16423 - Designing Computer Vision Apps - Spring 2017

Assignment 0 - Getting Started with iOS, and XCode (5 % of total grade)
100 points - (Q1 & Q2 & Q3)

Released - Thurs 19th January 2017
Due - Fri 3rd of February 2017

On your local machine create a directory called `Assignment_0`. Once you have completed the assignment questions below, zip up the contents of the `Assignment_0` directory and upload them to the Google form link. For any portions of these questions that require a written response please create a `Written_Responses.pdf` document in the `Assignment_0` directory before zipping up the contents (please label clearly inside the document which question you are answering).

1) Within the `Assignment_0` directory build and run the Xcode project `Intro_iOS_Lena` (see link) using the iPad Air simulator. If you have never used git before please inspect the git cheat sheet (see `link`, you can install git on your MAC using brew (see link). Using the MAC Grab Utility (see Applications/Utilities in Finder on your MAC) capture the output of the App when you run it on the iOS simulator. Save the App output screen in the file `Lena_App_Output.jpg` which you should locate in the base `Assignment_0` directory. Describe in no more than a sentence or two what you notice about the displayed image, in relation to the true image aspect ratio (which can be found in Supporting Files in Xcode).

   a) What is a simple way to correct the aspect ratio running on the App? Tip: consider re-ordering some components of the code. Make your changes to the `Intro_iOS_Lena` project (specifically the file `View_Controller.mm`). In no more than a few sentences (in `Written_Responses.pdf`) describe in plain English what you did and why you did it and **include it in your written response. (10 points)**

   b) From scratch start a new single view Xcode project this time displaying a picture of yourself with the correct aspect ratio (you can use any digital picture of yourself you have handy). Name the project `My_OpenCV_App`. Make sure the image you are bringing into your Xcode project is copied into your project (not referenced). Describe in a single sentence how you can check that the image is copied not referenced? Also, explain in your own words why the file `View_Controller.mm` has to have a .mm extension not a .m? **Place the answer in your written response. (10 points)**

2) Within the `Assignment_0` directory open, build and run the Xcode project `Intro_iOS_OpenCV` (see link `https://github.com/slucey-cs-cmu-edu/Intro_iOS_OpenCV`) using the iPAD Air Simulator. It should display an edge map of the Lena image. Take your solution from the previous question to ensure the aspect ratio of the image is correct.

   a) Inspect the following example code (see `https://github.com/slucey-cs-cmu-edu/Detect_Lena` on how to use the face/object detectors in OpenCV from the command line. Using this example try to modify the `Intro_iOS_OpenCV` project to detect the face in the Lena image and draw a red rectangle around the area within the Intro. Remember: you will need to bring in the face detection model file (they typically have .xml extensions), if you have the latest version of OpenCV installed from brew these should be located in: `/usr/local/Cellar/opencv/XXXXXX/share/OpenCV/haarcascades/`. Describe in your own words the color of the bounding box displayed, also describe why you are seeing that color? Further, describe what could be done to remedy this? Finally, describe what you had to do to get the correct path to the .xml files within your project (i.e. can you just write the name of the file or do you need to do something else?) see the following link for help on this. **Place all these answers in your written response. (20 points)**

b) In OpenCV there are .xml files to detect other objects such as the eyes, mouth, fullbody etc. Using the circle drawing function (see OpenCV drawing functions - `docs.opencv.org/modules/core/doc/drawing_functions.html`) extend your current code to draw two circles around Lenas eyes in green using eye detectors. Using the putText function place your Andrew ID in pink at the bottom of the Lena image. Describe in your own words, **and include it in your written response**, why it is a good idea to clone the Mat image before drawing on it? **(5 points)**

c) Build and run your modified `Intro_iOS_OpenCV` project on your own iOS device (most likely the iPAD 2 Air which you received from class). Take a screen shot using the following `technique`. Take the image off the device (I like to use the Dropbox app for this as it is simple see `link`) or simply email the image to yourself (there are a myriad of other ways to get images and videos off your iOS device choose whatever method works best for you). Name the image `iOS_Device_Lena_App_Output.jpg` and place in the base of your `Assignment_0` directory. **(5 points)**

