HIT3061 – Software Team Project - Semester 2, 2013

Tremor Detection with Leap Motion

Technical Manual

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# Overview

The purpose of this document is to help user easily for install the web application to their computer, required application and source code, required environment and source code overview for further development.

# Frameworks

#### Jquery

This framework is built based on javascript programming language. The syntax and usage reference can be found at following url: <http://jquery.com>

#### Boostrap

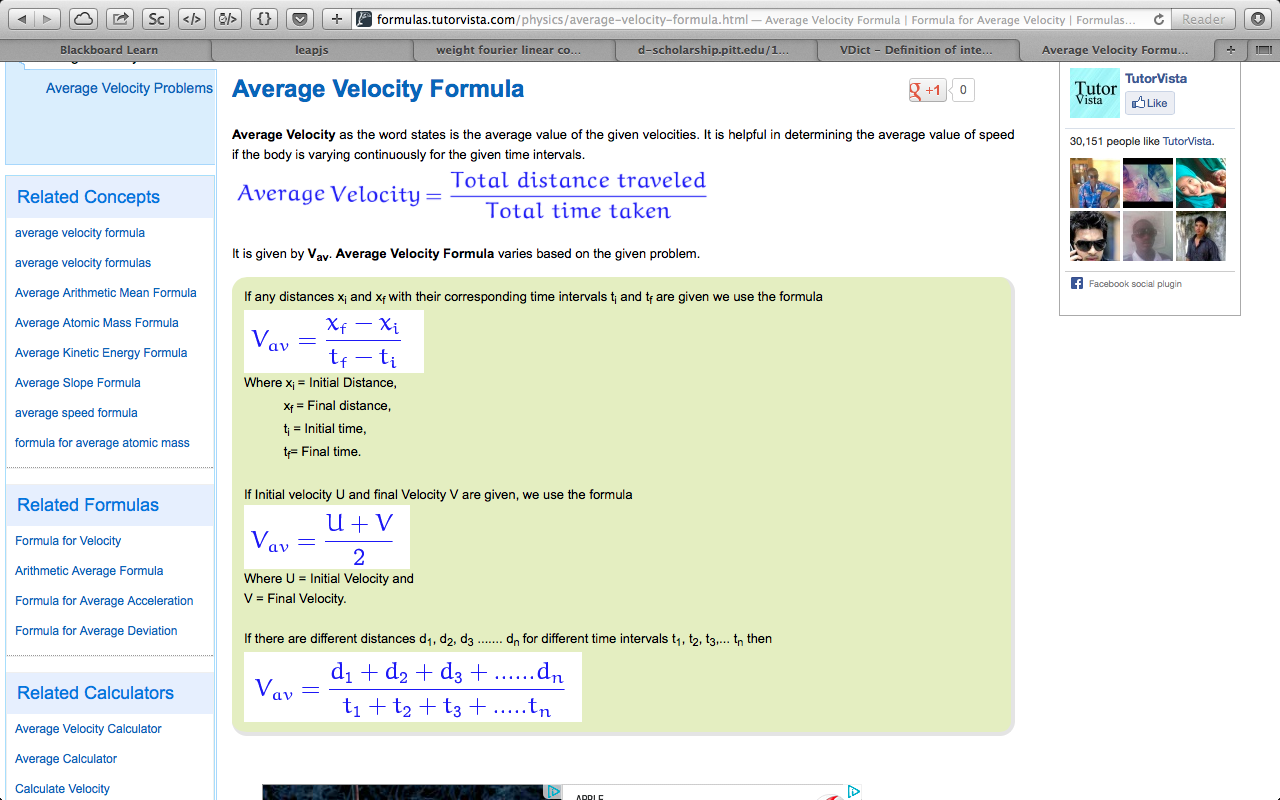
Boostrap is a front-end web development framework. Most of HTML components and animation effects are defined. For development, this url will be useful for developer <http://getbootstrap.com>

#### LeapJS

LeapJS is the Leap Motion javascript API. This library provides classes and methods that can make calls to the device and collect data. API documentation can be accessed via <http://js.leapmotion.com/start>

# Implementation

## Calculate Velocity



Calculate Velocity Average Implemented code locates in following project source code “js/LeapMotion/analysisFunctions/\_getVelocityAverage.js”

## Calculate Frequency

Flowchart

Macintosh HD 2:hoctap:Bachelor:stage5:Software Team Project:Leap-Motion:Flowcharts:Frequency - Flowchart.pdf

