

Pololu's MinImu-9 v2 to 3DSMax

This is a little tutorial for you to interact in real time with the Pololu's **MinImu-9 v2** to **3DSMax** through **Arduino Uno** board and usb connection.



What you will need:

Hardware:

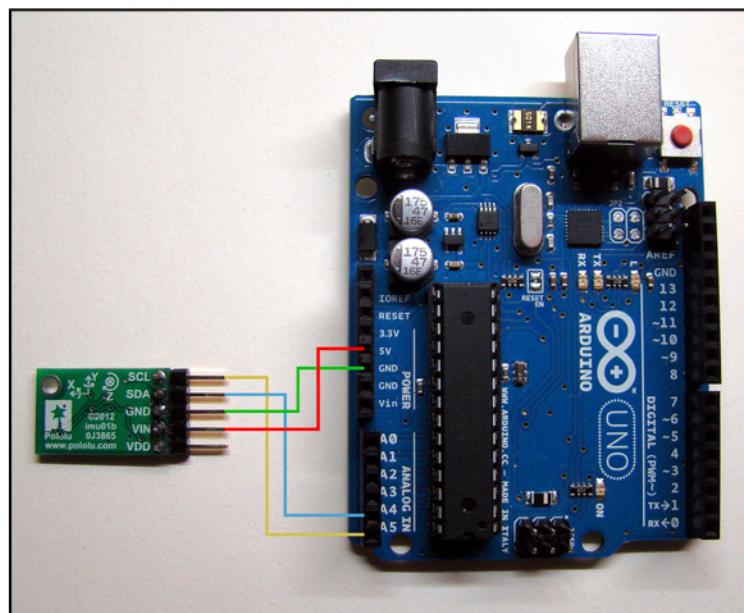
- 1) **MinImu-9 v2**
- 2) **Arduino Uno** Board
- 3) Usb cable
- 4) Cable for the connection between **MinImu** and **Arduino** boards

Software:

- 1) **Arduino** Software
- 2) **3DMax** (Autodesk 3DStudioMax)
- 3) **Framework Dotnet** (you can download it from: <http://www.microsoft.com/net>)*
*may be you have already instaled dotnet in your system

