

# Documentation

From The Relativity Wiki

## Welcome

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Welcome to the Relativity documentation! On this page, you will find the complete documentation to build, and setup your own VR headset!

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**PLEASE NOTE;** We highly recommend that you use the STM32 tracker because it has proved to be more stable than the Due based one. The Due code has recently been reported to throw compiler errors, and the Due trackers have exhibited stability issues. Because of this, we will be phasing out support for the Arduino DUE code in the next couple of months. (*NOTE added on Apr 17, 2019*)

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## before we start

### Recommended computer specs

Recommended computer specs	
Processor	Intel Core i5 2500 or AMD Ryzen 5 2600, equivalent or better
Graphics	NVIDIA GeForce GTX960 or AMD RX470, equivalent or better
Memory	4GB RAM or more
Video output	1x HDMI 1.4 port
USB	2x USB port

## Needed Hardware

Before you can start building your own Relativity VR headset, you will need the following parts;

Needed hardware
Arduino DUE
MPU6050
5.5 inch 2K screen
3D printed parts

## Needed Software

To get data output for our VR headset, and to make it compatible with SteamVR, we will need some software. Here are the links to the sites where you can download the needed software.

Arduino IDE (<http://web.archive.org/web/20201112010758/https://www.arduino.cc/en/main/software>)

Redirects you to the Arduino website, where you can download the IDE.

Download Relativity Github (<http://web.archive.org/web/20201112010758/https://github.com/relativity/Relativ/archive/master.zip>)

This downloads the Arduino code and the 3D models.

Download OSVR (<http://web.archive.org/web/20201112010758/http://www.osvr.org/getting-started.html>)

Redirects you to the website, where you can download OSVR.

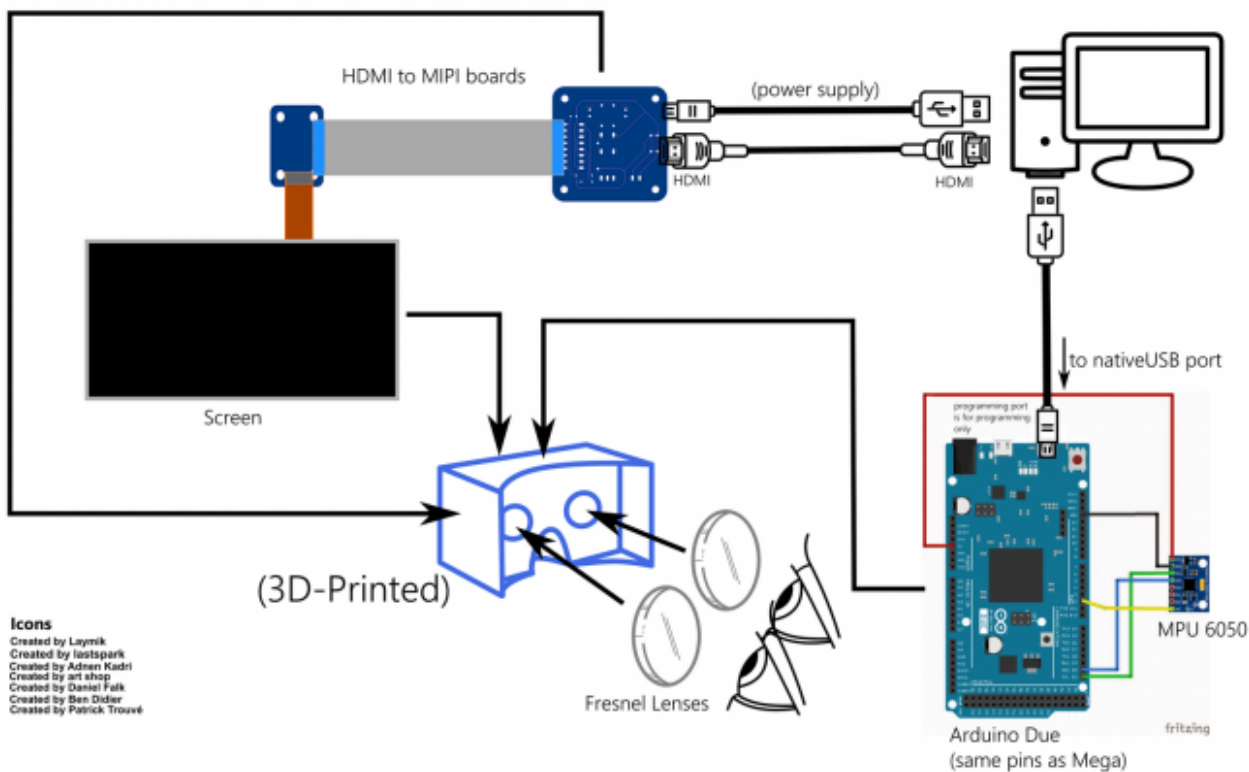
Download OSVR plugin github (<http://web.archive.org/web/20201112010758/https://github.com/relativity/relativ-osvr-plugin/archive/master.zip>)

