Spidolight Hexabot

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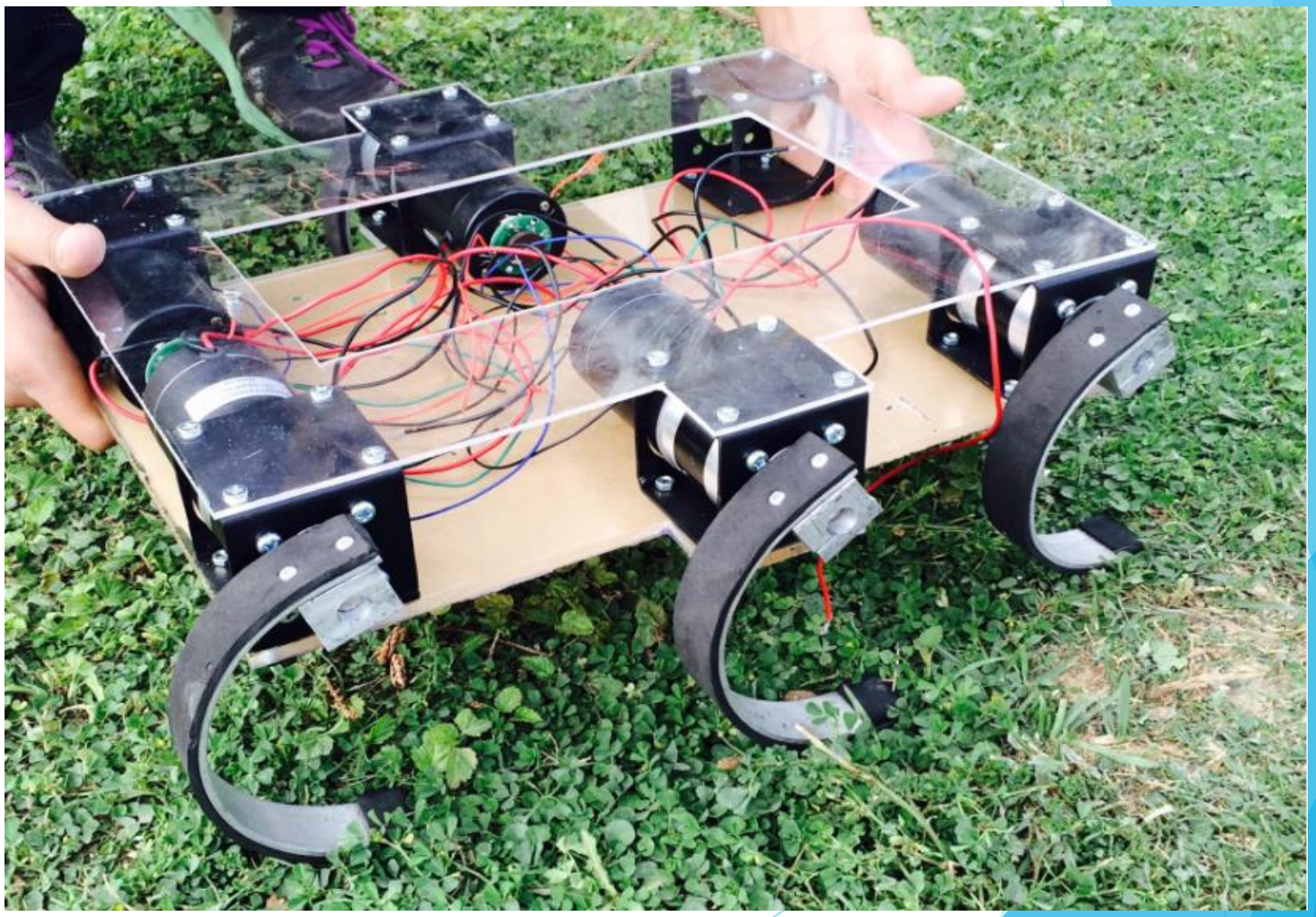