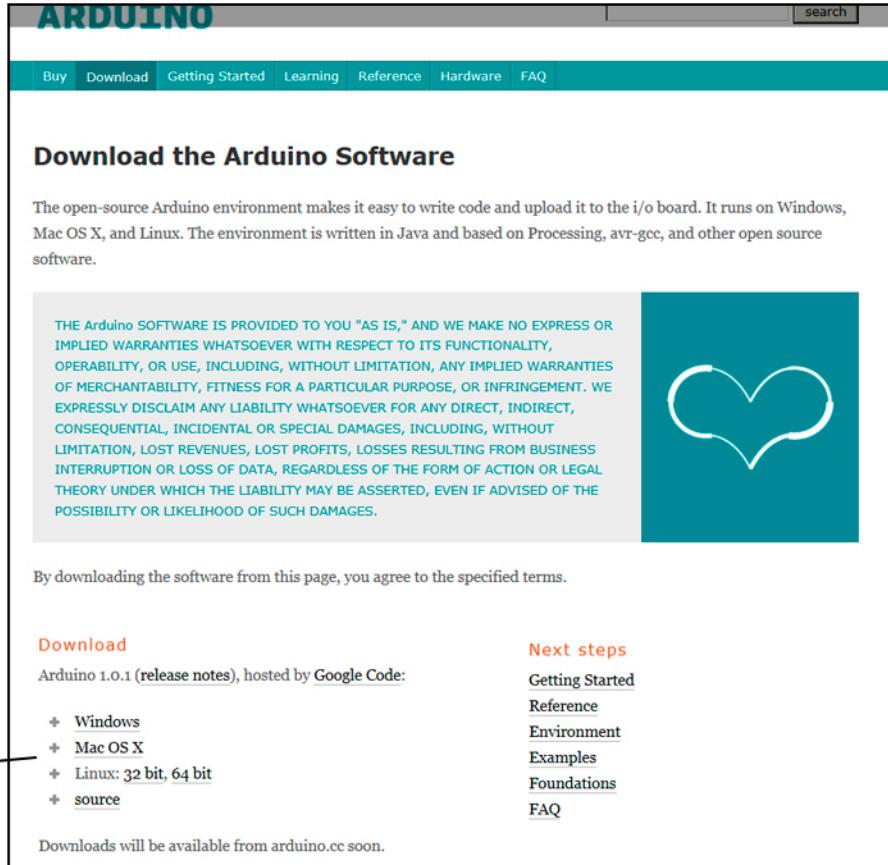
1. Connect **MinImu** to **Arduino**

MinImu	Arduino
SCL	A5
SDA	A4
GND	GND
VIN	5V



2. Install Arduino Software:

Download it from <http://arduino.cc/en/Main/Software>



The screenshot shows the Arduino website's software download page. At the top, there's a navigation bar with links for Buy, Download, Getting Started, Learning, Reference, Hardware, and FAQ. A search bar is located in the top right corner. Below the navigation, the title "Download the Arduino Software" is centered. A text block explains that the open-source Arduino environment runs on Windows, Mac OS X, and Linux, and is written in Java and based on Processing, avr-gcc, and other open source software. To the right of this text is a teal-colored graphic featuring a white heart outline. Below the main text, a note states: "By downloading the software from this page, you agree to the specified terms." On the left side of the page, there's a section titled "choose your system" with a dropdown menu showing options: Windows, Mac OS X, Linux: 32 bit, 64 bit, and source. To the right of this section is a "Next steps" sidebar with links for Getting Started, Reference, Environment, Examples, Foundations, and FAQ. At the bottom of the page, a note says: "Downloads will be available from arduino.cc soon."

Install it and test it with your **Arduino** board. You will have to know which COM port from your computer will be the right one to connect with your **Arduino** board. Usually you can try the COM3 without problems.

Of course we are talking about the usb connection from your **Arduino** to your computer here.

3. Add the two sensors from **Minimu-9 v2** libraries:

L3GD20 (gyroscope) Library

LSM303DLHC (accelerometer + magnetometer) Library

You will need to add this two **Minimu-9 v2** sensors libraries to your **Arduino**-software libraries.

3.1 Download the **L3GD20** library from here: <https://github.com/pololu/L3G/downloads>

download from here



The screenshot shows a GitHub repository page for the "pololu/L3G" repository. The page has a header with the repository name and a "Code" tab selected. Below the header, there are buttons for "Files", "Commits", and "Branches". At the bottom of the page, there are two download buttons: "Download as zip" and "Download as tar.gz". A message at the bottom right says: "There aren't any downloads yet".

3.2 Download the **LSM303DLHC** library from here: <https://github.com/pololu/LSM303/downloads>

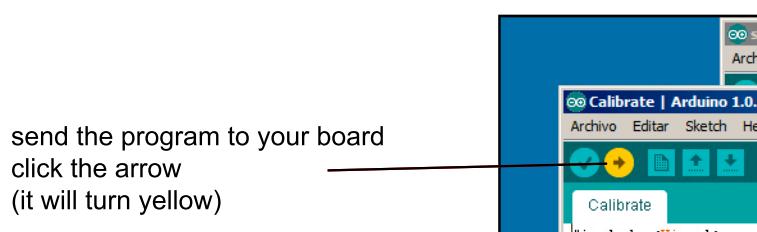
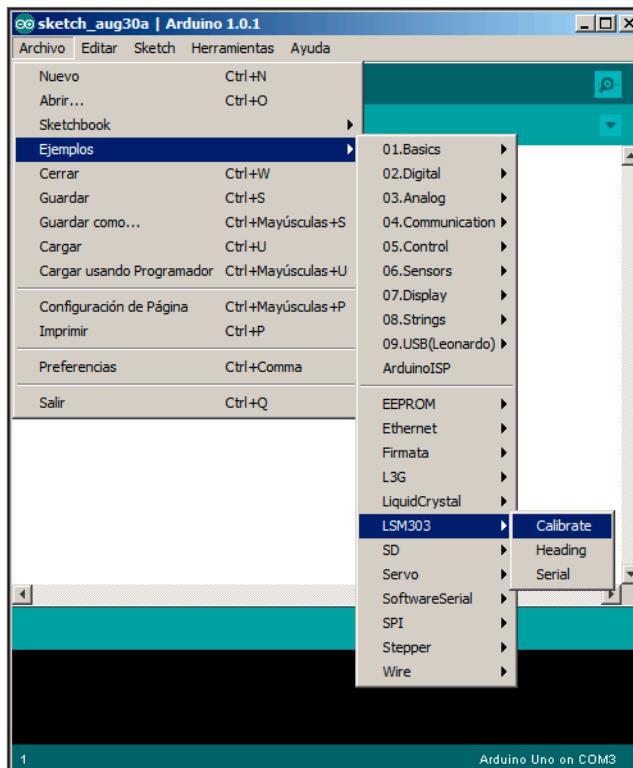


3.3 Decompress those files downloaded, and move the "**L3G**" and "**LSM303**" folders into the "libraries" subdirectory inside your Arduino sketchbook directory. You can view your sketchbook location by selecting File->Preferences in the Arduino environment; if there is not already a "libraries" folder in that location, you should create it yourself. After installing the library, restart the Arduino environment so it can find the **L3G** and **LSM303** libraries and its examples.

4. Calibrate your **MinImu-9 v2**

This is for get the correct values for the Min and Max values for the magnetometer from your board.