This downloads the files to make OSVR compatible with Relativ.

# Documentation

## Connecting the hardware (part 1)

We will start with connecting all the components of our VR headset. The first thing we will do is connecting our MPU6050 to our Arduino DUE, following this schematic;



The Schematics to connect your VR headset.

Schematic	
VCC	5V
GND	GND
SCL	21 (SCL)
SDA	20 (SDA)
INT	2

Now, we have connected our MPU6050 to our Arduino DUE, we can connect our Arduino to our computer, using the **programming port**. For uploading the sketch, we **dont** make use of the **native** USB port!

We dont have to connect our screen yet, we first need to upload our program to our Arduino DUE, and make sure it is working.

## Uploading the sketch

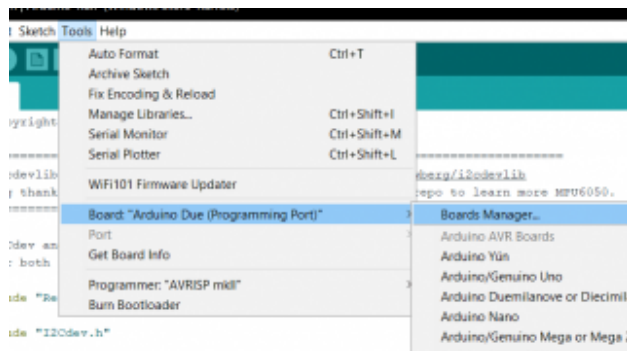
The first step is importing our downloaded Arduino libraries. We need to move the downloaded libraries from `\Relativ-master\src\libraries` to `Documents\Arduino\libraries\`.

After uploading our libraries, we can open the main.ino file, wich we can find in `\Relativ-master\src\main`. This should automatically open the Arduino IDE.

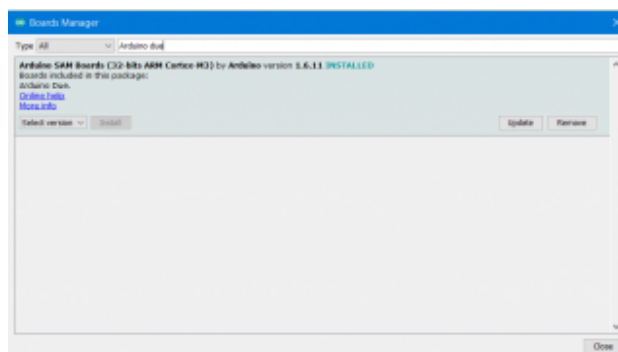
Before we can upload our sketch to our Arduino board, we need to make sure we have installed, and selected the righth board in our Arduino software. To do this, we have to go to Tools - Boards manager. Search here for **Arduino DUE**, and install the package.

Now, we can go to Tools - Boards, and select the **Arduino DUE (programming port)**. When you have done this, you can go to Tools - Port, and select your connected Arduino board.