Calculate Frequency Average code locates in following project source code “js/LeapMotion/analysisFunctions/\_getFrequencyAverage.js”

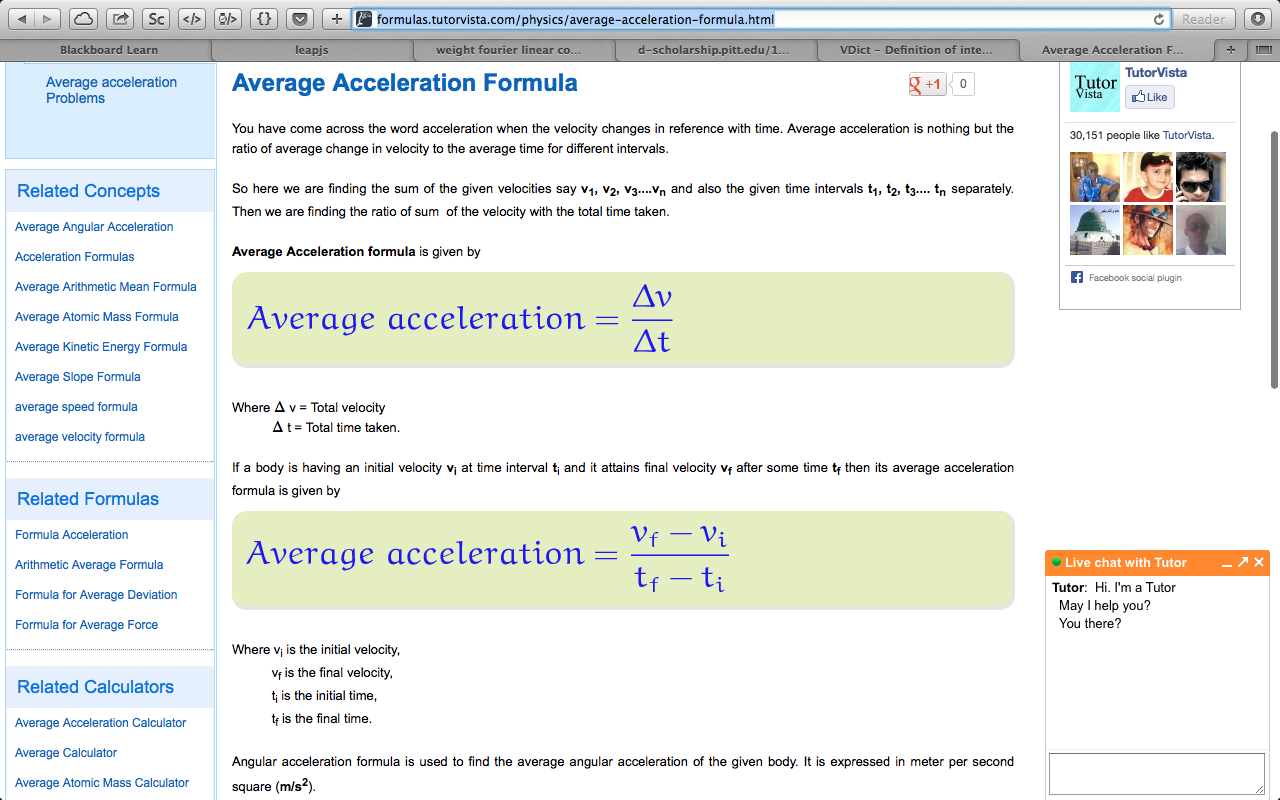
## Calculate Amplitude

#### Flowchart

Macintosh HD 2:hoctap:Bachelor:stage5:Software Team Project:Leap-Motion:Flowcharts:Amplitude - Flowchart.pdf