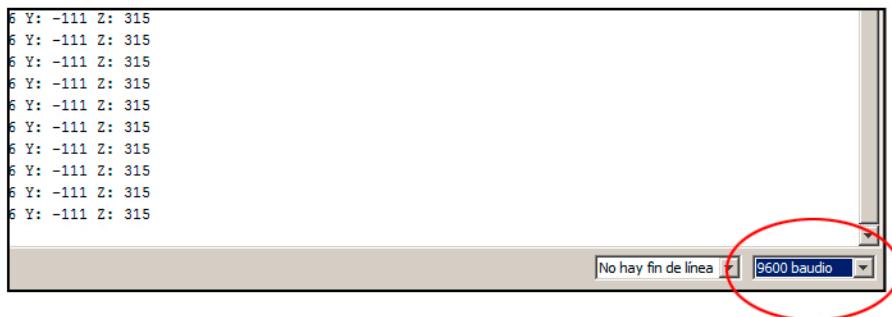
4.1 Connect your **MinImu** board to your **Arduino** board, connect your **Arduino** board to the usb port. Open the "Calibrate" example from your Arduino environment: File/Examples/LSM303/Calibrate



4.2 Watch the values from the serial monitor: Tools/Serial Monitor

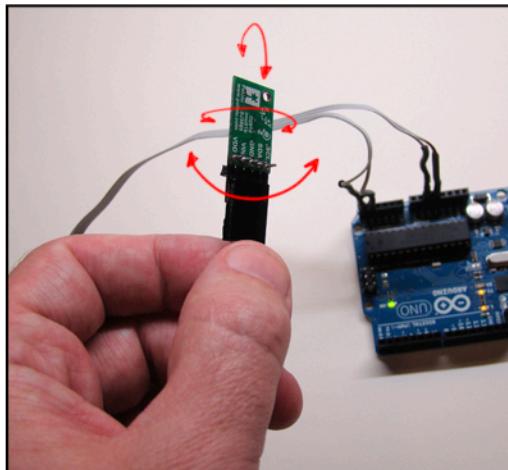


Choose Baudrate: 9600



Take the Minimu board as far as you can away from the computer or other device which can produce a magnetic field, or Iron objects too.

Rotate the board in all possible angles until you see that the values from the Serial Monitor don't change anymore.



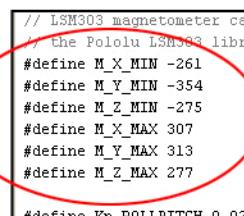
Write this values on a paper or whatever ($\min X$, $\min Y$, $\min Z$, $\max X$, $\max Y$, $\max Z$)

5. Charge the "MinIMUToMaxArduino" software from the MinIMUToMaxArduino folder into the **Arduino** board

In Arduino: File/Open/MinImuToMaxArduino/MinImuToMaxArduino

5.1 Change the values of min ad max of the magnetometer with the ones that you wrote before.

change this values with your values —



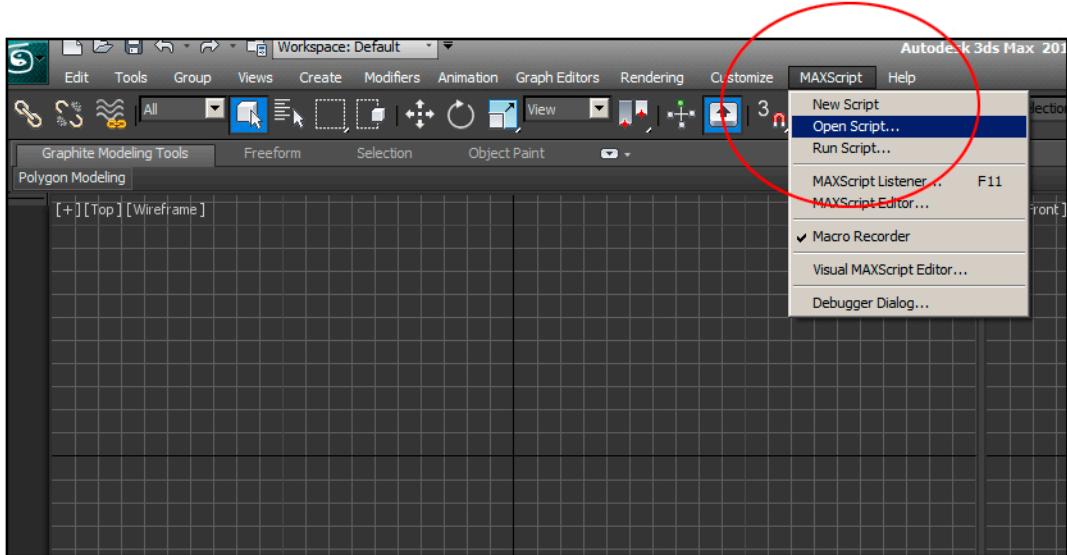
Note: The "MinIMUToMaxArduino" is the same that the "MinIMU9AHRS" provided by Pololu but with a few changes, in the Hz output, this works with 25 Hz, meaning that will be 25 frames per second in 3DSMax, also in the Serial Output are some changes.