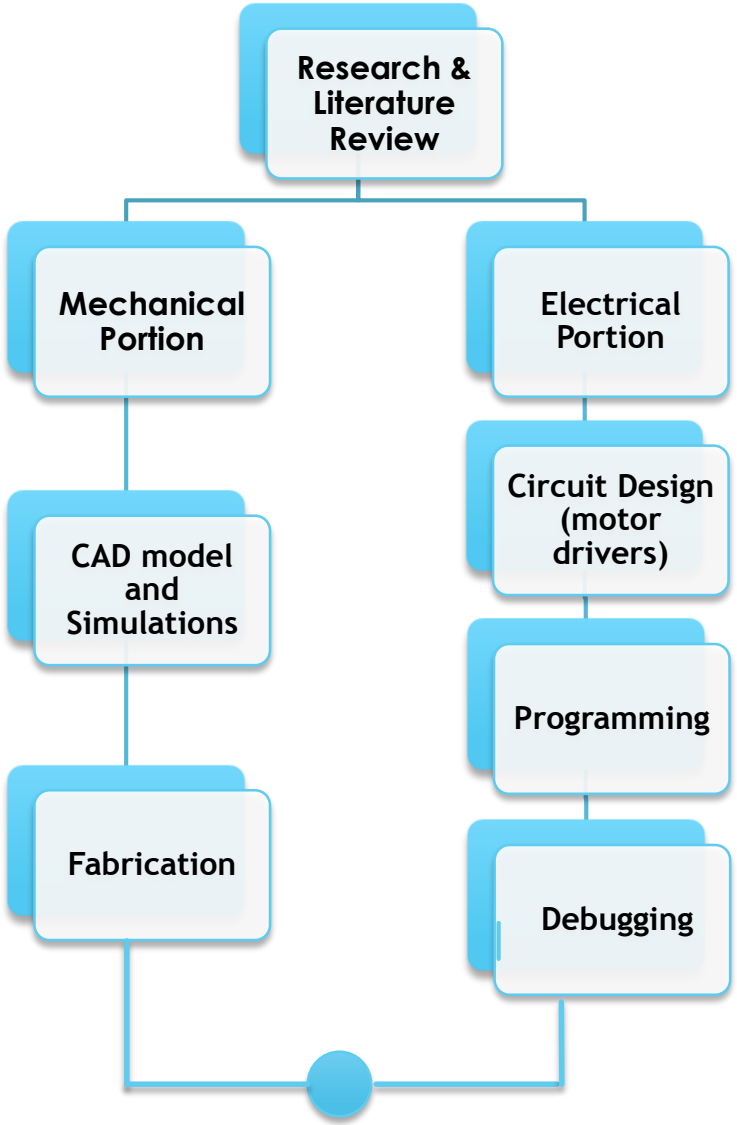
Outline

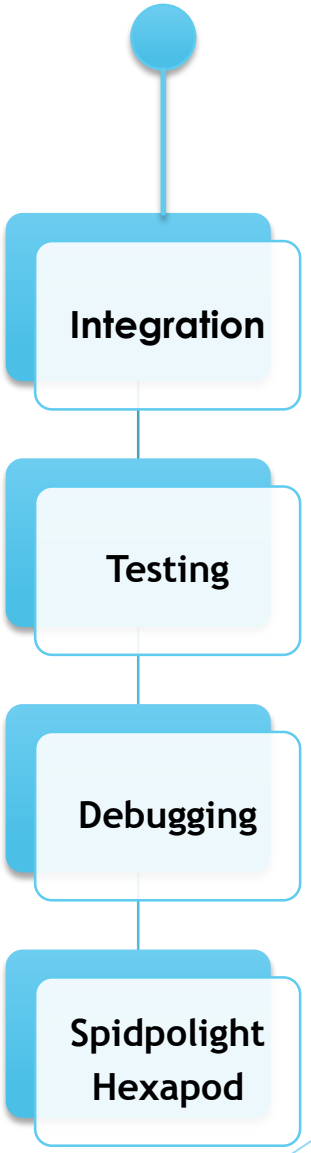
- Objective
- Block Diagram
- CAD Modelling
- Spidolight Hexapod
- Motion Study
- Simulation Results
- Hardware Integration
- Gait Analysis
- RC operation
- Limitations

Objective

- **Aim of the project is to fabricate a robust and lightweight UGV with all terrain capabilities by designing and integrating electrical and mechanical components.**

