Designing a Wireless Tensegrity Robot

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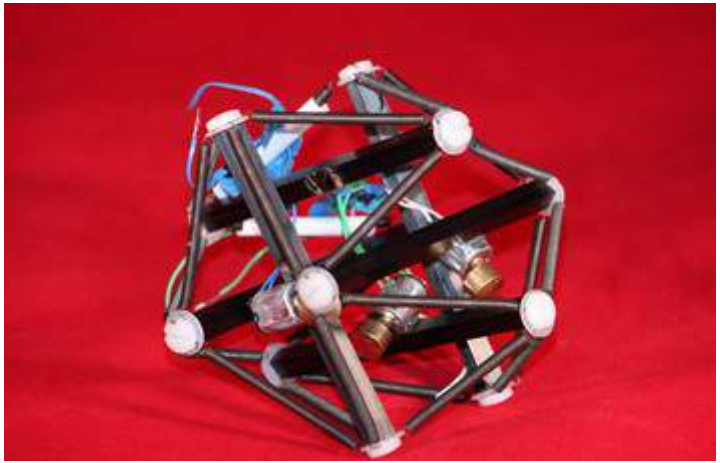
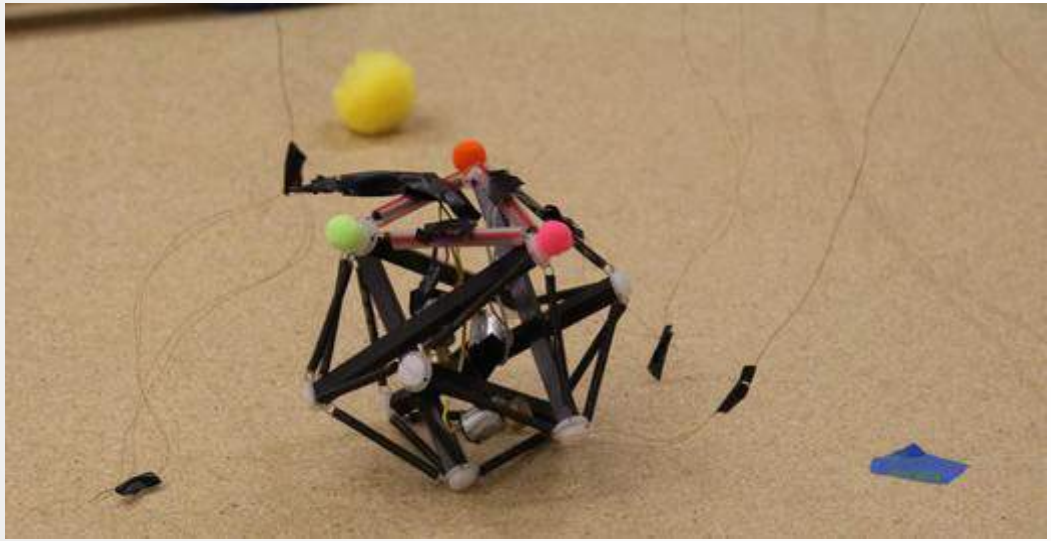


Advised by Prof Cherrice Traver (Electrical Engineering)
and Prof. John Rieffel (Computer Science)

