

***FREETRACK* MANUAL**



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English Translation by Gweeds.
Manual Version 1.2.**

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1. Introduction:

FreeTrack is software which simulates movements of your head within a game hence increasing realism and the pleasure of game play. To achieve this, FreeTrack uses a standard Webcam and head mounted markers which consist of four Infrared LED (light emitting diodes) mounted on a standard baseball cap. FreeTrack uses the Webcam to "see" the LED's and so it can calculate the position and movement of your head and feed this information to your game.

FreeTrack functions in the same way TrackIR does and is compatible with the majority of games using head tracking technology.

The latest version of FreeTrack is available at this address:

<http://n.camil.chez-alice.fr/index.php>

Or on the site of Didja at this address:

<http://freetrack.online.fr/>

2. Materials and Equipment necessary to the operation of FreeTrack:

- a PC running Microsoft Windows XP SP2 or Windows VISTA
- DirectX 9.0c installed
- Processor with SE instruction set
- Webcam
- 4 diodes IR (ref. OSRAM SFH485P or equivalent), failing this, 4 bright red or orange diffused LED's can be used.
- 4 120 ohm resistors
- A standard baseball style cap
- A rigid wire of 30 cm length to make a frame to hold the LED's, an old wire coat hanger is ideal for this
- 2 batteries 1,5volts in series to power the LED's or optionally a cable and a USB type 'A' plug to power the LED's from a spare USB port.
- Insulation tape to insulate electrical connections and to fix the diodes to the frame
- A switch if using batteries to switch the power on and off to the LED's
- some small electrical wire to wire it all up
- An IR Filter to block out any external light to the camera. (The end of a film negative can be used)
- Flat nosed pliers to cut and bend the wires
- A soldering iron and solder
- some string and glue to fix the frame together
- A small piece of fine grain sandpaper

Note:

Correct operation of FreeTrack depends on the precision and quality of your assembly. Take care particularly in respect of the symmetry of the frame and LED position. For more information see the diagrams in the following section.