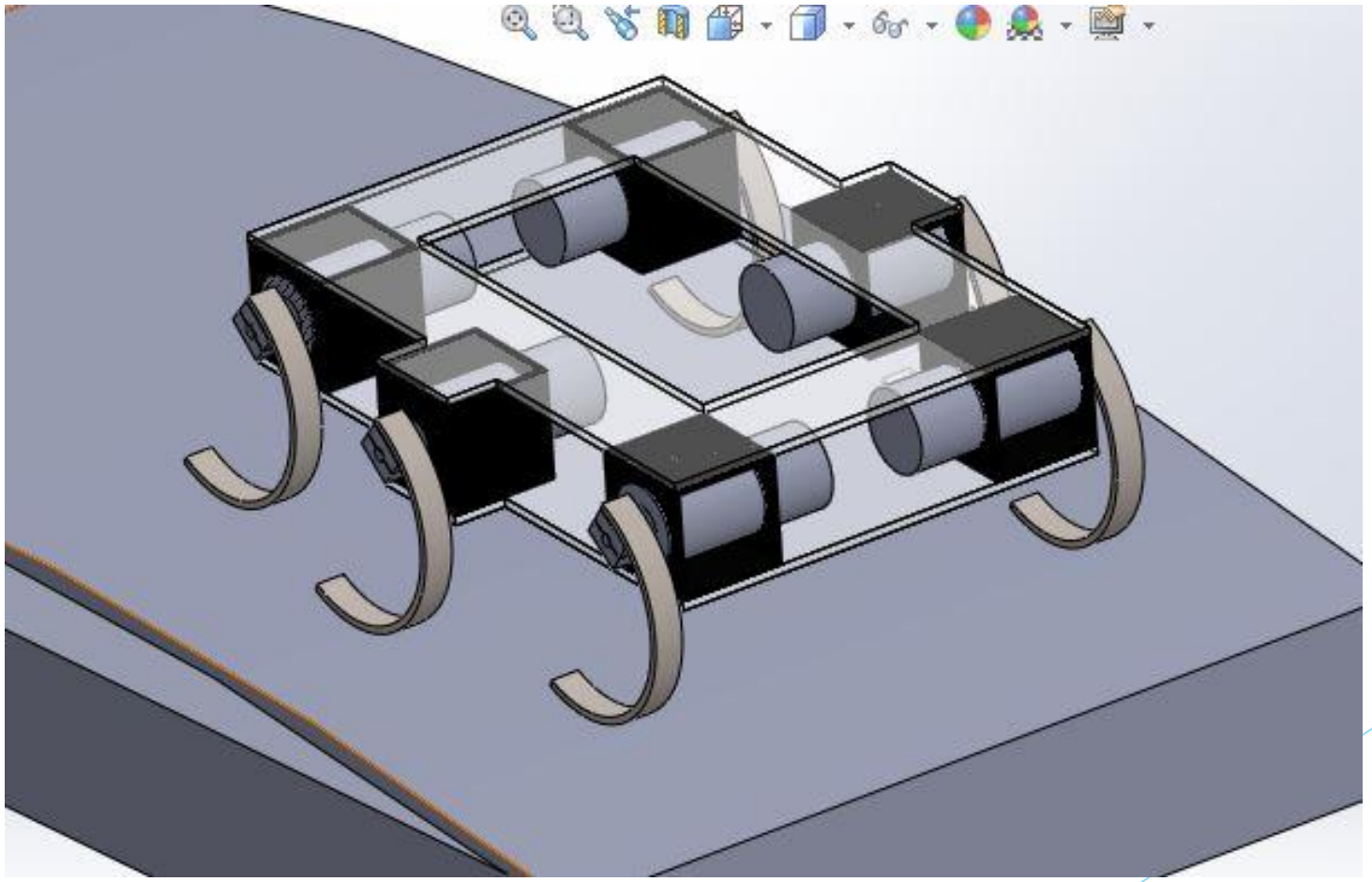
Block Diagram



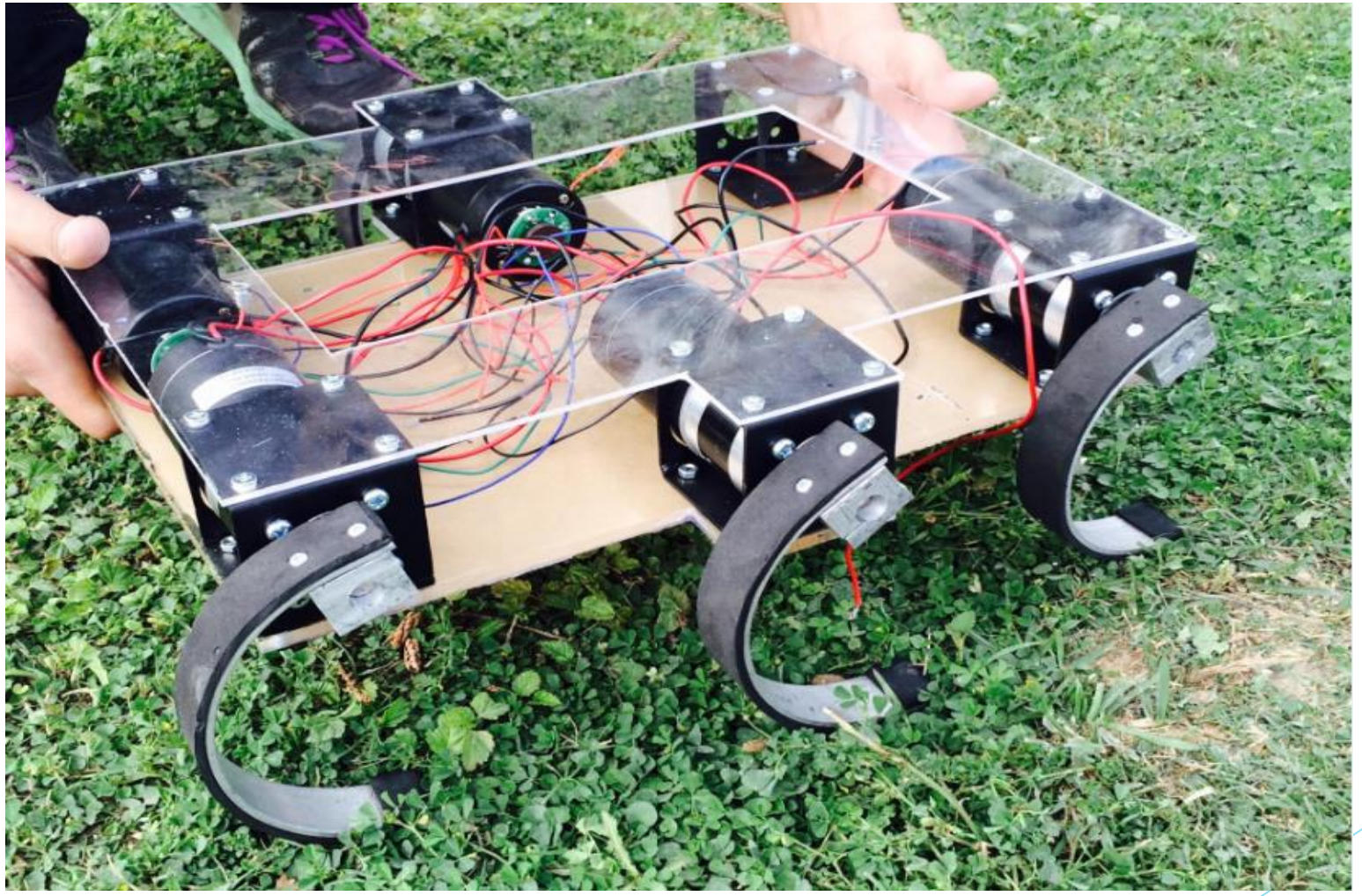


CAD Modelling

- **Modelled using SolidWorks 2014**



Spidolight Hexapod

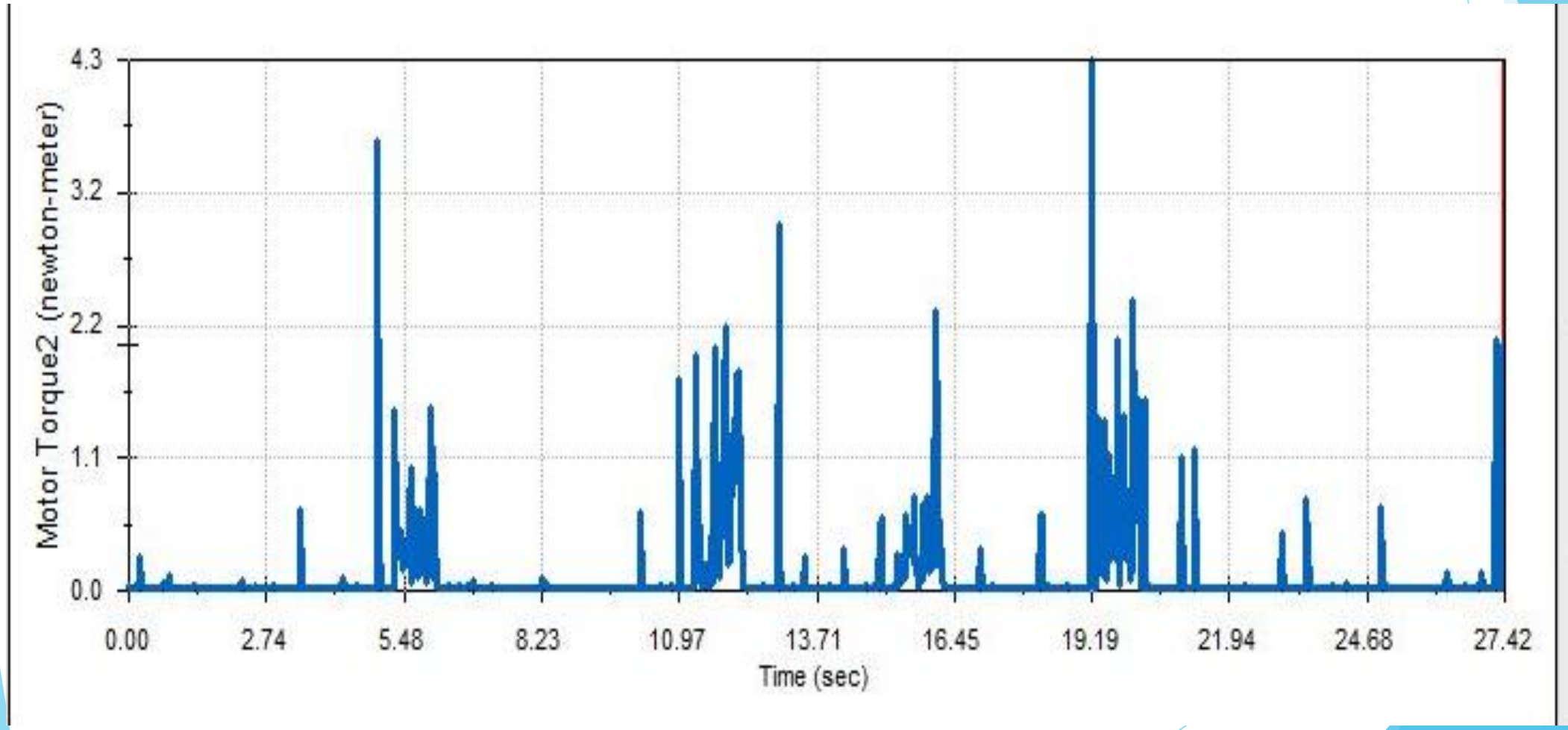


Motion Study

- Gait Analysis
- Speed Analysis