Project Motivation

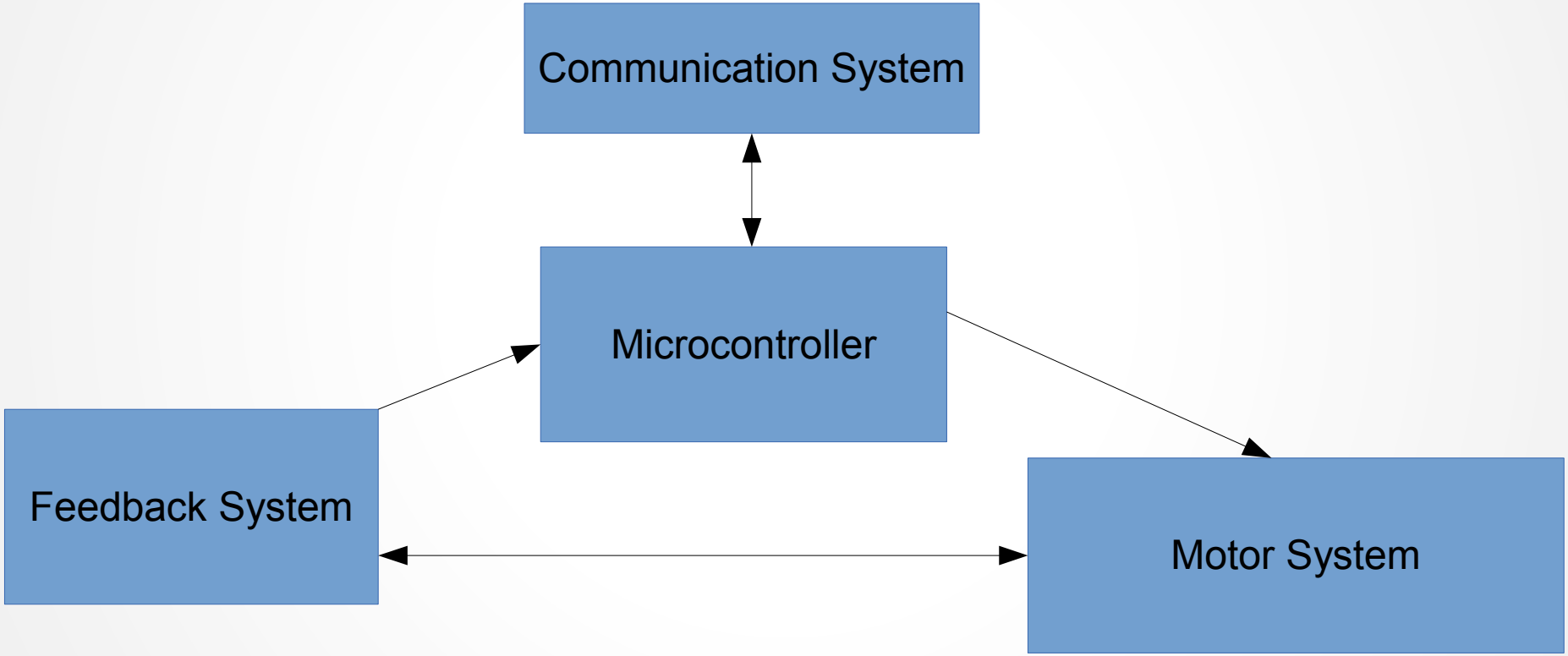
- What is a Tensegrity Robot?
- What current research is being done?
- What are the difficulties with VALTR?



Project Goals

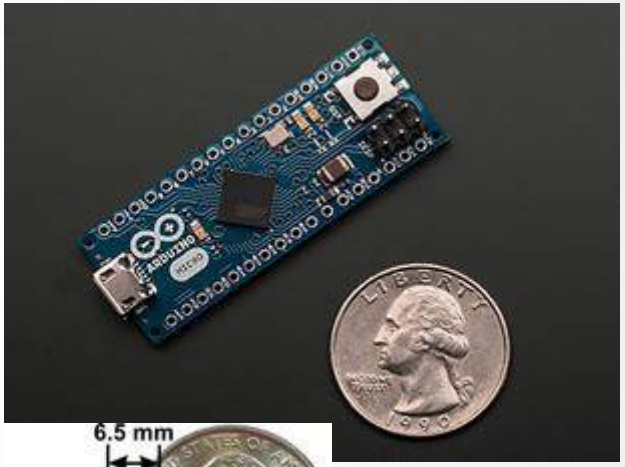
- Wireless: Be able to be controlled without tether
- Size: Be as small as possible
- Run-time: Have a battery that would allow for over an hour of operation on one charge
- Modular: Be designed so that it is easy to multiply
- Closed Loop Control: The motor frequency will controlled with feedback