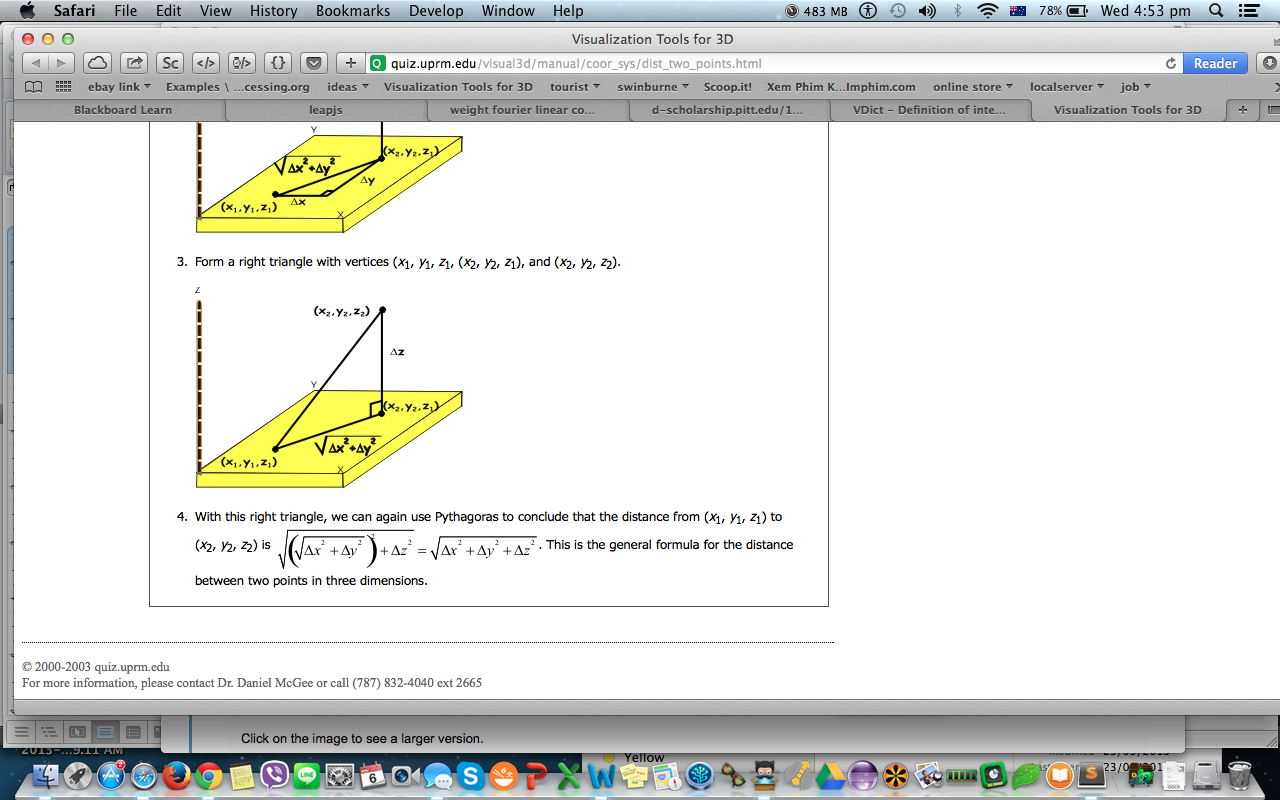
Calculate Amplitude Average Implemented code locates in following project source code “js/LeapMotion/analysisFunctions/\_getAmplitudeAverage.js”

## Calculate Acceleration



Implemented code locates in following project source code “js/LeapMotion/analysisFunctions/\_getAccelerationAverage.js”