- Torque Analysis

Simulation Results

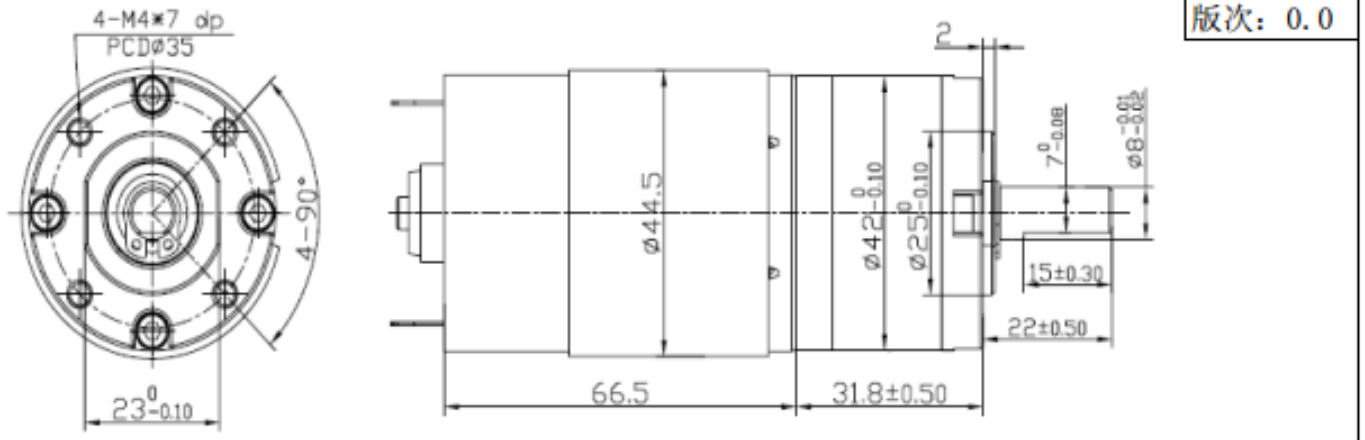
Torque Plot



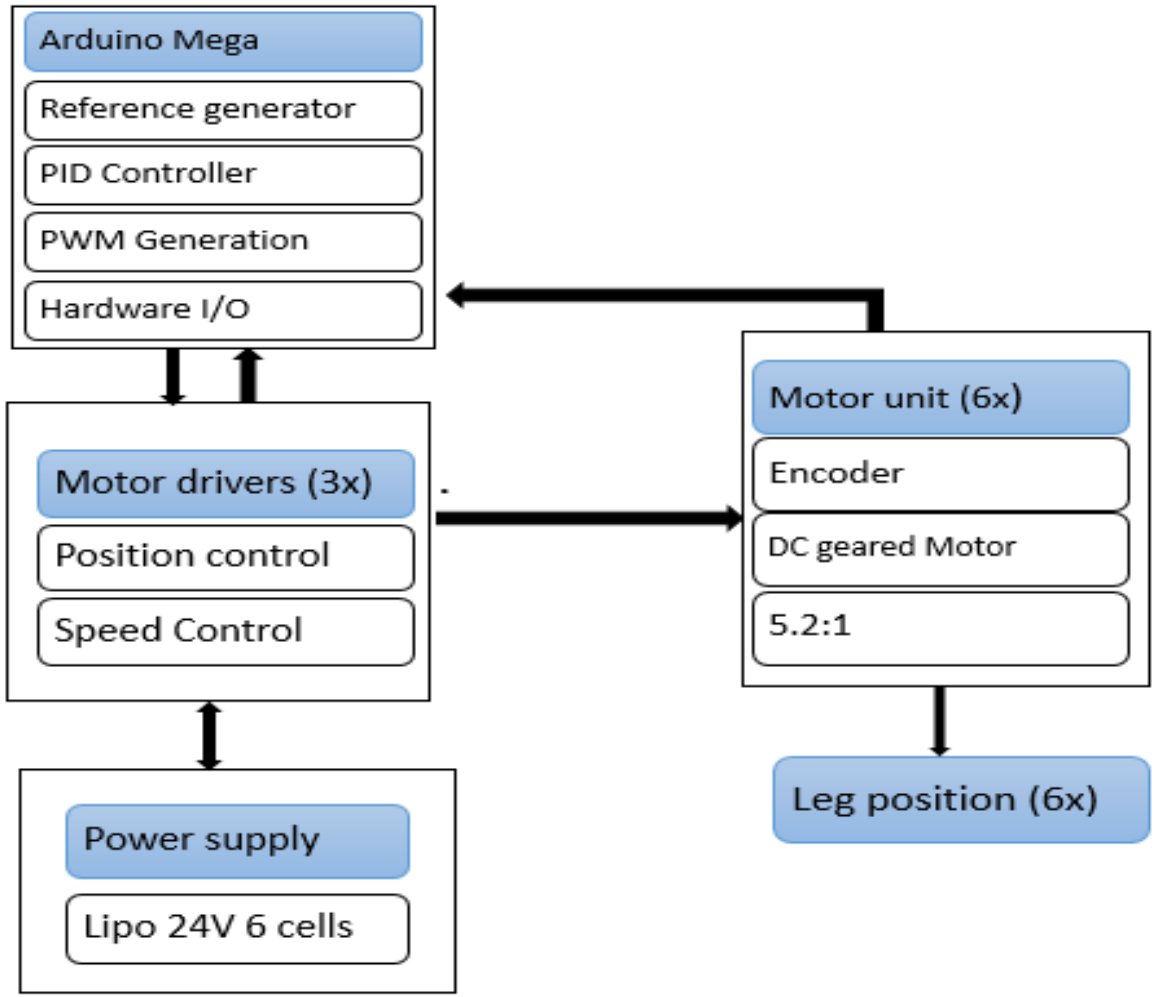
DC Motor with encoder

Specifications

Motor Specifiactions

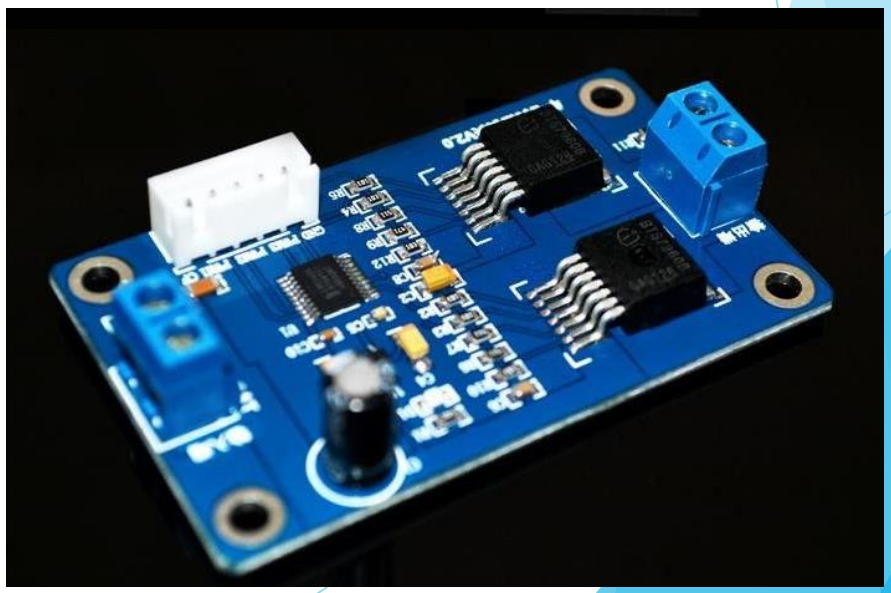
Drawing				版次：0.0	