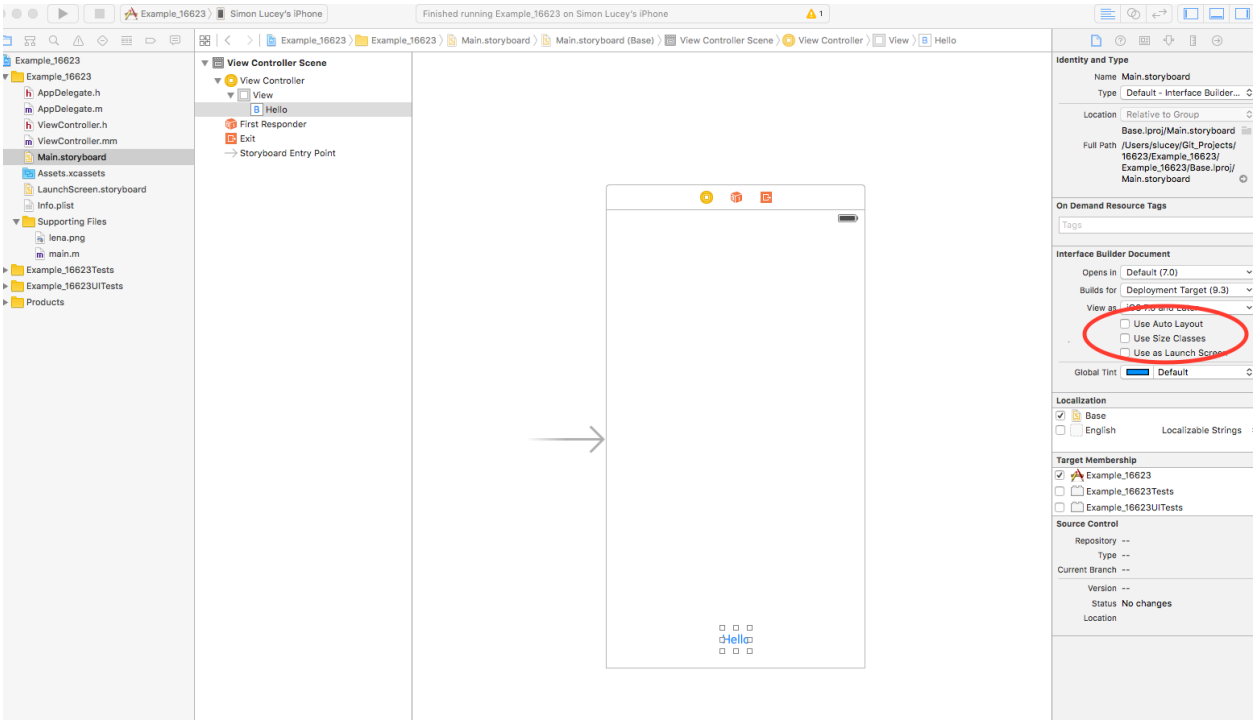
d) From scratch create a new single view Xcode project. This time we would like you to take a picture of yourself using the front facing camera on your mobile device using the `Intro_iOS_Camera` template code we are providing here (see link `https://github.com/slucey-cs-cmu-edu/Intro_iOS_Camera`). Name your project `My_Camera_App` in the base `Assignment_0` directory. Re-use the OpenCV code you have developed from (a)-(c), so that you apply the face and eye detector to your own face. In the `Intro_iOS_Camera` project you are exposed to the `CvPhotoCameraDelegate`. What is a delegate (see `link` for help) how is it used in this example project? Why is this useful when attempting to include OpenCV code into a project? Describe your answer in a few sentences and **include it in your written response.** **(20 points)**

3) An important component of designing an effective app is the user interface (UI). Although the focus of this course is NOT on teaching UI design or coding, being able to design and build a basic UI for your App is imperative. Please read this `article` on using the interface builder, and this `article` on connecting objects to code within Xcode. Now attempt to answer the following questions.

a) From scratch create a new single view Xcode project that is similar in functionality to your `My_Camera_App` with the exception that you employ the interface builder for including the `UIButton` and `UIImageViewer` classes within the UI. Name this new Xcode project `My_Camera_IB_App` and place in the base of your `Assignment_0` directory. To keep the UI simple ensure that you turn off AutoLayout and Size classes are disabled (see below). Using Quicktime record a short video showing your App running on your own face (see `link` on how to do this). Name the movie file `My_Camera_IB_App.mov` and include in the base `Assignment_0` directory. Finally read this `article` on autolayout and in a few sentences please describe what it is and why it might be useful and **include your answer in your written response.** **(20 points)**

b) Read this `article`. In a couple of sentences describe the benefits and drawbacks of using Xcode's interface builder for UI over iOS custom code (ignore the portion of the article on storyboards). **Place your answer in your written response.** **(5 points)**

c) Use the following `link` to obtain your device's UDID. Read the following `article` and describe in your own words: (i) what a UDID is?, (ii) why UDIDs are a privacy concern? **Place all these answers in your written response.** **(5 points)**


Example_16623
Simon Lucey's iPhone
Finished running Example_16623 on Simon Lucey's iPhone
Example_16623
Example_16623
AppDelegate.h
AppDelegate.m
ViewController.h
ViewController.mm
Main.storyboard
Assets.xcassets
LaunchScreen.storyboard
Info.plist
Supporting Files
lena.png
main.m
Example_16623Tests
Example_16623UITests
Products
Example_16623
Main.storyboard
Main.storyboard (Base)
View Controller Scene
View Controller
View
Hello
View Controller Scene
View Controller
View
Hello
First Responder
Exit
Storyboard Entry Point
Hell
Identity and Type
Name Main.storyboard
Type Default - Interface Builder...
Location Relative to Group
Base.lproj/Main.storyboard
Full Path /Users/slucey/Git_Projects/16623/Example_16623/Example_16623/Base.lproj/Main.storyboard
On Demand Resource Tags
Tags
Interface Builder Document
Opens in Default (7.0)
Builds for Deployment Target (9.3)
Use Auto Layout
Use Size Classes
Global Tint Default
Localization
Base
English
Localizable Strings
Target Membership
Example_16623
Example_16623Tests
Example_16623UITests
Source Control
Repository --
Type --
Current Branch --
Version --
Status No changes
Location