Prosthesis v1 Application Notes

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1. General Notes

1. Variables with suffix CM\_ are used in CubeMonitor.
2. Coordinates are x = forward, y = up, z = right. CM\_ variables follow the right-hand rule.
3. Knee and ankle angle figure.
4. Control loop timing is based on LPTIM2 set for a 512 Hz interrupt.

# 1.1 Wiring

XXX

# 1.2 Software Usage

1. STM32CubeIDE ()
2. STM32CubeMonitor ()

2. Flow of Code

XXX

3. CubeMonitor Description

CubeMonitor serves as the interface between the device and the researcher. It performs data acquisition, plotting and displaying of variables, and user defined inputs to variables.

4. Test Programs

Various test programs are provided to check functionality at my desk. A test program is selected in main.c as shown below. The options for test programs are described in the follow sections.

# 4.1 None

Enter value *None* as the argument for the XXX function shown above. This program runs the full firmware.

# 4.2 Read Only

Enter value *ReadOnly* as the argument for the XXX function as shown above. This program allows all sensors to be read and the state machine to be deployed, but no power will be provided to the motor(s).

# 4.3 Encoder Bias

Enter value *EncoderBias* in the argument for the XXX function as shown above. This program allows all sensors to be read and the state machine to be deployed while calculating the average encoder reading of every 10 consecutive samples. No power is provided to the motor(s).

# 4.4 Impedance Control

Enter value *ImpedanceControl* in the argument for the XXX function as shown above. This program allows all sensors to be read and initially calculates equilibrium of the current motor position(s). The control gains are initially XXX for Ankle and XXX for Knee. The values can be changed from the CubeMonitor interface. State machine is not deployed??

5. Future Improvements

1. IMU sensitivities can probably be better than 8g and 1000 dps. They were adopted from previous firmware.
2. Nominal current for motor is most likely not accurate. This was adopted from previous firmware. Should probably ask a forum to help out.