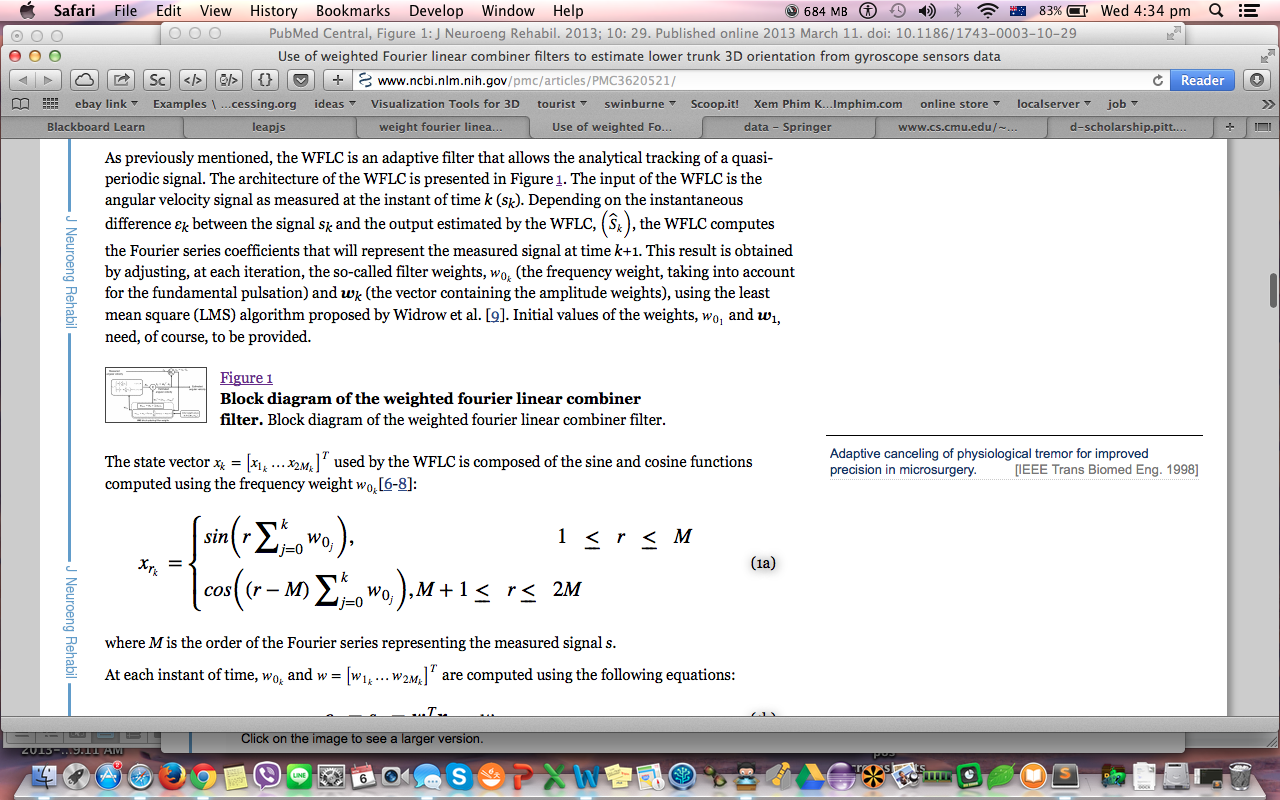
## Calculate Euclidean

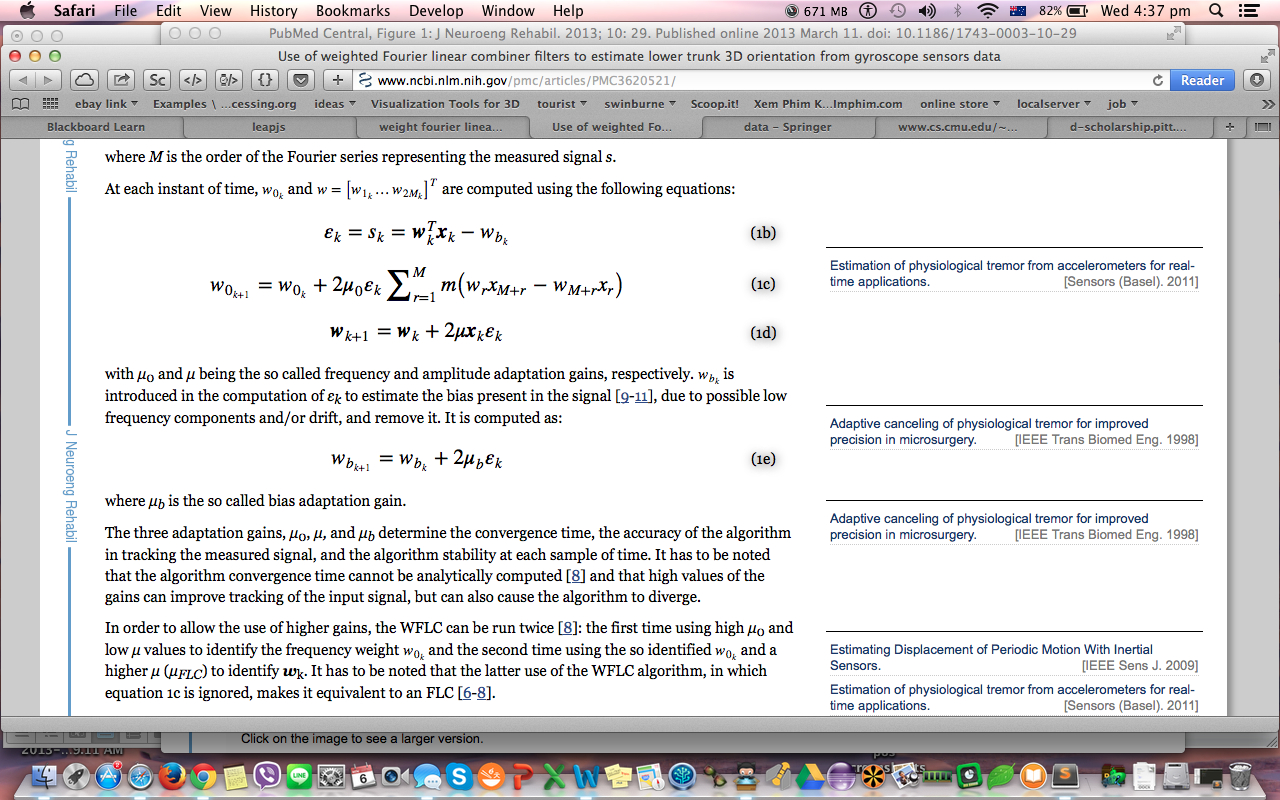


Implemented code locates in following project source code “js/LeapMotion/analysisFunctions/\_getEuclidean.js”

## Weighted Fourier Linear Combined (WFLC) Noise Filter Algorithm

WFLC formula:



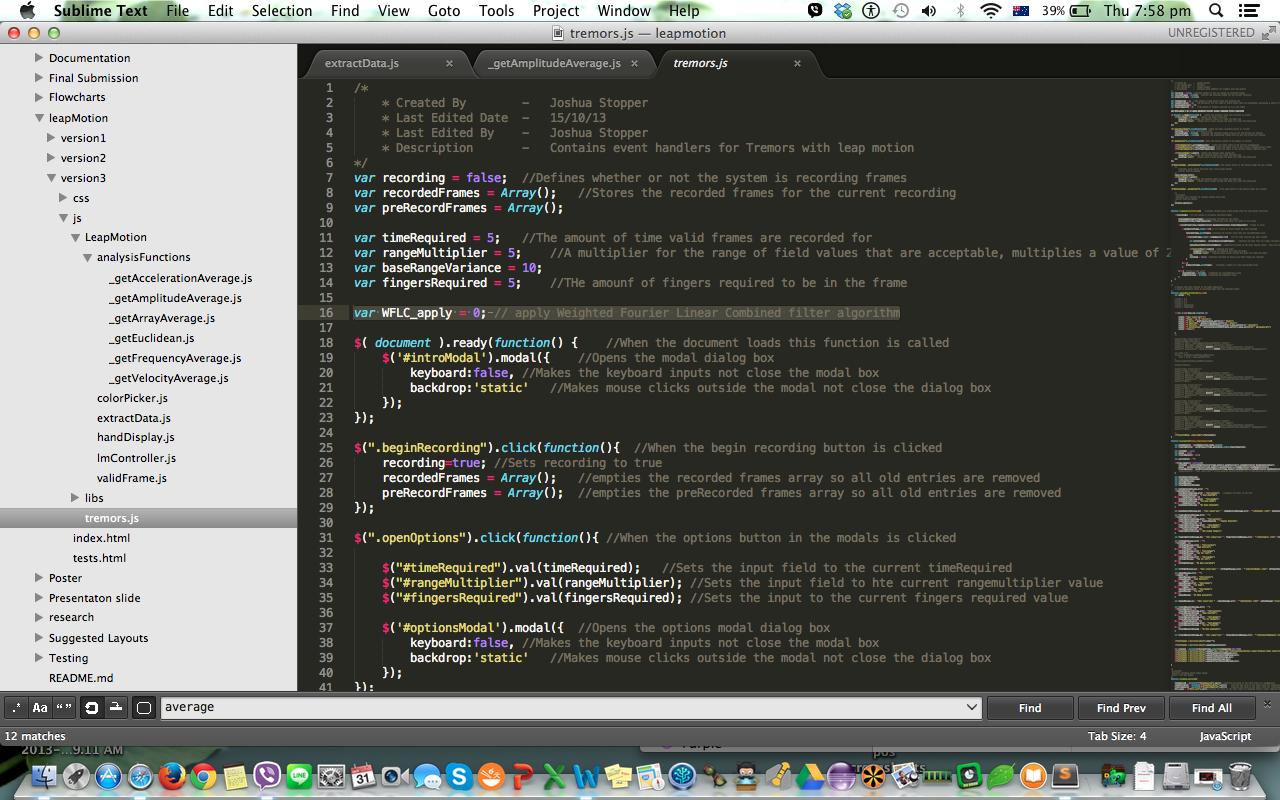


#### Sample Implementation written in C

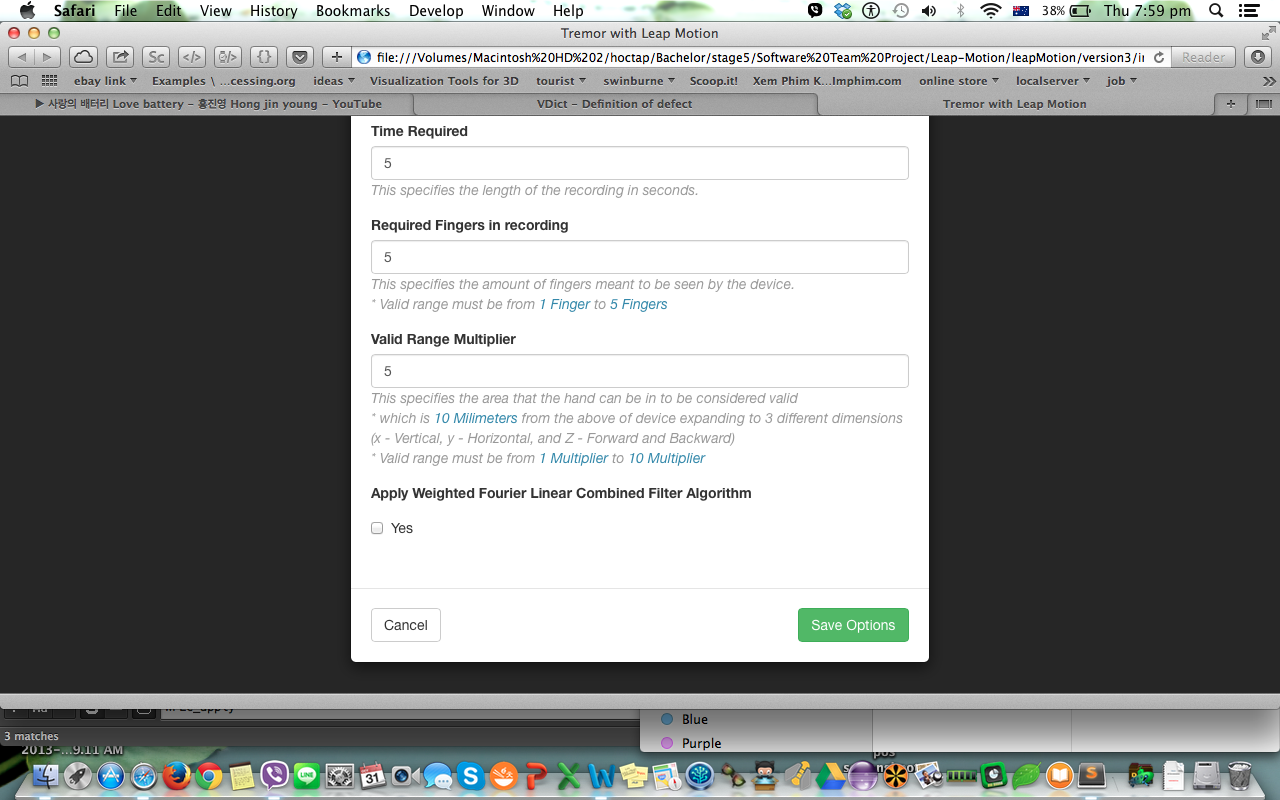
This url is an example to WFLC implementation in programming language C <http://www.cs.cmu.edu/~camr/wflc0.c>

#### WFLC Integration

WFLC algorithm implementation flag variable “WFLC\_apply” is declared as global variable in “js/tremors.js” file line 16. The initial value of this variable is 0 indicating that WFLC algorithm is not applied.