3. Head Gear Construction:

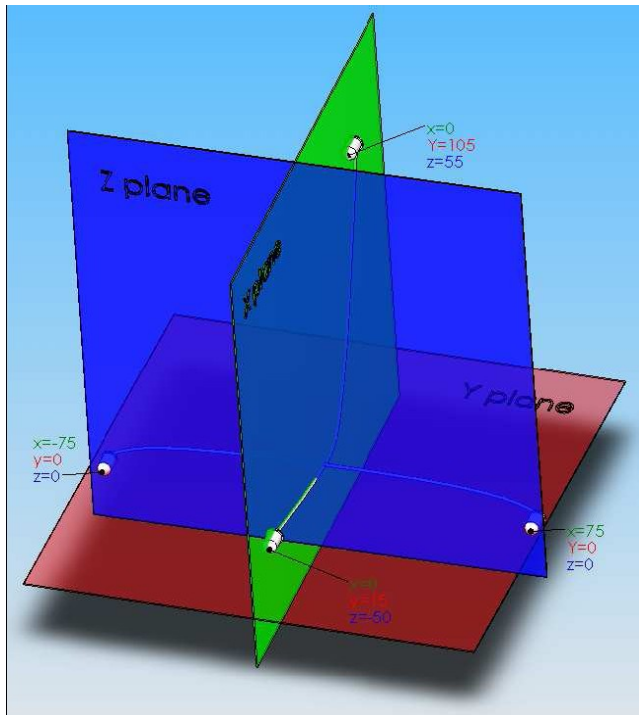


Figure1, Axis representation of LED's



Figure 2, LED's Mounted on a cap

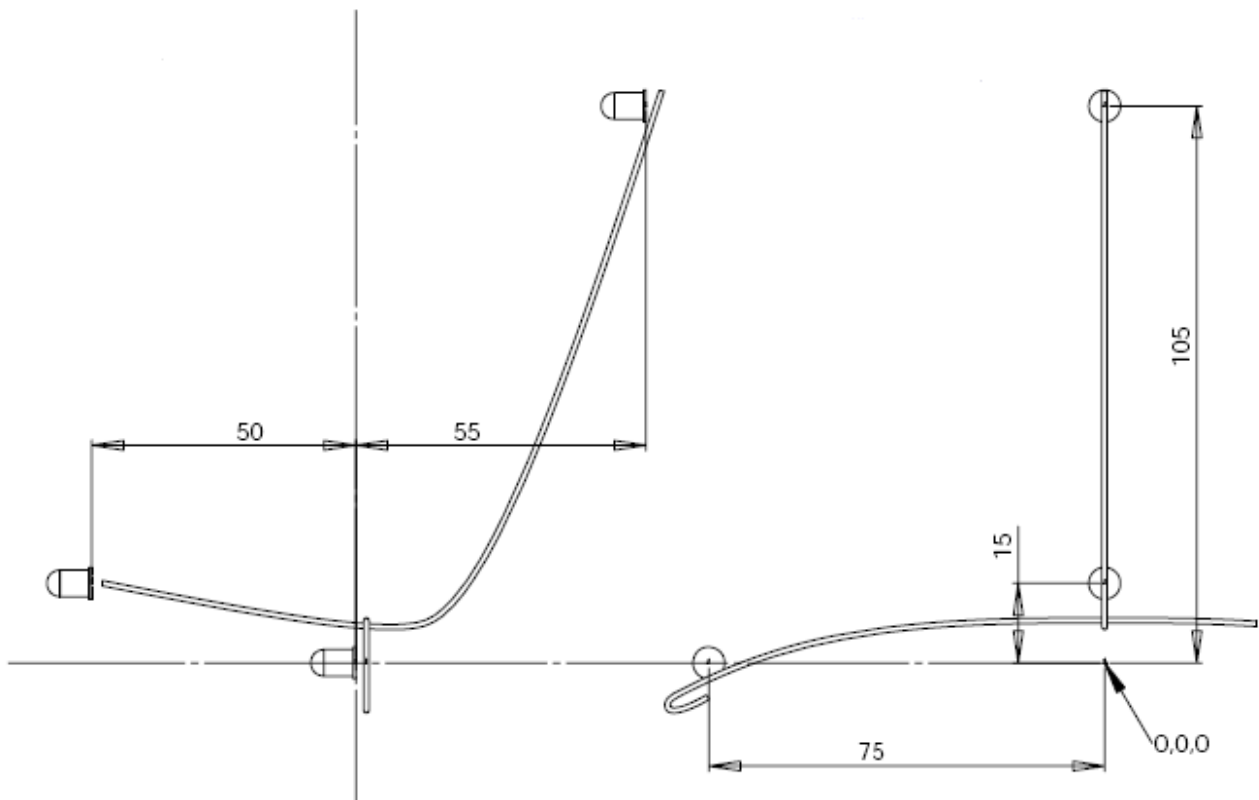
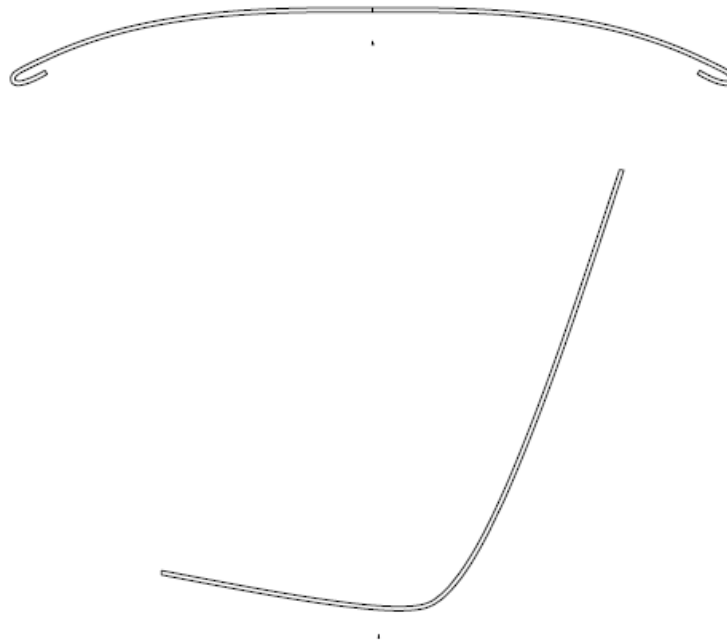