	客户确认（Customer APP.）：		商		
Details	No Load Current(A):	≤0.700			
	No Load Speed(r.p.m):	810±10%	标		
	Rated Load Torque(kgf.cm):	1.3	NO.	备注	
	Rated Current(A):	≤2.000	1		
	Rated Load Speed(r.p.m):	648±10%	2		
	Stall Current(A)	7 A	3		
	Stall Torque(kgf.cm)	4.5 Nm	4		
	Rotation Direction:		5		
Remark			6		
Draw		Rev		APP.	

Hardware integration



Why 3 Motor drivers?

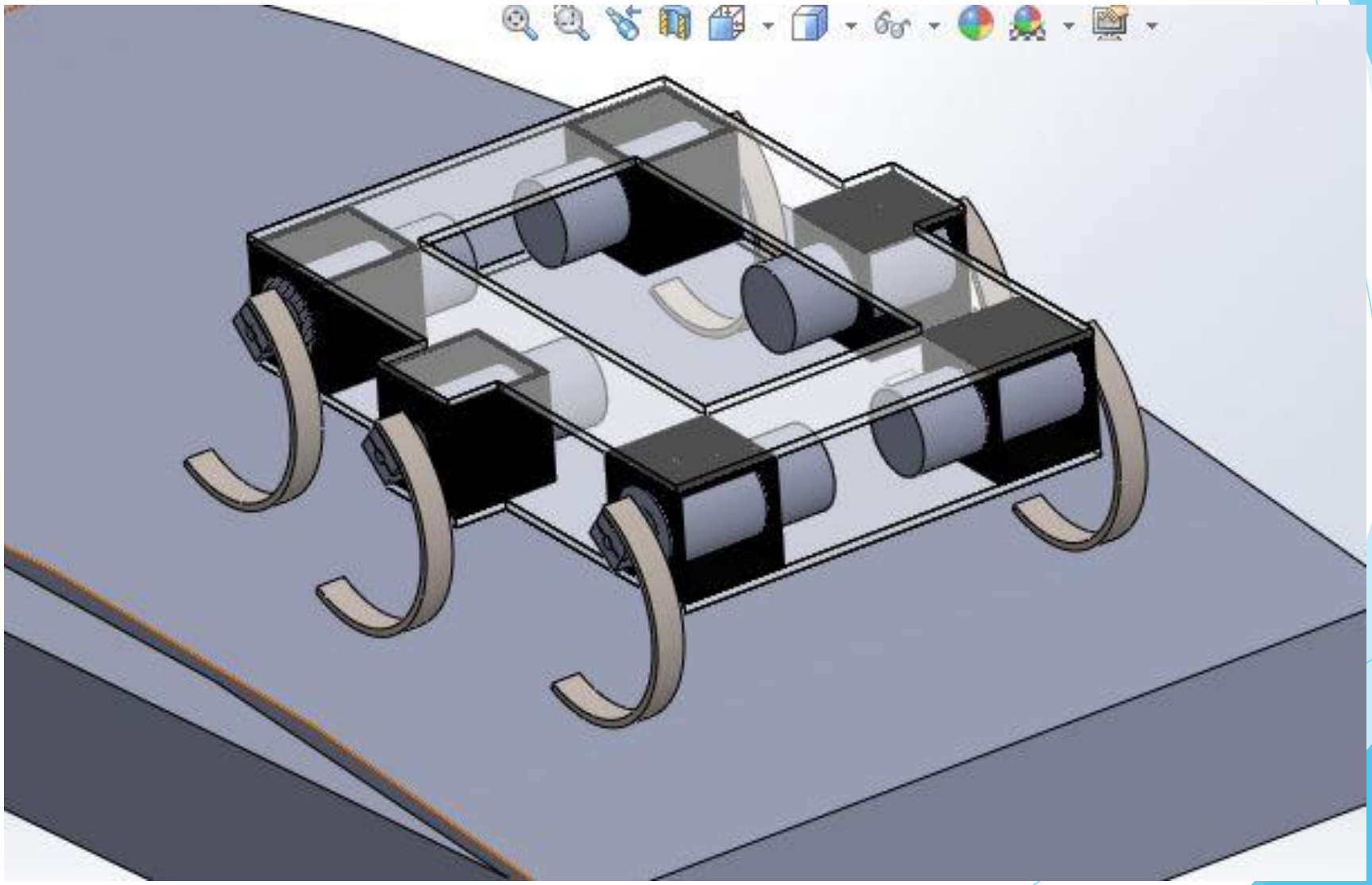
- BTS 7960 motor driver
- 2x Dual H bridge for 4 motors
- 1 Dual H-Bridge to control 2 motors separately



