Full Design of Arduino System

The following outlines the full design of the EMG-Data Acquisition System

Hardware Components

- MyoWare EMG Sensor
- Arduino R3
- DC Motors
- Current Sensors
- 5V Battery

Public Methods

- ***void setup()***
  - Function:
    - Called at runtime, setting initial Serial port and attaching Servos to their specified ports
- ***void loop()***
  - Function:
    - Looped indefinitely
    - Has complete algorithm
- ***int ReadInput(int pinNumber)***
  - Function:
    - Calls the private ***_TryReadInput*** method
    - Only returns a value if ***_TryReadInput*** was successful
  - Arguments:
    - pinNumber (int): the specific input pin that is read from
  - Returns:
    - int: digital value from pin

Private Methods

- ***Pair _TryReadInput(int pinNumber)***
  - Function:
    - Reads the analog input value at a specified pin
  - Arguments:

- pinNumber(int): the specific pin that is read from
  - Returns:
    - bool: whether or not the read was sucessful
    - float: the value read from the pin as a float

Design Components

- [Digital Filter](#)
- [Control Algorithm](#)

Algorithm

```cpp
const int EMG_PIN = A0;

struct Pair {
    bool success;
    float data;

    Pair(bool s, float d) : success(s), data(d) {}
};

void setup() {

    .

    .

    .


}


.

.

.


void loop() {

    .

    .

    .

    float rawSignal = ReadInput(EMG_PIN);

    /* Filter signal */

    /* Control Algorithm */

    delay (100);    // 100 ms delay
}

float ReadInput(int pinNumber) {
    /*
    - Function:
        - Calls the private ***_TryReadInput*** method
```

```cpp
        - Only returns a value if ***_TryReadInput*** was successful
    - Arguments:
        - pinNumber (int): the specific input pin that is read from
    - Returns:
        - int: digital value from pin
    */

    Pair input = _TryReadInput(pinNumber);
    if (!input.success) {
        Serial.println("Error reading input from pin" + String(pinNumber));
        return 0.0;
    }

    return int(input.data);
}

Pair _TryReadInput(int pinNumber) {
    /*
    - Function:
        - Reads the analog input value at a specified pin
    - Arguments:
        - pinNumber(int): the specific pin that is read from
    - Returns:
        - bool: whether or not the read was sucessful
        - float: the value read from the pin as a float
    */

    Pair input(false, 0.0); // Instantiate bad input value in case an error occurs

    float value = analogRead(pinNumber); // Input value in Volts

    input.success = true;
    input.data = value;

    return input;
}
```

Full Design

Hand

DC Motors

DC Current

Current Sensor

MyoWare EMG Sensor

EMG Data

Current Reading

Arduino

Input Pins

Digital Control Signal

ADC

Digital EMG Signal

Digital Filter

Filtered EMG Data

Control Algorithm

Output Pins