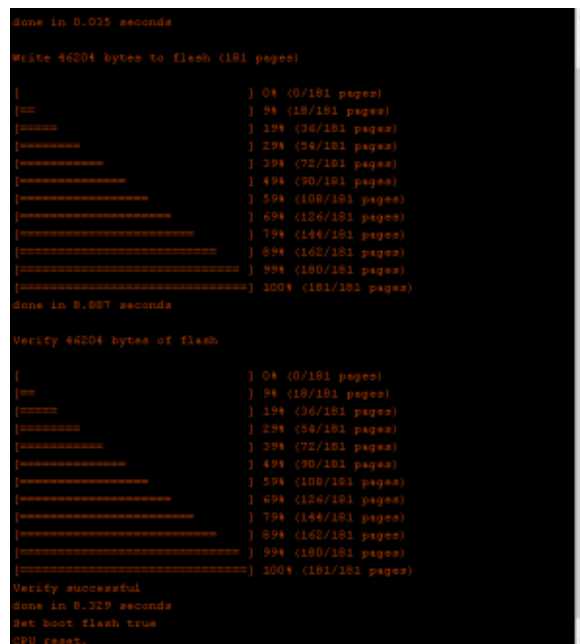
When you have done all above steps, you should be able to upload the sketch to your arduino board! You can do this by pressing the **button** with the **right arrow** in it.



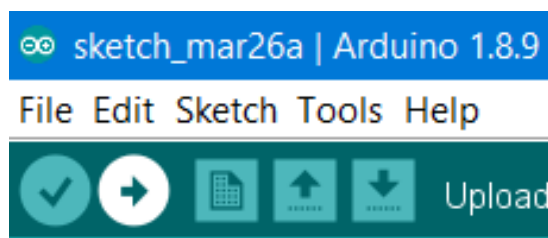
The boards manager in the Arduino IDE



Search for "Arduino DUE", and download the package



How a succesfull upload should look like



The uploading button (with the **right arrow**)

If your sketch is uploaded succesfully, you should see this in the console of the Arduino IDE (see image on the right);

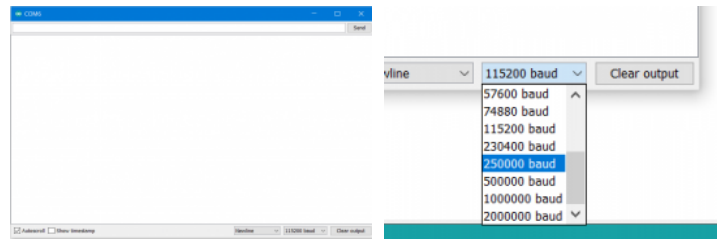
After uploading your code, you will need to **disconnect** your Arduino, and **reconnect** it on the **Native USB port**!

## Testing

Before we continue with building, and setting up our VR headset, we will frist test our MPU6050, to make sure that it is connected correctly, and everything is working.

We can check this, by opening the Serial Monitor. **(Make sure your Arduino Due is connected on the Native USB port!)**

We can open our Serial monitor in the following ways; Tools - Serial Monitor Ctrl+Shift+M Before the Serial monitor will display something / the correct data, we will need to set it to 250.000 baud.



The Serial Monitor in the  
Arduino IDE

You can select your  
baudrate here.

If everything is connected good, and you had uploaded your sketch without a error, we should see a lot of numbers in the serial monitor.

## Setting up SteamVR

Before we start setting up OSVR, we will setup SteamVR. This is a easy, and simple step. We will have to copy all the files from

relativ-osvr-plugin/SteamVR

and paste them in the **drivers** folder of your Steam directory

(PATH\_TO\_STEAM/Steam/steamapps/common/SteamVR/drivers)






## Setting up OSVR

Before you continue, we assume you have downloaded OSVR, and the OSVR drivers, as mentioned in the "Needed Software".
























We will start with setting up the config files. To do this, copy the files from relativ-osvr-plugin/OSVR/Configs, and paste them in the '**displays**' folder in the OSVR directory (PATH\_TO\_OSVR/OSVR/Runtime/bin/displays).