Figure 3, Frame dimensions



1/1

Figure 4, 1:1 scale of frame parts

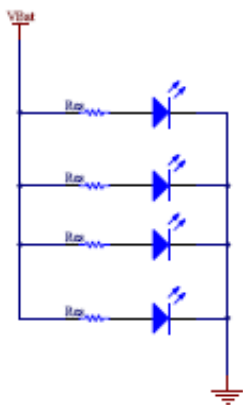


Figure 5, schematic

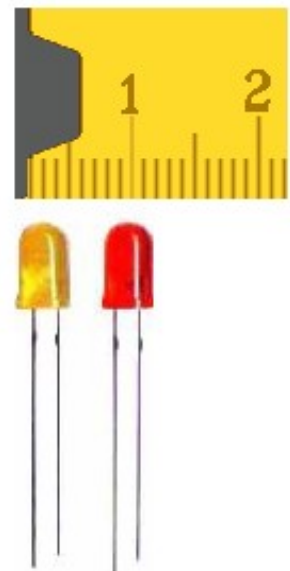
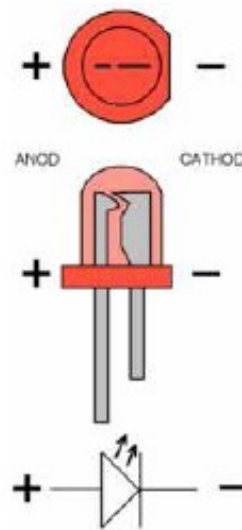
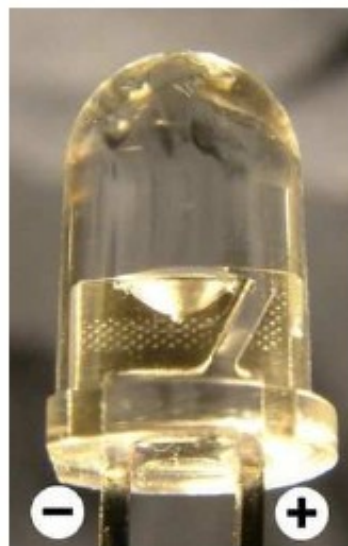


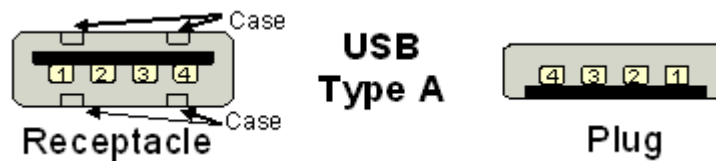
Figure 6, LED details.

Start by making the wire frame. Print out figure 4 and make sure your frame pieces line up exactly with those in Figure 4. To join the two frame pieces in a cross, tie string around the joint and cover it with glue to set the string in place and provide a strong joint. Filing a little notch into one of the frame pieces will aid in the location and strength of the joint.

If you are using clear lens LED's it pays to give the entire LED body a bit of a sand with the sandpaper to "frost" the LED. This gives a more even light dispersion and allows FreeTrack to see the LED's better from an angle.

Next mount the LED's and resistors as per Figure 2 and Figure 3, then connect them electrically as per the schematic Figure 5. If using batteries connect the positive of the batteries to Vbat and the negative to the ground. Make sure you get the polarity of the LED's correct as shown in Figure 6. The resistors are not polarised so they can be mounted which ever way around.