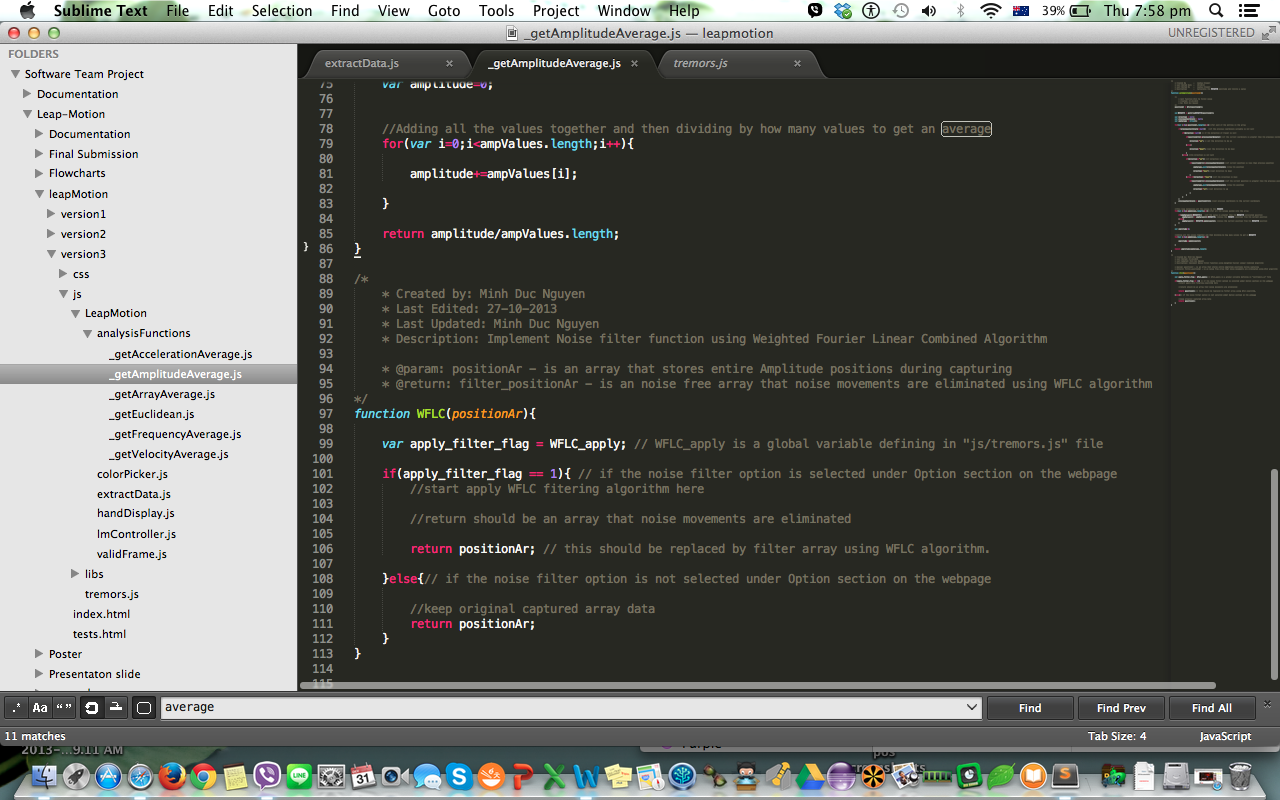
In the option modal in “index.php” page, the check box “Apply Weighted Fourier Linear Combined Filter Algorithm” is used to enable or disable WFLC algorithm in calculating output. The variable “WFLC\_apply” value is 0 by the default and will be set to 1 if the check box “Yes” is ticked.