Once you change the values of the magnetometer, charge the software to your **Arduino** board

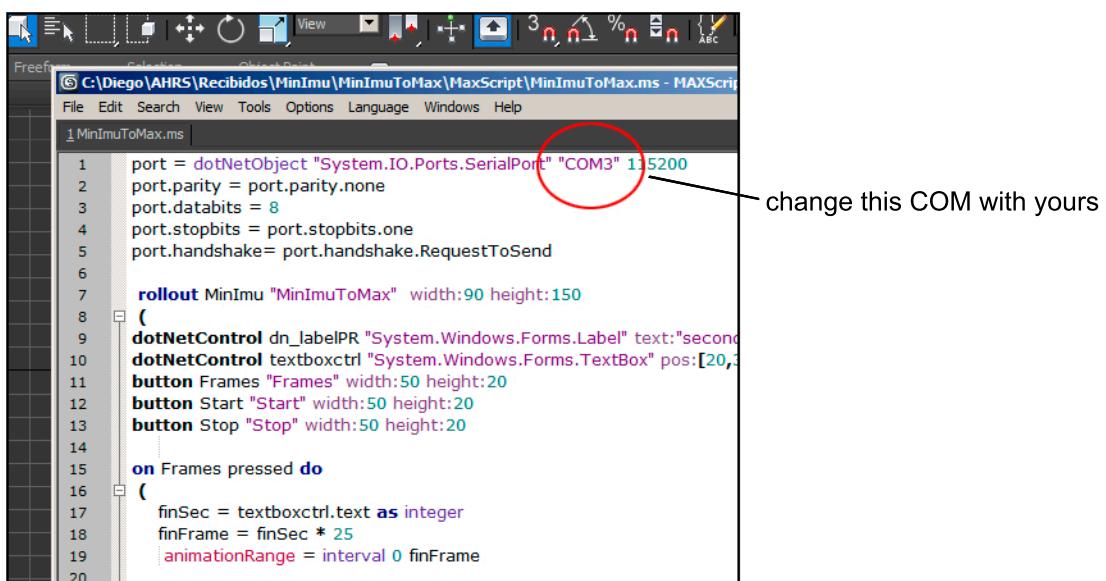
6. Open **3DSMax** (Autodesk 3DSMax), and Open Maxscript

6.1 In **3DSMax** go to MaxScript/Open Script.

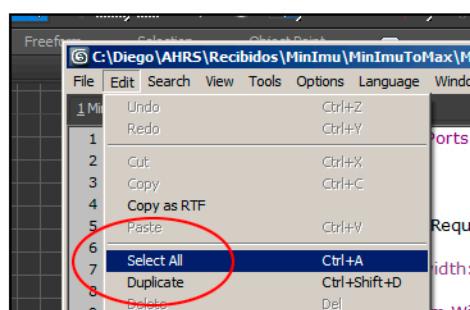
From there browse inside the folder MaxScript/MinIMUToMaX



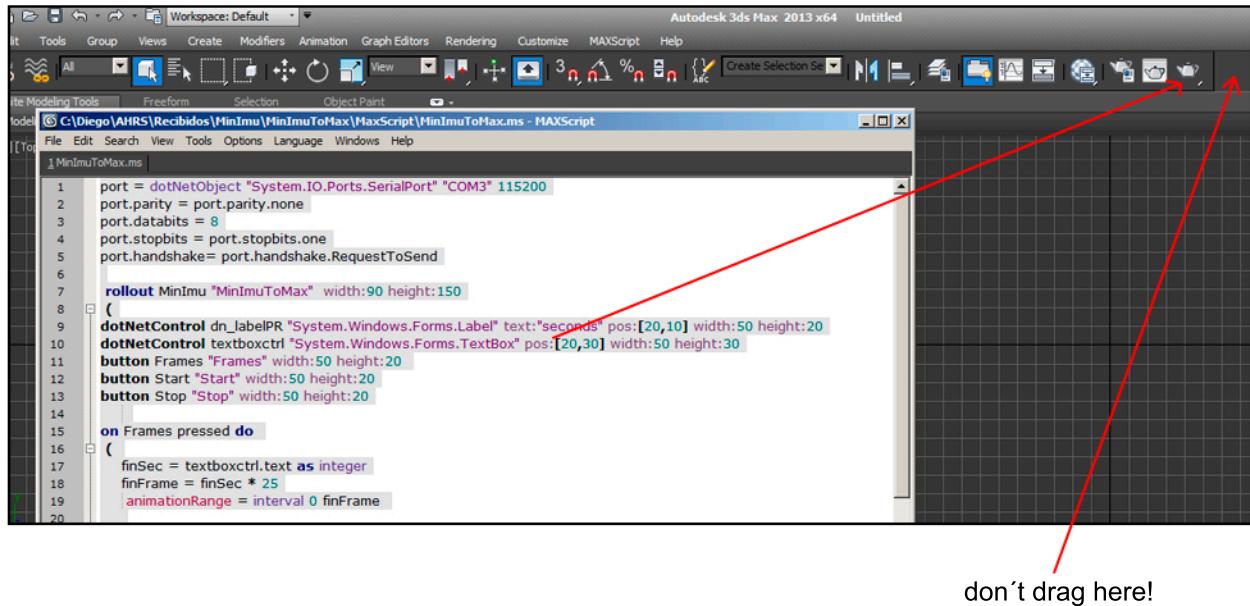
The MaxScript Editor will open. Change the COM port to the one that you are using with **Arduino**