Work that has been done

- **Literature review**
- **CAD Model design**
- **Simulations**
- **Fabrication**

Gait of Hexapod



Gait for forward motion

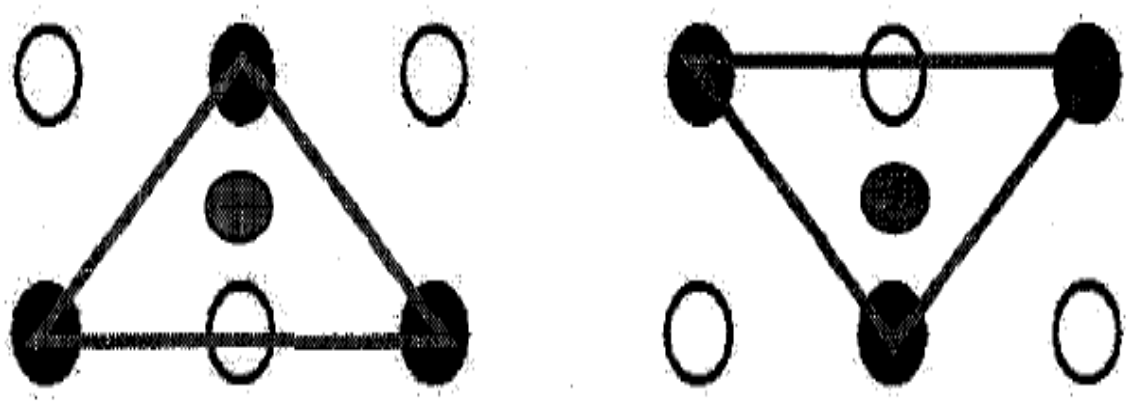
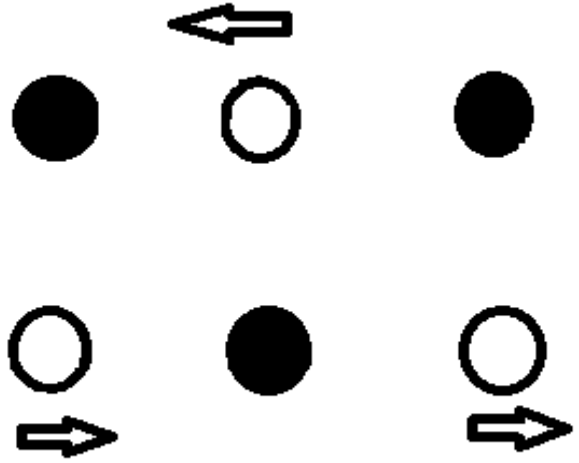
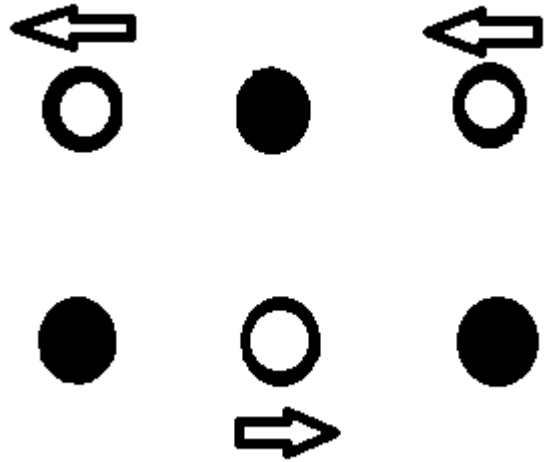


Figure The two phases of the alternating tripod gait. Full circles are legs in stance, open circles are legs in flight. Center of mass, oval dot, must stay inside the *polygon of support* (triangle) formed by stance legs.