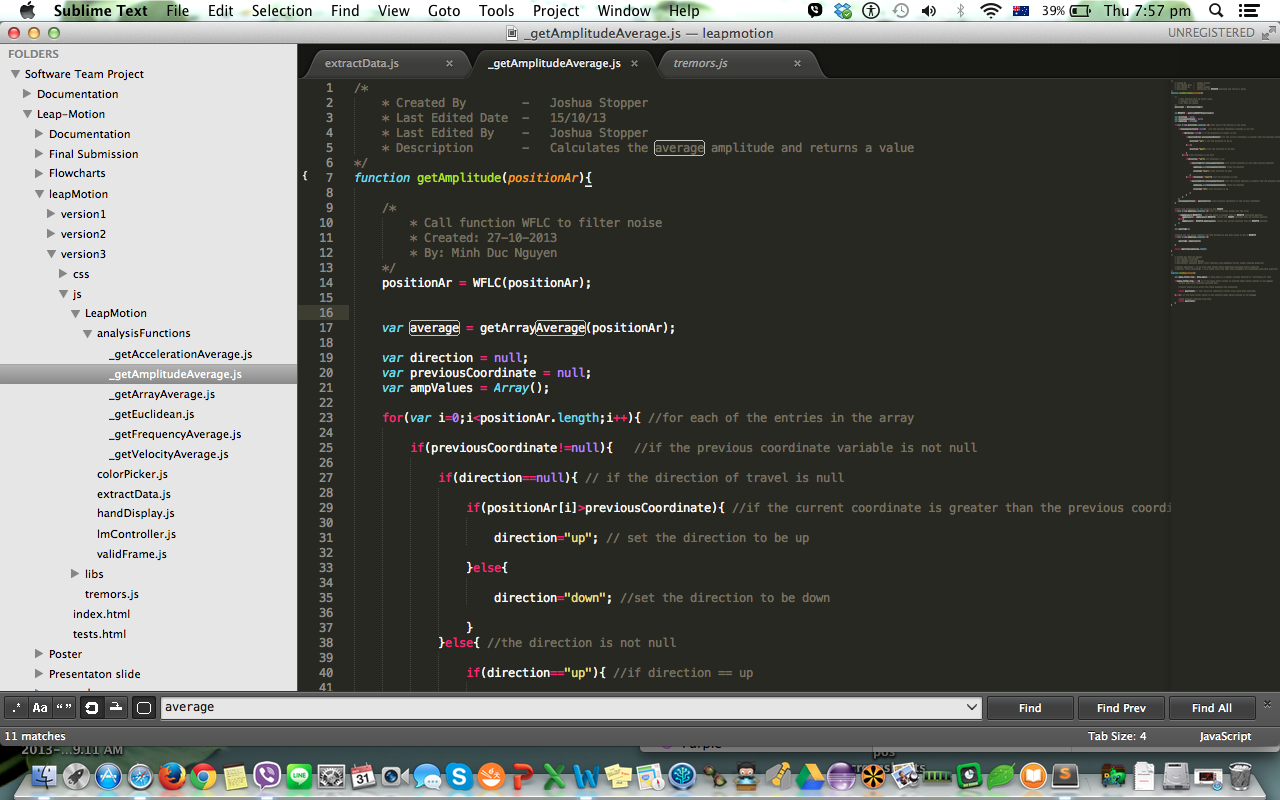
In “js/tremors.js” file, line 385, this statement gets the current checkbox status (tick / un-tick) and assign to the global variable “WFLC\_apply”

## Macintosh HD:Users:ng0kylan:Desktop:Screen Shot 2013-10-31 at 7.59.18 pm.png

The WFLC implementation is defined in “js/LeapMotion/analysisFunctions/\_getAmplitudeAverage.js” file at line 97. The accepted parameter is an array object that stores a set of Amplitude values during the capture. The purpose of this function is to read the “WFLC\_apply” flag variable and apply WFLC filter algorithm if this flag value is 1 (selected on Option page as a checkbox). The output of this function is an array comprising a set of Amplitudes value that were cleaned using WFLC algorithm.



In “js/LeapMotion/analysisFunctions/\_getAmplitudeAverage.js” file line 14, this statement calls the “WFLC” function before process Average Amplitude output to the report on screen.



## Other features

#### Changing virtual hand color

When user moves hand to either valid or invalid position, color will be changed to appropriate state; valid is green and invalid is red. The defined color picker function locates in “js/LeapMotion/colorPicker.js”

#### Extract data from “leapjs” library for calculation

Collected data via “leapjs” library will be passed to “extractData” function in “js/LeapMotion/extractData.js” file. The purpose of this function is to get useful data for each fingers and palm that support for calculation only.

#### Display the hand on screen

User hands and fingers are virtualized as 3d blocks on screen. The virtual palm and fingers are also applied changing color when user moves hand to the right or wrong valid position. Implementation code of this feature can be found at “js/LeapMotion/handDisplay.js”

#### Connection with the Leap Motion Device

The controller that makes connection to Leap Motion Device driver and passes the latest frame to Frame controller is defined in “js/LeapMotion/lmController.js”.

#### Validate Valid Frame

Function in which determine whether or not the frame is contains valid information. It represents different state when user moves hand outside the valid range above of LeapMotion device. The definition of function locates at “js/LeapMotion/validFrame.js”

#### Main Process Controller

The main javascript file that initialised the called to different functions is defined at “js/tremor.js”

# Reference

* Visualization tools for 3D, Dr. Daniel McGee, quiz.uprm.edu. Accessed Date: 25/9/2013. Available from: <http://quiz.uprm.edu/visual3d/manual/coor_sys/dist_two_points.html>
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