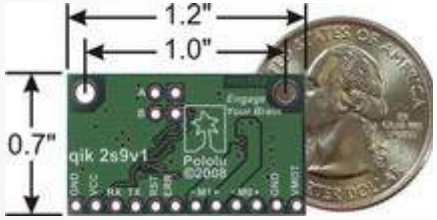
System Block diagram

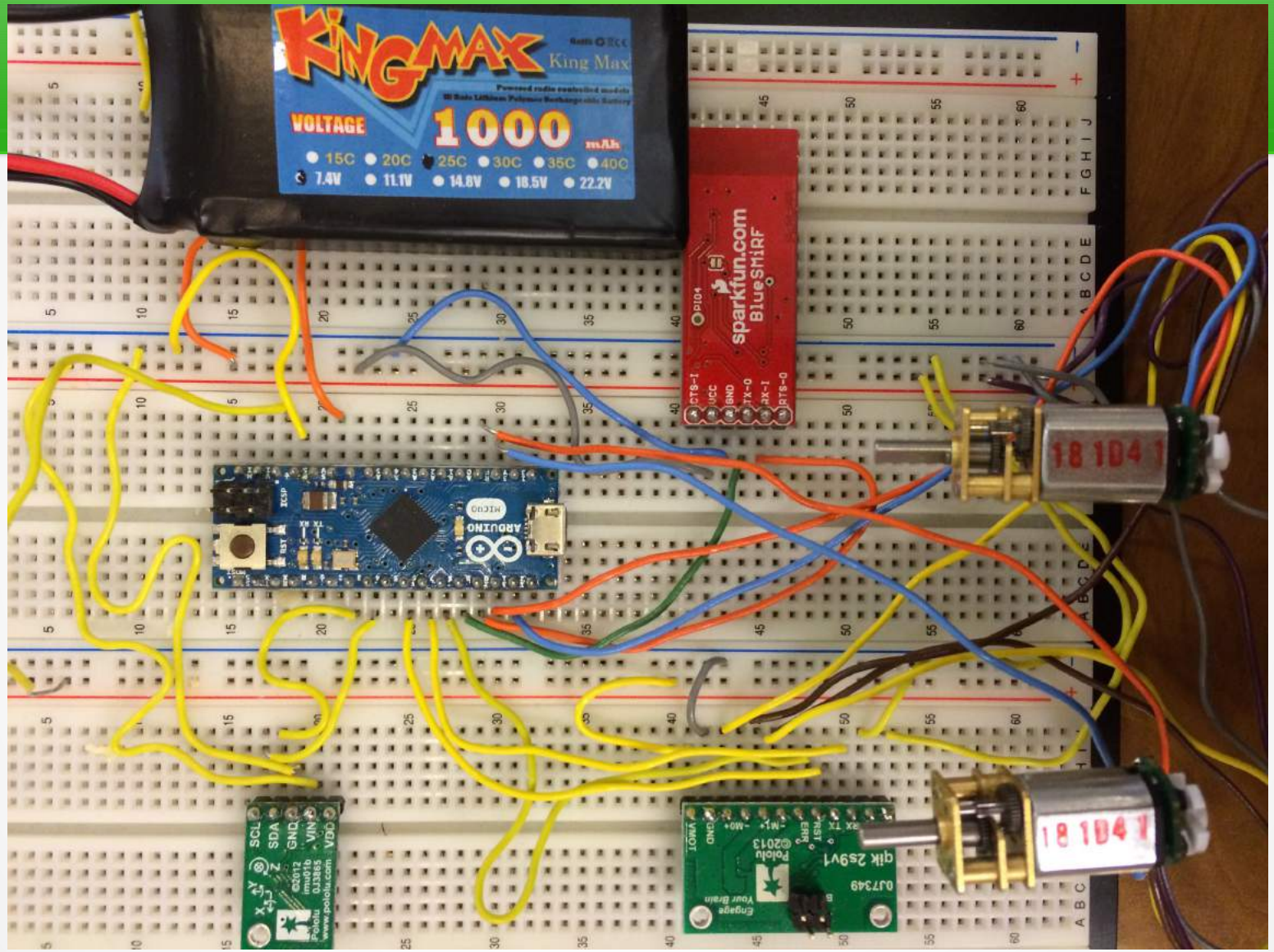


Electrical Implementation

- Arduino Micro - Microcontroller
- BlueSMiRF Silver – Bluetooth Unit
- MinIMU-9 v2 - Inertial Measurement Unit
- Qik 2s9v1 - Motor Controller
- 10:1 Gear Motor with Optical Encoder
- 1000mAh 7.4v LiPo Battery