Left turn





Right turn

Work in progress

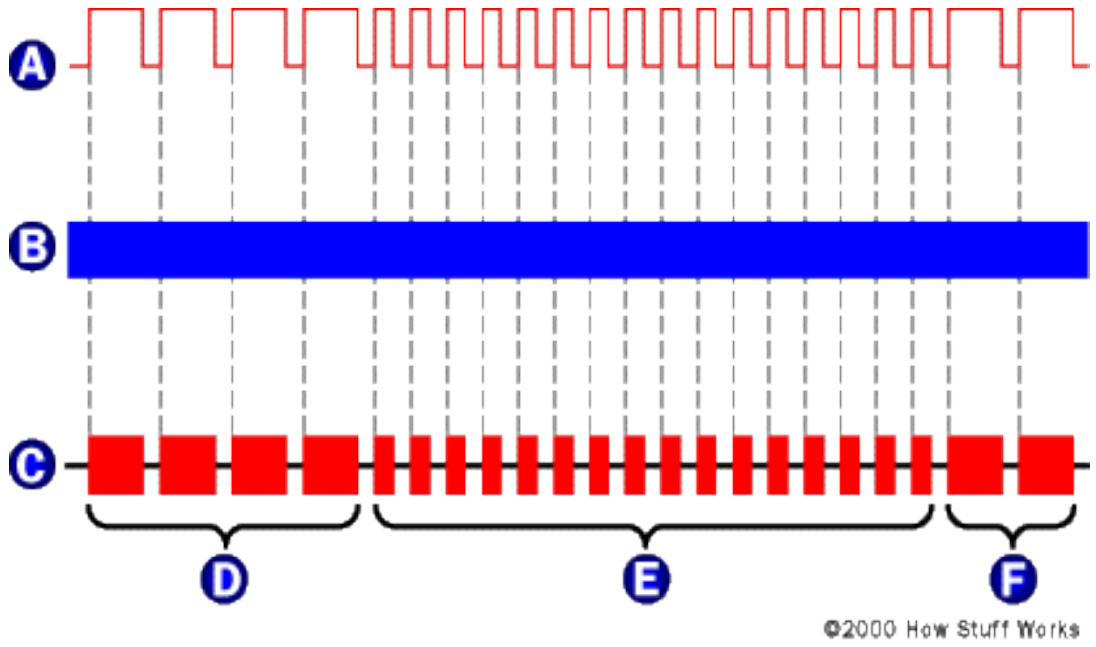
- **PID based position control**
  - **PID is preferred because it has good steady state and transient response**
  - **First test run**
- **Radio control**

Radio control

- 2 channel radio control
- One channel control the forward backward movement
- Second channel control left right turns
- 27 MHz frequency
- Range is 75 to 100 feet
- RC module has been ordered
- Manufacturer NIKKO

RC operation

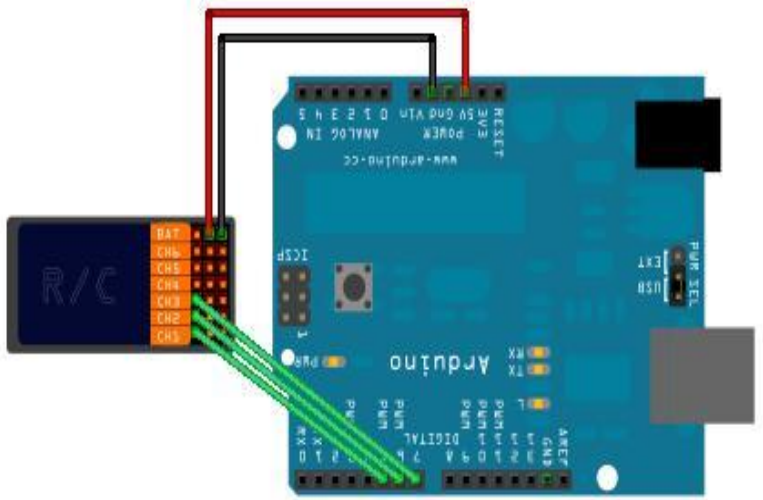
- Forward: 16 pulses
- Reverse: 40 pulses
- Left: 28 pulses
- Right: 34 pulses



A Pulse sequence
B 27.9MHz signal
C Transmitted signal
D 4 synchronization bursts each ≈ 2.1ms long with ≈ 700µs spacing
E Burst sequence, each ≈ 700µs long with ≈ 700µs spacing
F Sequence repeats

RC module connection with Arduino Mega

- **Digital PWM pins to read the inputs**
- **5V power to the receiver**



Limitations

- **Low range RC**
- **Test runs will be done using power supply, final implementation using lipo batteries**

Timeline

End Date	Tasks	Status
30th November 2015	Literature Review	Complete
31th December 2015	CAD Model	Complete
29th January 2016	Simulations	Complete
4th April 2016	Fabrication	Complete
30th April 2016	Programming	In Progress
10th May 2016	RC Integration	In Progress
20th March 2016	Final testing , results and poster presentation	Not Started

Thank You!!
Questions??