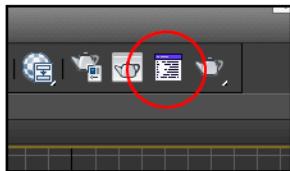
Now, in the MaxScript Editor choose Edit>Select All



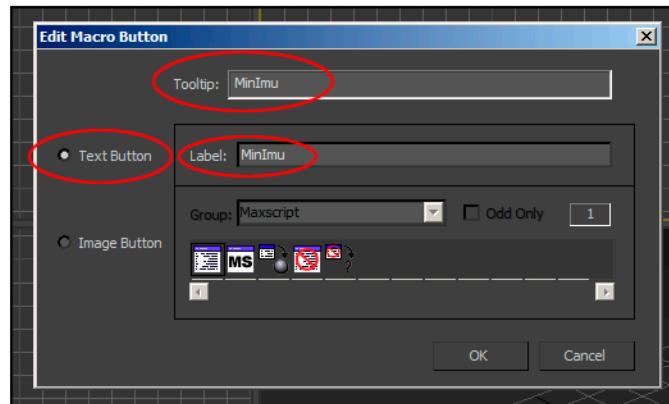
Drag the selected text to the toolbar, the mouse cursor will turn to a “+”



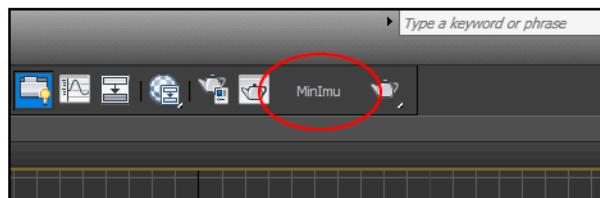
A new button is created and it will look like this



Right click over this new button, and choose “Edit Button Appearance...” a new dialog box will appear. Choose “Text Button”. In “Tooltip” box write “MinImu”, In “Label” box write “MinImu”, click “OK”



Now, your Button will look like this, and it doesn't matter if you close 3DSMax, the button will be there always.

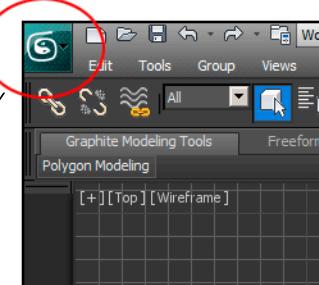


6.2 Playing with MinImu to MAX

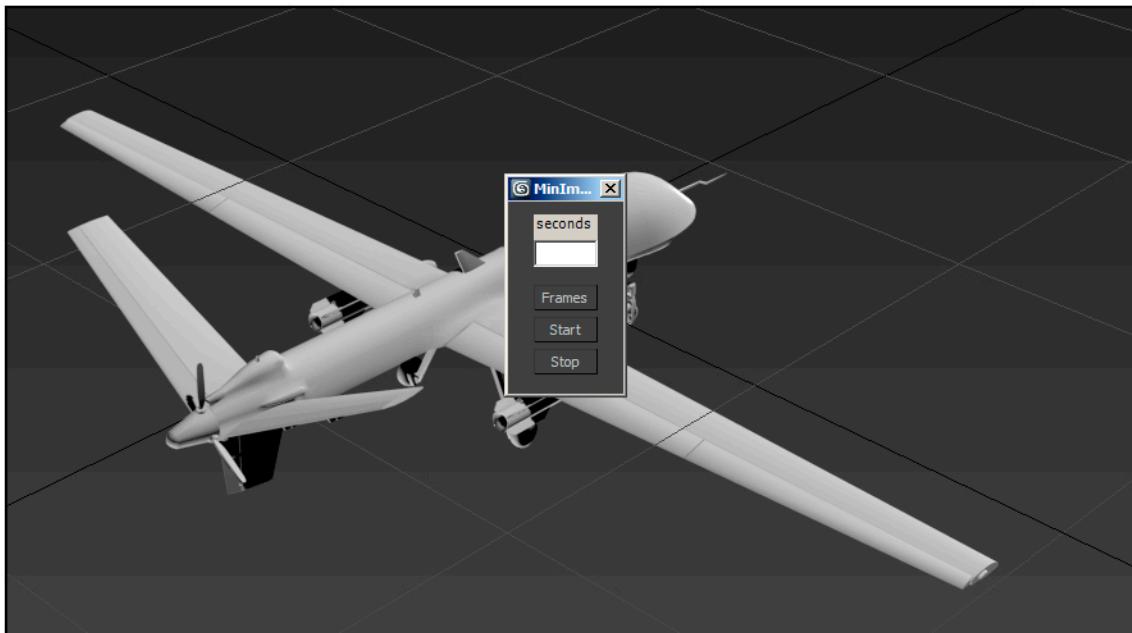
Close 3DSMax and open it again, check if the "MinImu" Button is still there.