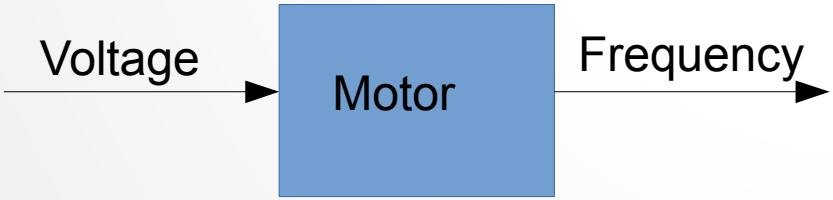



KINGMAX
King Max
VOLTAGE
1000
mAh
15C 20C 25C 30C 35C 40C
7.4V 11.1V 14.8V 18.5V 22.2V
sparkfun.com
BlueSMiRF
CTS-I
VCC
GND
TX-O
RX-I
RTS-O
ARDUINO
SCL
SDA
GND
VIN
VDD
Pololu
qik 2s9v1
0J7349

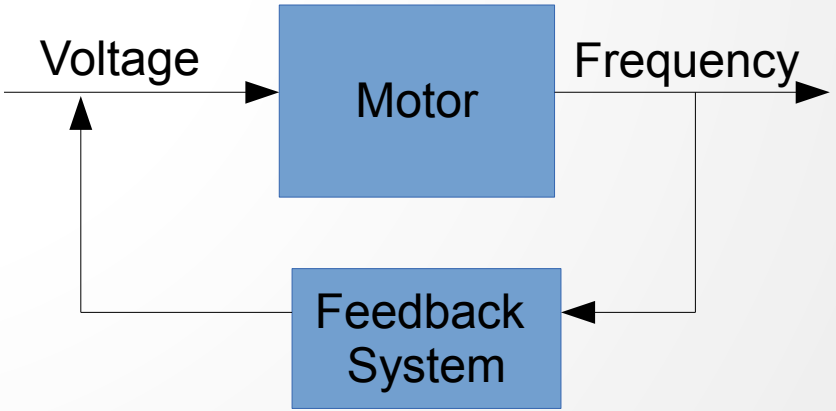
Why a Feedback System?

- Offers better control of the vibration/wider range of behaviors
- Makes motor frequency more repeatable
- Strut communication
- More inputs to current genetic algorithm

