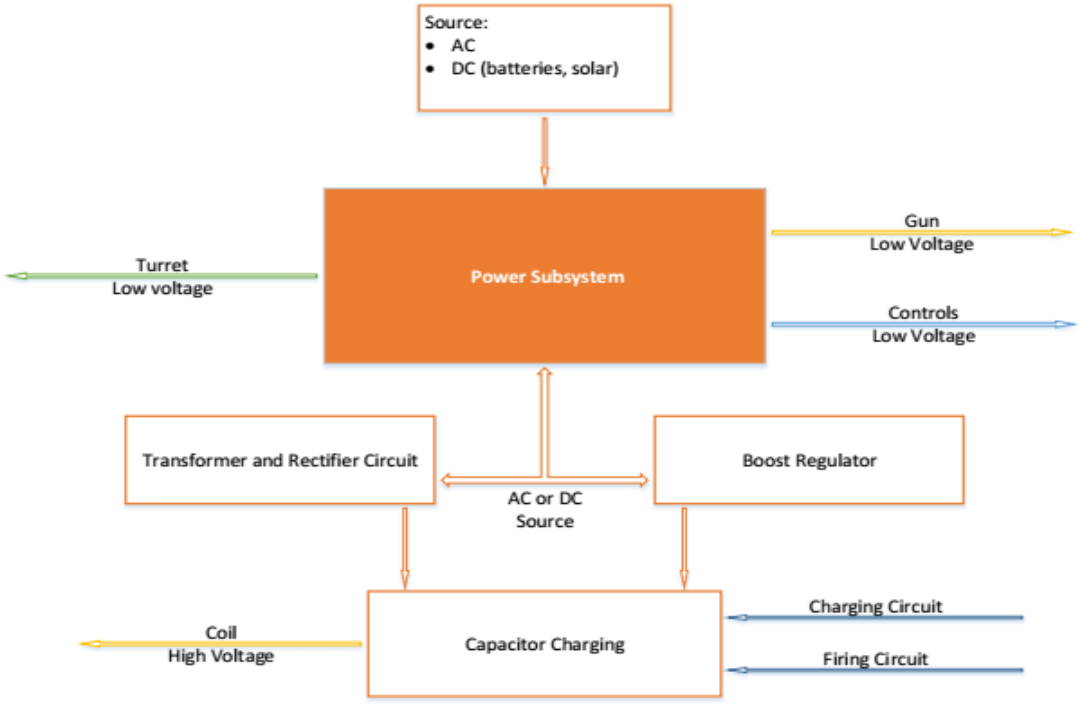
The project design will be a turret mounted, wirelessly controlled, coil gun. The turret will have range of motion on two axes. The coil gun will have multiple rates of fire, a reloading mechanism, and optics for viewing target. The turret and coil gun will be controlled wirelessly from a smartphone application. The application will have a graphical user interface to display the view from the coil gun and any necessary buttons. Control of the turret and coil gun may include touch, voice, or motion activation.