Go to File/Open/MinImuToMax/3DSMax/Predator2012 or
2011 or 2010 (depending on your version of 3DSMax)
In my case I work with 3DSMax 2013

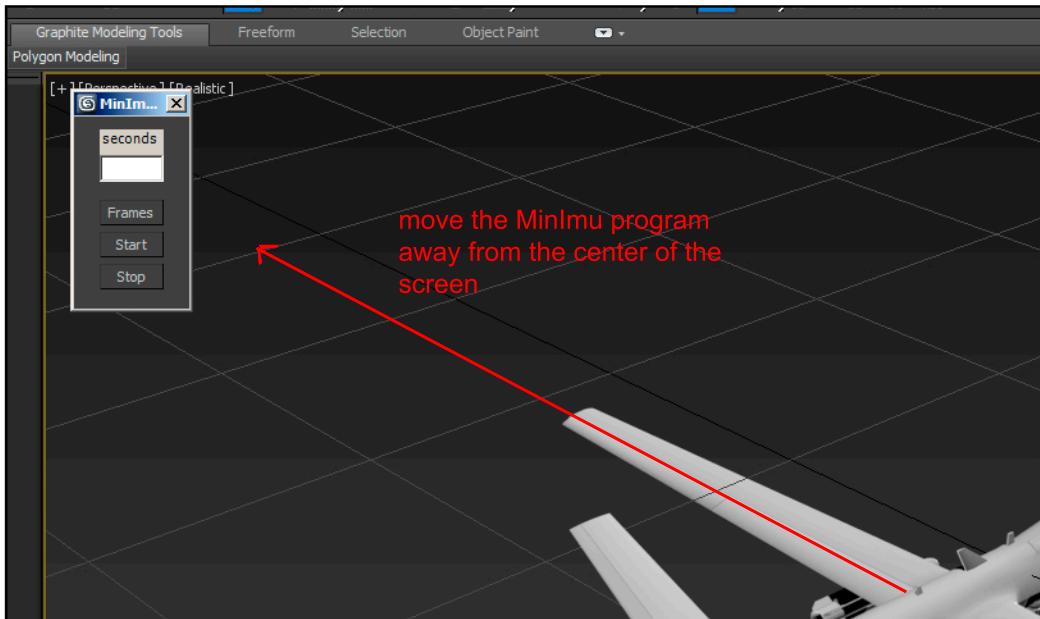
This Button is "File"



Once the scene with the Predator airplane appear, click on the "MinImu" button that you created before

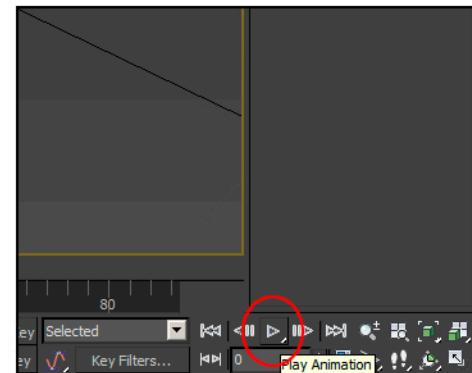


Now the MinImu Program will appear at the center of the screen, IT'S VERY IMPORTANT to move it to a side, for example Up Left corner as you can see in the image below (that's because when the program starts you will not be able to move it until it finish, if you are a programmer and know how to fix this please do it!)