Open Loop

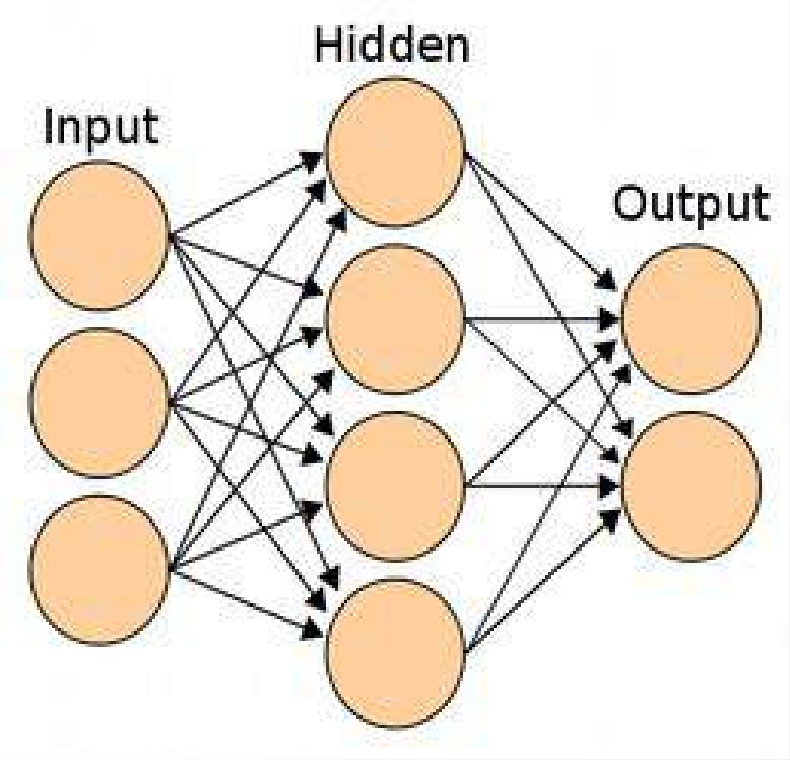


Closed Loop



Spiking Neural Network

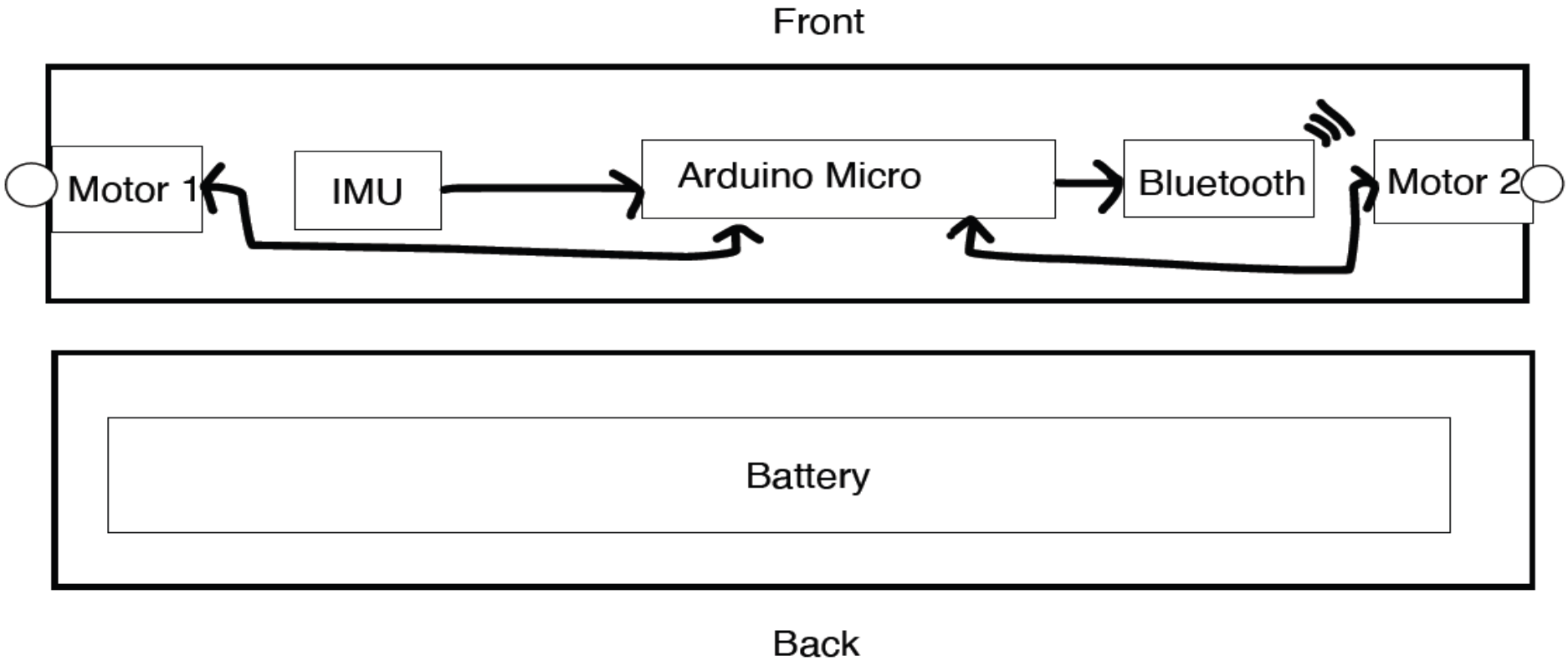
- Branch of artificial neural networks that improves on standard ANNs by introducing a time component
- Only fires when a potential is reached