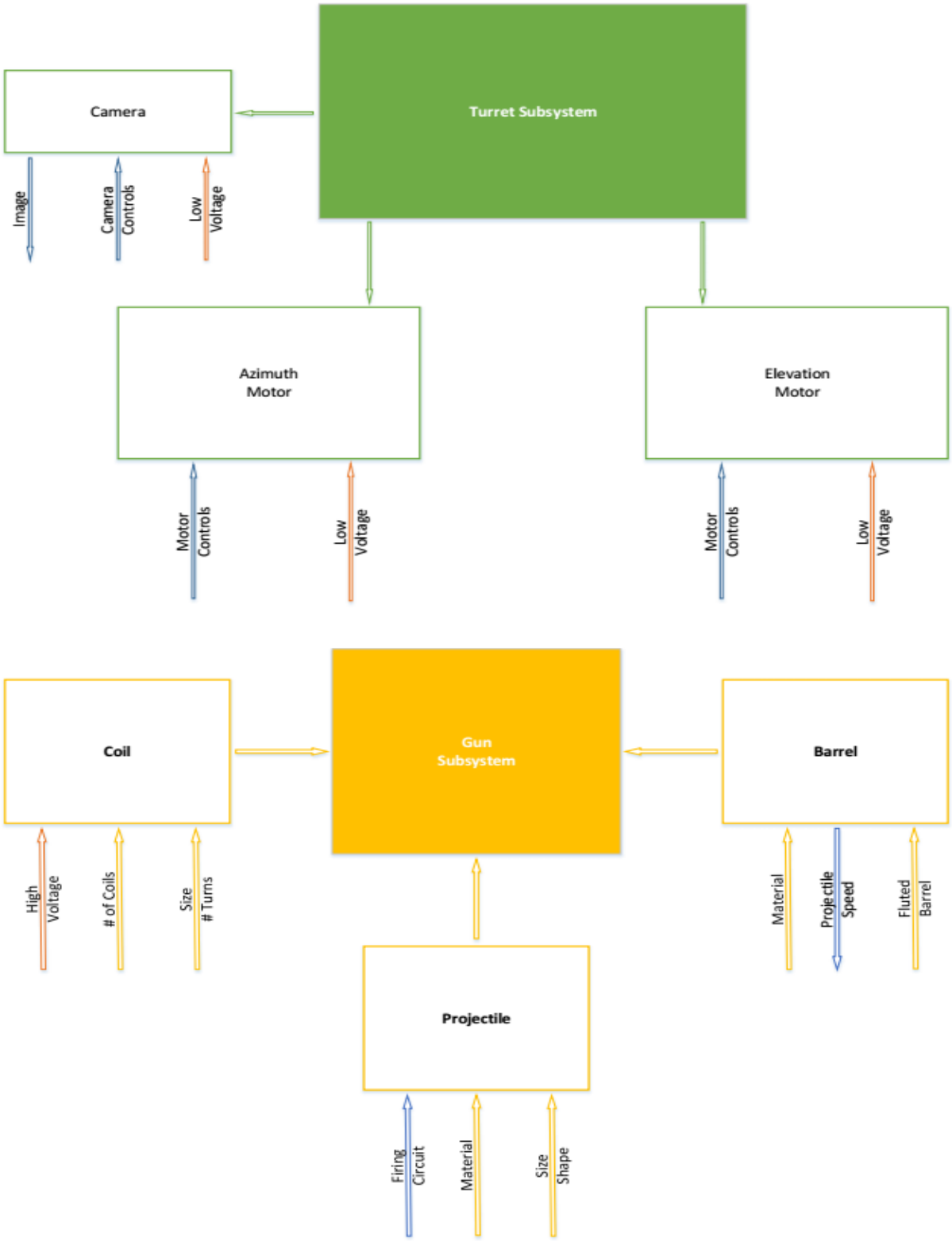
Specifications and Requirements

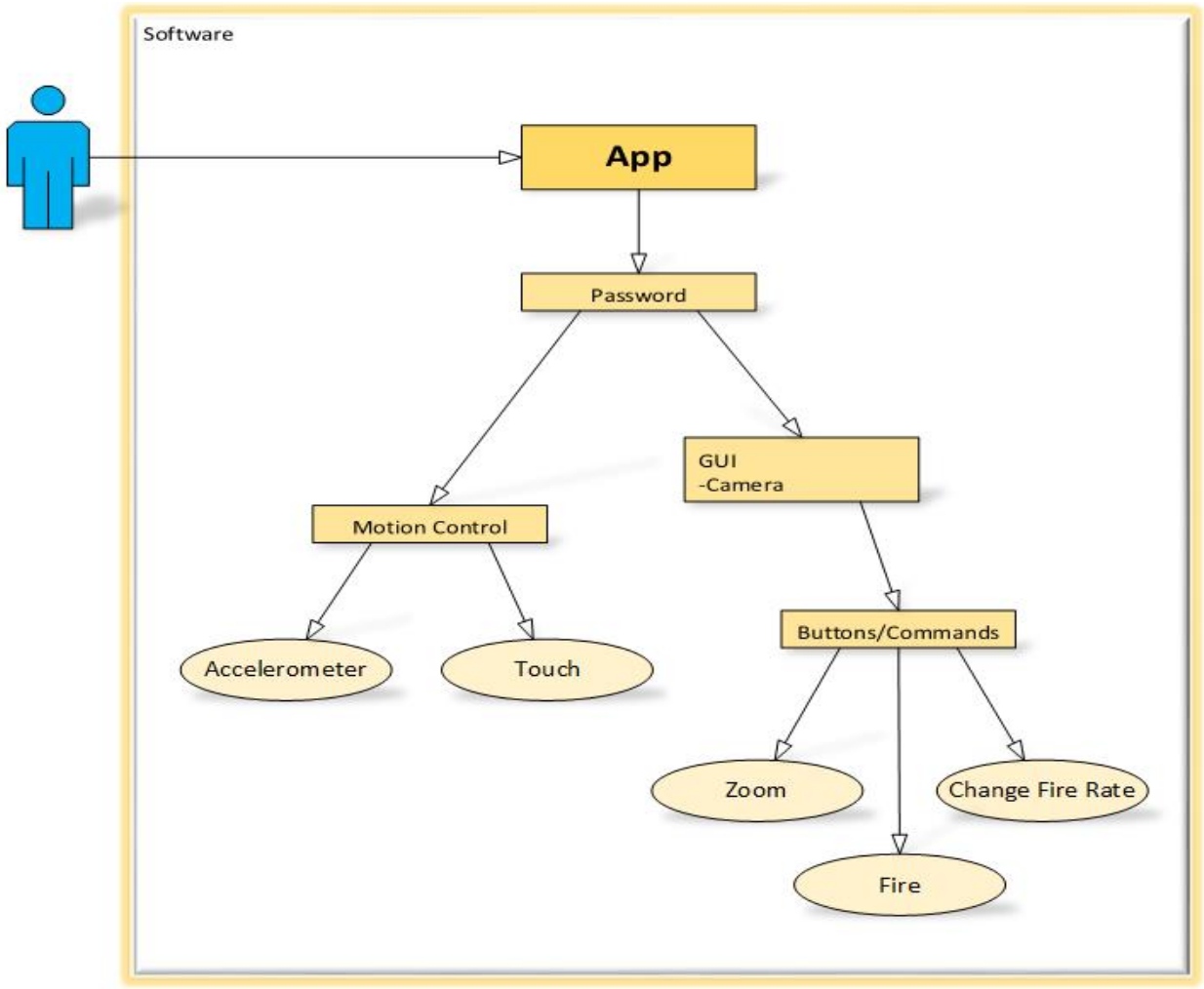
- Specifications and Requirements
    - FPS: Comes out at a rate of 120 Feet/sec
    - projectile distance: 100 feet
    - rounds per minute: 10 projectiles/minute
    - weight: 25 pounds or less
    - camera: A camera with motherboard mountable capabilities shooting at 480p quality or better
    - phone app: Android phone app
    - power supply: AC power(wall plug in)
    - range of motion: azimuth - 120
      elevation - 45
    - type of projectile: magnetic round

