

# EE 267 Virtual Reality: Lab 5

## Instructions

Students should complete this lab before starting to work on Homework 5. Completing the lab will give you useful information that will aid in completing the homework assignment. Everything should work on Mac, Windows and Ubuntu, but we don't support the use of virtual machines.

For the programming part of Homework 5, you will mostly do Arduino programming with our VRduino. If you have a lot of experience with Arduino, you may skip this lab. If you have not worked with Arduino before or your skills are a bit rusty, please complete the tutorials listed below before starting the homework.

## Task 1: Getting started with Arduino and Teensy

We briefly discussed Arduino in class, but you may want to read the brief [“official” introduction](#). [The Arduino website](#) should be your go-to place for all questions related to Arduino. Also read the information on [Getting Started](#) with Arduino.

The VRduino uses a Teensy 3.2 microcontroller. This Teensy is an Arduino-compatible board, but it is a bit more beefy than the official Arduino boards. The Teensy 3.2 uses an ARM Cortex-M4 processor that runs at up to 72 MHz and it is also smaller than the Arduino UNO, for example. The official Teensy website is <https://www.pjrc.com/teensy/>.

If this is the first time you use a Teensy, install Teensyduino by following [the installation instruction page](#). This is a stand-alone app or a plug-in for the Arduino IDE app, which lets you compile your code for the Teensy. Depending on your operating system, you may need to reinstall the Arduino IDE app if you have already installed one on your computer. The [Teensy First Use](#) article will also help you get started.

Due to the fact that the Teensy is Arduino compatible, you can program it in pretty much the same as any other Arduino and benefit from the Arduino IDE and strong community support on the internet. For example, to upload the starter code to the IDE, open vrduino.ino with the Teensyduino/Arduino app. Connect your VRduino to your computer via the USB port. Under Tools, change the port in the IDE to the new serial Teensy port and make sure that the Board is set to Teensy 3.1/3.2. Click the right arrow on the IDE to compile and upload the program to Teensy. Here is a brief tutorial on [How to Setup Teensyduino](#).

You are free to edit your code within the Arduino IDE, but if you find the editor lacking (e.g. lack of syntax highlighting), you can use your favorite editor to edit the code, and use the IDE to compile/upload the program. You can do this by checking off "Use External editor" in the settings/preferences.

### Task 3: Practice your Arduino skills

If you feel confident about your C programming skills and the Teensy, go ahead and get started on the homework. If you'd like some more info on how to program Arduinos, you can find a lot of Arduino tutorials online. For example, these [Arduino Video Tutorials for Beginners](#) are very helpful.

### Task 4: Installing Node.js

You are going to need a WebSocket server to communicate IMU orientation data to the browser in sections 2.4 and 2.5 in the homework. For this purpose we are using Node.js, which will setup this server. We provide you with the Node.js based script `server.js` that reads data from the serial port and publishes it through a WebSocket. To run it, you first need to install a few packages from a JavaScript package manager, npm. Follow these instructions:

1. [Download and install Node.js \(LTS version\)](#), which includes the package manager npm.
2. In a terminal, navigate to `server/` in your homework folder. This is where `server.js` is located.
3. Enter: `npm install`. This should install a `node_modules` folder with the required libraries.
4. Compile and upload `vrduino/vrduino.ino`, and enter: `node server.js`. You should start seeing data streaming to the terminal.