Performance Evaluation

- Power/Run time
  - Over an hour per charge
- Vibration Force
  - Motor will be able to supply sufficient vibrations
- Hardware performance
  - Everything works as expected
- Wireless control
  - Able to adjust speeds of the motors via bluetooth

Sample Strut



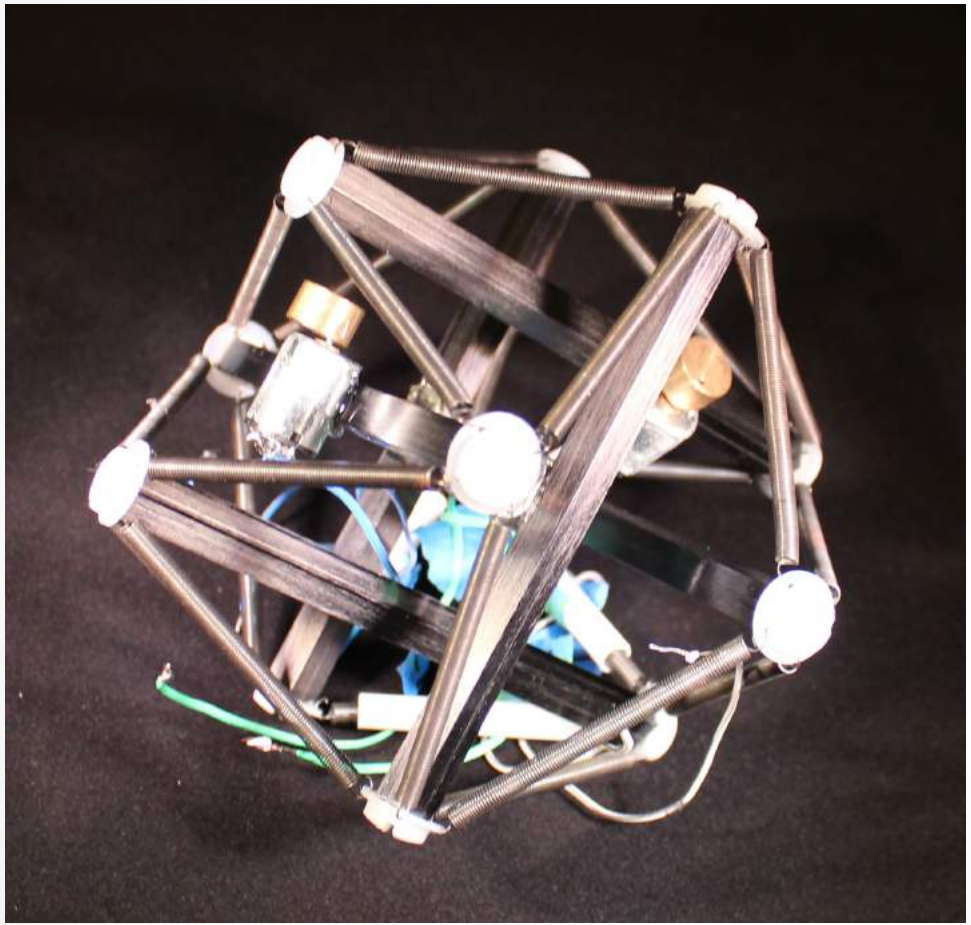
Accomplishments

- Implemented a Spiking Neural Network on Arduino
- Interfaced the MinIMU with the Arduino using I2C
- Interfaced the Qik with the Arduino Software Serial
- Implemented wireless control over bluetooth of motor speeds

Future Work

- Reduce the size components → Specifically Battery
- 3D Print a strut so that the components can be mounted.
- Develop a proto board to better connect components
- Determine how much better the new robot is at moving.

Questions?



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Thanks!!