Electromyography and Gyroscope Controlled Rover

German Rafael Gomez Urbina

System Integration Lead

Emil Jafarli

EMG Software Lead

Motivation

FUN :)

Wearable Technologies to interface with all of our current electronics

Could facilitate use of devices to help people with arthritis or other motor skill impairments

Test Plan

Code Example

Functionality

- Gestures detected by EMG and Gyroscope sensors are converted to digital signals
  - These signals are then to be decoded into a command sent via a RF transmitter to RC car
- Based on the hand and arm movements of the user, an RC car is powered and controlled.

Jessica Matthews

EMG Hardware Lead

Grant Hunter

Software Gardener

Design

Overview

Hardware

Software

Design

Biggest challenge: Dealing with signals from the EMG

Components:
Altera Cyclone® II 2C35 FPGA device
8-channel 12-bit ADC Controller.
-12bit X 2kHz
4 GPIO pins for transmitter
I2C IMU controller

Optional Features

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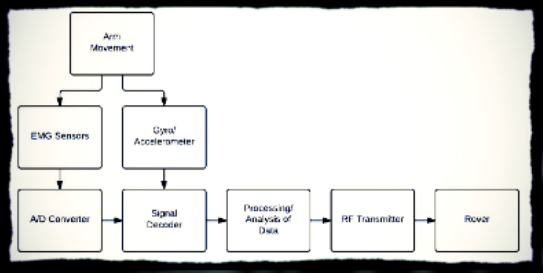
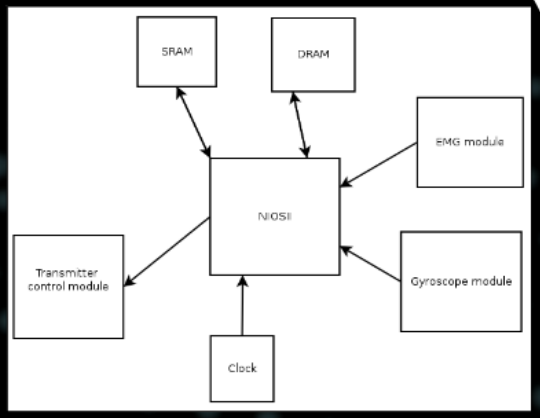
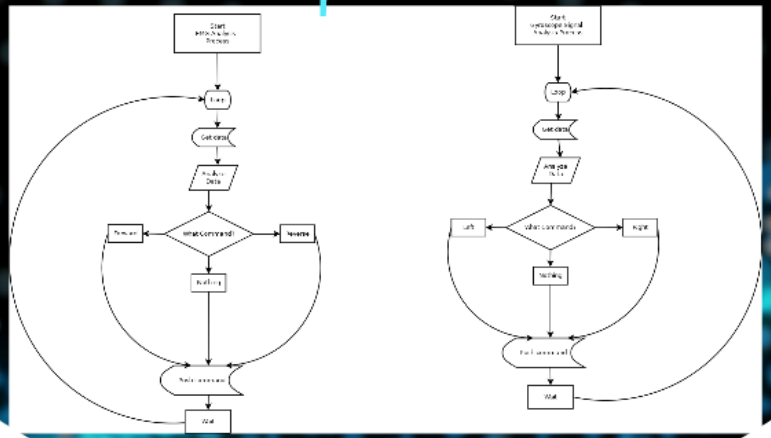


Hardware



Software



Code Example

```
/*Task that polls EMG Sensor, processes the
* information and relays  it to the transmitter
*/
void taskEmg(void* pdata)
{
  long emgData;
     while(1){
  //Read analogue data from EMG sensor
     emgData = EMG.readData()
  //Convert data to usable information
     SmoothEMGDATA(&emgData);
  //Compare EMG to threshold value. Either raw signal or frequency.
  //Send the appropriate signal determined by the threshold.
  //Signal could be Forward or Reverse.
  //Otherwise do nothing
    if (emgData > EMG_THRESHOLD_TOP )
    {
         Transmitter.setForwardOn();
    } else if ( emgData < EMG_THRESHOLD_BOTTOM)
    {
         Transmitter.setReverseOn();
    } else {
         Transmitter.setForwardOff();
         Transmitter.setReverseOff();
    }
}
```

Test Plan

Software

Hardware-dependent

Classify the control gestures as control commands

Display these commands on the lcd in real time, and check if these commands match with the assigned movements

Hardware-independent

Ensure our program doesn't have any memory leaks or deadlock-causing conditions

Use performance analysis tools to check for the deadlocks

Use software such as Valgrind to test if our program has any memory leaks

Hardware

Test all the hardware components separately to verify the correct functionality of each unit

Connect some components and test if these components still preserve their original functionality

Test the overall functionality of the system

Optional Features

Add more gesture options:

- a gesture for the rover to do a 3-point turn

Interface the armband with other electronic devices

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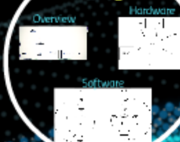

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