Diagrams


Power Subsystem
Low Voltage
Turret Subsystem
High Voltage
Low Voltage
Coil Timing
Capacitor Charging
Low Voltage
Image
Motor Control
Gun Subsystem
Projectile Speed
Firing Controls
Controls and Phone App Subsystem
Austin Akey (Research Phase)
Joshua Sanchez (Research Phase)
Donald Freeman (Research Phase)
Brett Oden (Research Phase)


Source:
AC
DC (batteries, solar)
Power Subsystem
Turret
Low voltage
Gun
Low Voltage
Controls
Low Voltage
Transformer and Rectifier Circuit
AC or DC
Source
Boost Regulator
Coil
High Voltage
Capacitor Charging
Charging Circuit
Firing Circuit


Turret Subsystem
Camera
Image
Camera Controls
Low Voltage
Azimuth Motor
Motor Controls
Low Voltage
Elevation Motor
Motor Controls
Low Voltage
Gun Subsystem
Coil
High Voltage
# of Coils
Size # Turns
Barrel
Material
Projectile Speed
Fluted Barrel
Projectile
Firing Circuit
Material
Size Shape



Budget

	Part Discription	Price	Quantity	Total		Overall Total	
	servo motor	39	2	78		846.8	
	misc. wood	25	1	25			
	magnet wire	20	3	60			
	barrel	5	1	5			
	IR led	4.33	6	25.98			
	IR sensor	5.98	6	35.88			
	projectile	10	1	10			
	transformer	40	1	40			

	Capacitor	25	6	150			
	555 timer	5	3	15			
	SCR	17.59	5	87.95			
	Camera	28.99	1	28.99			
	wifi module (cc3000)	35	1	35			
	full wave rectifier	10	1	10			
	misc. componenets	50	1	50			
	PCB	30	3	90			
	misc wire	50	1	50			
	misc hardware	15	1	15			
	microcontroller	35	1	35			

Milestones

Senior Design One (Spring 2014)

- Definition
  - Initial Project and Group Identification Document
- Research
  - Find previous works and similar projects
  - Create Spreadsheet of possible parts (price, manufacturer, part number, quantity)
  - Create master list of reference documents and websites
  - Research equipment necessary to do testing
- Design
  - Complete block and schematic diagrams and overall design
  - Complete parts list based on final design
  - Complete final design documentation
- Order parts

Senior Design Two (Summer 2014)

- Prototype
  - Complete fully functioning software
  - Complete full size prototype turret
  - Complete full size prototype coilgun
  - Integrate all three systems
- Test
  - Full testing of individual systems
  - Full testing of integrated systems
  - Compare results with specifications, requirements, and objectives