Now, we have have completed the Configs, we will do the Displays. We need to copy the files from relativ-osvr-plugin/OSVR/Displays, to the '**displays**' folder in our OSVR directory. (PATH\_TO\_OSVR/OSVR/Runtime/bin/displays)

Last, but not least, we will do the plugins. We will have to copy the plugin files from relativ-osvr-plugin/OSVR/Displays, to the '**displays**' folder in your OSVR directory. (PATH\_TO\_OSVR/OSVR/Runtime/bin/osvr-plugin-0)

 osvr_server	16/11/2017 14:31	Application	510 Ko
 osvr_server.pdb	16/11/2017 14:31	Program Debug D...	3 092 Ko
 osvr_server_config.autodetectall	16/11/2017 13:20	Fichier JSON	2 Ko
 osvr_server_config	27/02/2018 21:19	Fichier JSON	1 Ko
 osvr_server_config	24/02/2018 14:59	Document texte	1 Ko

### The config file

 HMD_Vuzix720	16/11/2017 13:20	Fichier JSON	1 Ko	 com_osvr_Multiserver.dll	16/11/2017 14:30	Extension de l'app...	562 Ko
 HMD_Vuzix1200dx	16/11/2017 13:20	Fichier JSON	1 Ko	 com_osvr_VideoBasedHMDTracker.dll	16/11/2017 14:30	Extension de l'app...	1 409 Ko
 Oculus_Rift_DK1	16/11/2017 13:20	Fichier JSON	1 Ko	 com_osvr_VideoCapture_OpenCV.manua...	16/11/2017 14:30	Extension de l'app...	71 Ko
 Oculus_Rift_DK2	16/11/2017 13:20	Fichier JSON	2 Ko	 org_osvr_filter_deadreckoningrotation.dll	16/11/2017 14:45	Extension de l'app...	407 Ko
 OSVR_HDK_1_1	16/11/2017 13:20	Fichier JSON	2 Ko	 org_osvr_filter_oneeuro.dll	16/11/2017 14:45	Extension de l'app...	266 Ko
 OSVR_HDK_1_3	16/11/2017 13:20	Fichier JSON	2 Ko	 org_osvr_filter_videoimufusion.dll	16/11/2017 14:46	Extension de l'app...	741 Ko
 OSVR_HDK_1_3_with_mesh	16/11/2017 13:20	Fichier JSON	2 Ko	 org_osvr_unifiedvideoinertial.dll	16/11/2017 14:48	Extension de l'app...	2 487 Ko
 OSVR_HDK_2_0	16/11/2017 13:20	Fichier JSON	1 Ko	 Relativ_Core.dll	26/02/2018 16:57	Extension de l'app...	114 Ko
 Relativ_HMD_1920	27/02/2018 21:18	Fichier JSON	2 Ko	 Relativ_HMD.dll	28/06/2017 19:48	Extension de l'app...	141 Ko
 Relativ_HMD_2560	27/02/2018 21:18	Fichier JSON	2 Ko				
 Sensics_dSight_landscape_1input_sbs	16/11/2017 13:20	Fichier JSON	1 Ko				
 Sensics_dSight_landscape_2inputs	16/11/2017 13:20	Fichier JSON	1 Ko				
 Sensics_dSight_portrait_1input_sbs	16/11/2017 13:20	Fichier JSON	1 Ko				
 Sensics_dSight_portrait_2inputs	16/11/2017 13:20	Fichier JSON	1 Ko				

### The display files

### The plugin files

## Changing the COM port

To get movement on your VR headset, OSVR will need to get the input from your Arduino board. To get this input, OSVR needs to know on wich **COM port** your Arduino is connected.

### How to check your COM port;

Arduino IDE

**Tools > Ports** Here you can find your connected Arduino board(s), and its COM port.






Device Manager

1. Open Device Manager:

Click; Start > Control Panel > Hardware and Sound > Device Manager (under "Devices and Printers")

2. In the **Device Manager** list, look in **ports**, and find your Arduino board.

You can find the COM port of your OSVR in the config file. (osvr\_server\_config.json) make sure it matches the COM port of your Arduino board, because OSVR wont work otherwise!