If powering your head gear via USB connect Vbat to pin 1 (red wire) of the USB plug and Gnd to pin 4 (black wire) of the USB plug. Pins 2 and 3 (green and white wire) are not used and should be left unconnected.



Caution:

If powering from USB you must plug into a powered USB socket. Do not use a USB hub unless it is a powered USB hub. The developers of FreeTrack and writers of this manual are not responsible for any damage to your computer or loss of data caused by misuse, misinterpretation, or incorrect information contained in these instructions. Double check your connections and if unsure please use battery power.

If you are using batteries it is recommended the batteries be mounted in a small battery box and that a switch be mounted so as to be able to turn the head gear off when not in use.

The end results of your efforts should resemble the head gear pictured below:

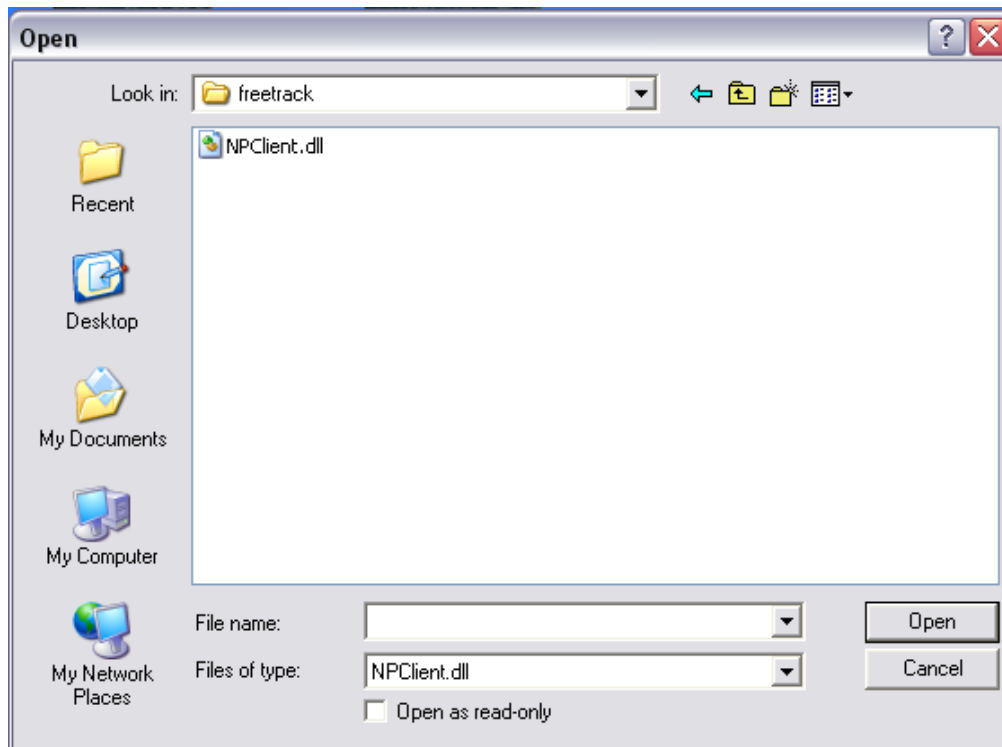


4. Installation of the FreeTrack software:

To install the FreeTrack software just unzip it to the directory of your choice.

eg: C:\Program Files\FreeTrack

The registry is updated automatically. If a registry key does not exist or it does not point to NPCClient.dll of FreeTrack, a dialog box will open asking you to point to the location of NPCClient.dll. This file will be in the directory you installed FreeTrack into.



Use Notepad to modify the Freetrack.ini file and adjust the figures in the [LEDs] section according to the position of your LED's on your head gear.

Note: The leds1 and 3 should never go up higher than 0 when you turn the head. The four LED's SHOULD NOT be coplanar.