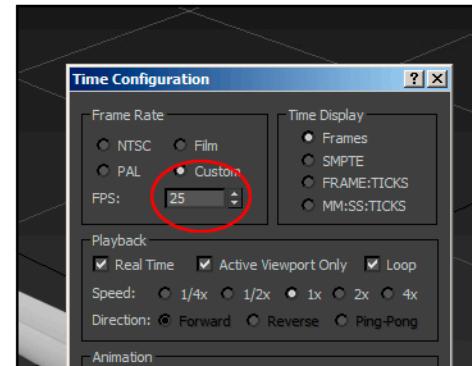


Check for the Frame Rate options (it must be 25 frames per second)

Right click over the “Play Animation” button at the right low corner of the screen

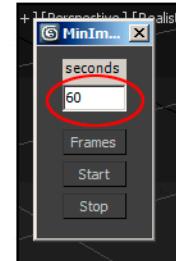


The “Time Configuration” dialog box appear, enter Custom, and 25 in the “FPS” box (*this if 25 is not already there*)

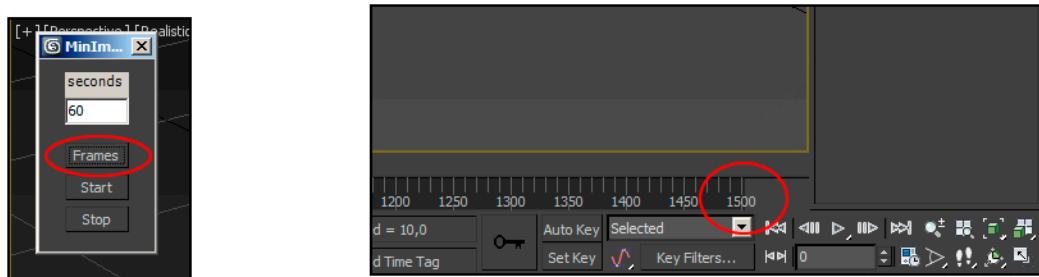


Now, the program only work with a time Interval, for example you want to play 60 seconds, then enter in the “Seconds” box 60, or what-ever you want, please enter only integer numbers.

You will see that when the program is running you will not be able to interact with 3DSMax until those 60 seconds ends. If someone could do it better changing the MaxScript, be my guest!)



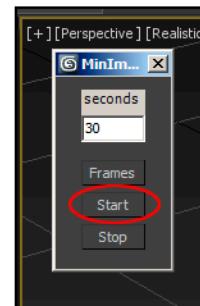
Now, click on the button “Frames” on the MinImu Program, and you will notice that the animation tab end frame changed from 100 to 1500 (that's 60 sec * 25 fps)



Now, leave your MinImu steady in a flat position in the desk or what-ever; plug your **Arduino** board to the usb port and click the “Start” button in the MinImu program, wait until the airplane start to move searching for his Heading initial pose (it might take several seconds).

Now you can move freely your MinImu board.

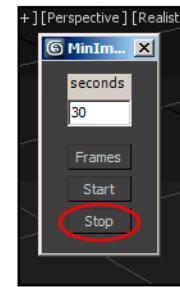
The program will continue until the seconds that you enter ends.



When the action ends and the airplane stops moving click the button

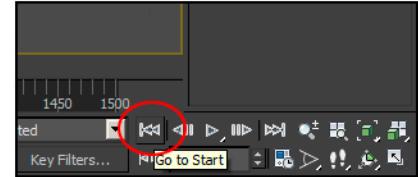
"Stop" in the Minimu program.

Do not unplug your **Arduino** board!



Now, if you want to play it again click the "Go To Start" button in 3DSMax at the right low corner.

This will set the Frame timeline to frame 0, and you can play again the Minimu program, just repeat the steps you did before: Enter "Seconds", click "Frames", click "Start", wait until the airplane get it's position, move the Minimu board, wait until the airplane don't move anymore, and click "Stop"



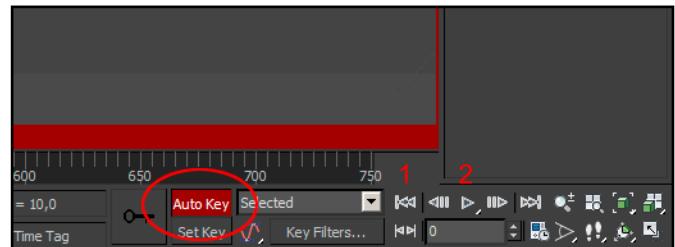
If you get some message like "COM does not exist", just unplug **Arduino** and close and open The **3DSMax** again.

7. Record your animation!

You can record your animation and play it after to watch your movements

Just click on the "Auto Key" button, you will notice that it turns red and also the frame around the viewport turns red.

Now simply repeat the steps you did before with the Minimu program and all the airplane movements will be recorded in real time.



Once the airplane doesn't move anymore, click the "Stop" button on the Minimu program, then click the "Go To Start" (1) button in 3DSMax, and click the "Play Animation Button" (2), by default the animation will loop.