 osvr_server	16/11/2017 14:31	Application	510 Ko
 osvr_server.pdb	16/11/2017 14:31	Program Debug D...	3 092 Ko
 osvr_server_config.autodetectall	16/11/2017 13:20	Fichier JSON	2 Ko
 osvr_server_config	27/02/2018 21:19	Fichier JSON	1 Ko
 osvr_server_config	24/02/2018 14:59	Document texte	1 Ko

The config file

```

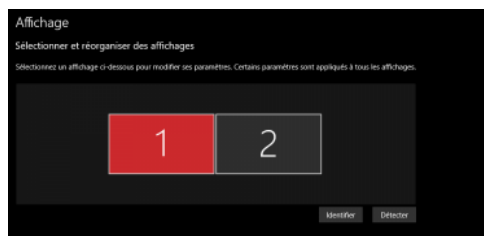
{
  "description": "This configuration supports video (so-called 'positional') and",
  "display": "displays/relativ_1920_1080.json",
  "renderManagerConfig": "sample-configs/renderManager_extended_landscape.json",
  "drivers": [
    {
      "driver": "Relativ_Core",
      "params": {
        "port": "COM1"
      }
    }
  ],
  "aliases": {
    "alias": "/No/Head": "/No/Head/Relativ/semantic/Relativ"
  },
  "server": {
    "sleep": 1
  }
}

```

You can change the COM port here

## Screen Configuration

Please make sure you have only **two** screens connected! (your main screen, and the screen of your VR headset.) Your VR headset screen must be at the **right** of main screen, and must be **aligned** with the **top border** of the main screen.



How your screen setup should look like

## Connecting the hardware (part 2)

Well done, you have setup your Arduino DUE, and MPU6050! Now, we will connect our screen to our PC, using a HDMI, and USB cable.

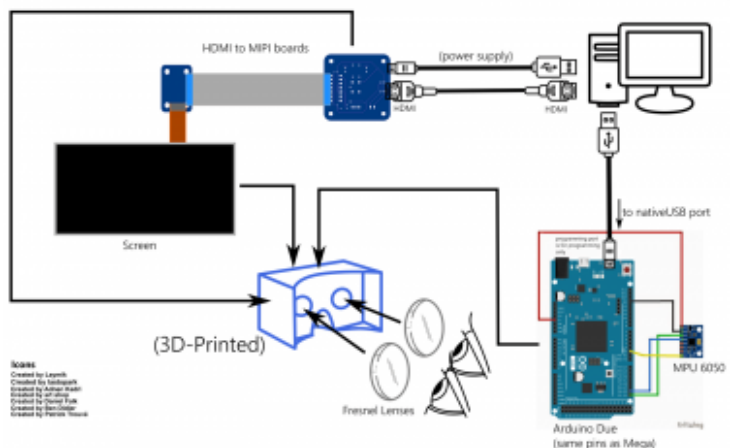
Your screen should automatically turn on when you connect it to the power (the USB cable).

# Relativ and OSVR

Well, it is time to startup your Relativ headset for the first time!

To do this, we need to start '**osvr\_server.exe**'. You can find this in FOLDER\_TO\_OSVR/OSVR/bin/osvr\_server.exe

This window should appear: (see image 1)



The Schematics to connect your VR headset.

Now, we can start SteamVR. A little SteamVR windows should appear: (see image 2)

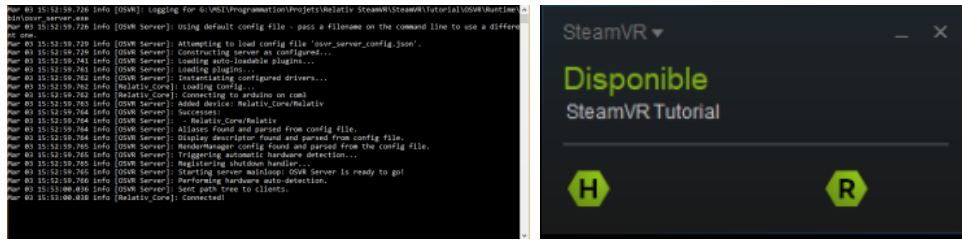


Image 1 -The OSVR server terminal

Image 2 - The SteamVR window

## Have fun playing SteamVR games with your headset!

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