8. Clean your animation

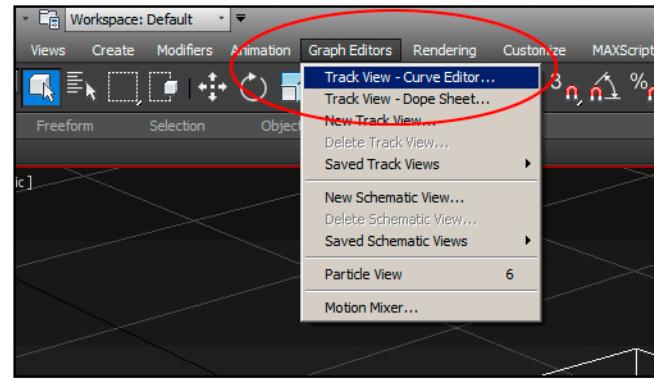
You will notice some flickering caused by the accelerometer mostly, but you can get an incredible smooth movement once you recorded your animation.

Select the airplane with the left button

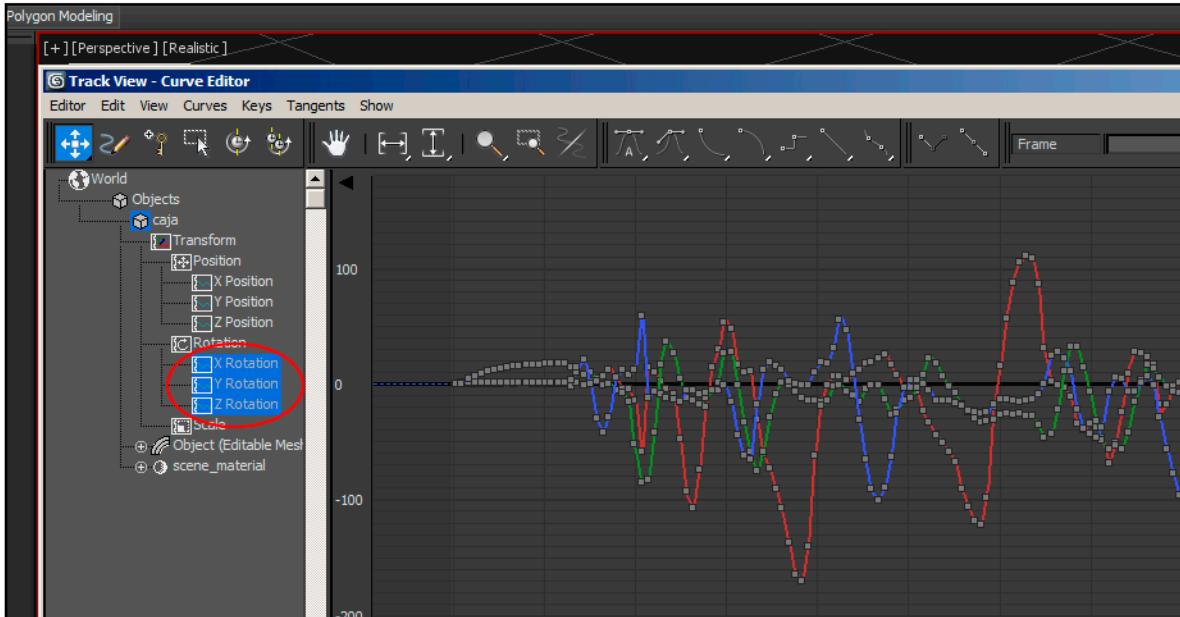
you will notice that when you select the airplane appear some kind of white box lines, this means that the airplane is selected



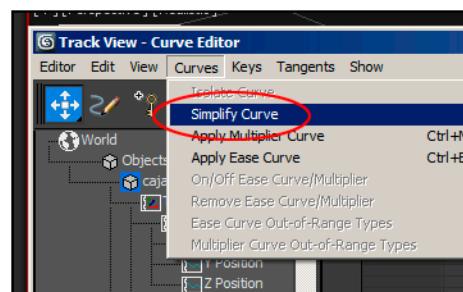
Go to Graph Editors/Track View-Curve Editor...



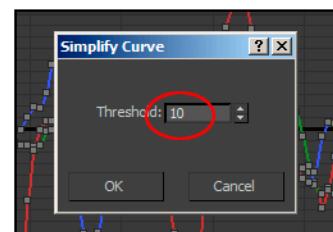
Something like this will appear, check that the “Rotation parameters” in XYZ are chosen or highlighted, if not, select them



Now, in the Track View-Curve Editor, go to Curves/Simplify Curve



Now, the “Simplify Curve” dialog box appears, in “Threshold” enter a number, maybe 10 is too much, just play with it and notice how your animation plays now. You will notice it is incredibly smooth now. But of course the movement will change too.



Well, that's all, I hope that someone could find this tutorial and MaxScript useful, of course you can improve it if you have some programming skills.

May be a potentiometer can be plugged to the **Arduino** board and work like an accelerator of some 3D airplane or what-ever.

You can watch a little video of this thing working here:

<http://www.youtube.com/watch?v=PyUgsx3SuyE&feature=plcp>

Thanks for reading!

cheers

Nippur