If you built your head gear following the above instructions exactly, then please enter the following numbers into the Freetrack.ini file:

[Leds]

Led_0.x=0
Led_0.y=105
Led_0.z=55

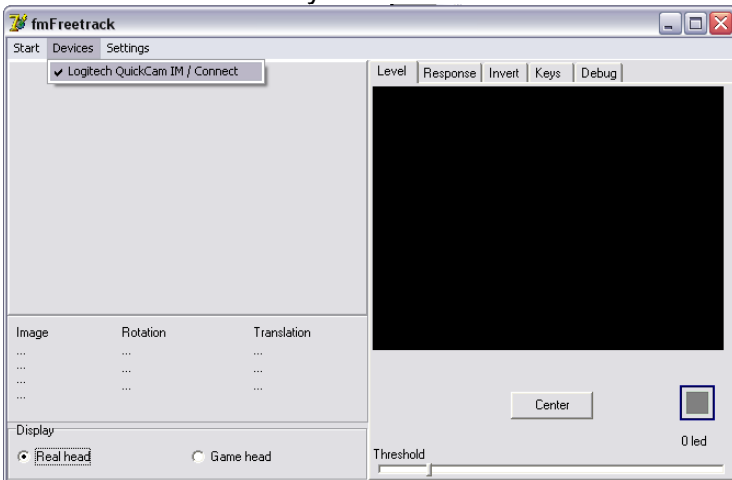
Led_1.x=-75
Led_1.y=0
Led_1.z=0

Led_2.x=0
Led_2.y=15
Led_2.z=-50

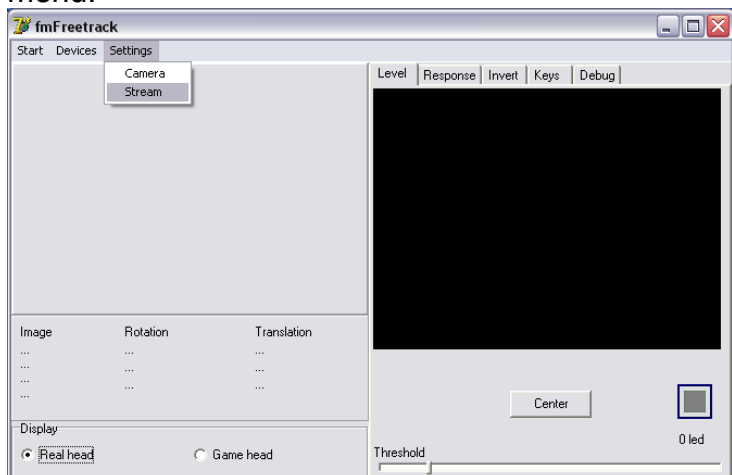
Led_3.x=75
Led_3.y=0
Led_3.z=0

5. Setting up and tweaking FreeTrack:

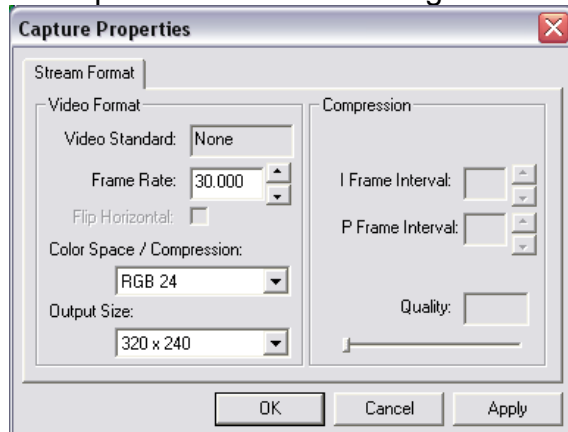
Make your first test in the dark so as to avoid FreeTrack picking up any other light sources. Position your cap with the headgear on your head and launch FreeTrack. Pull down the devices menu select your Webcam.



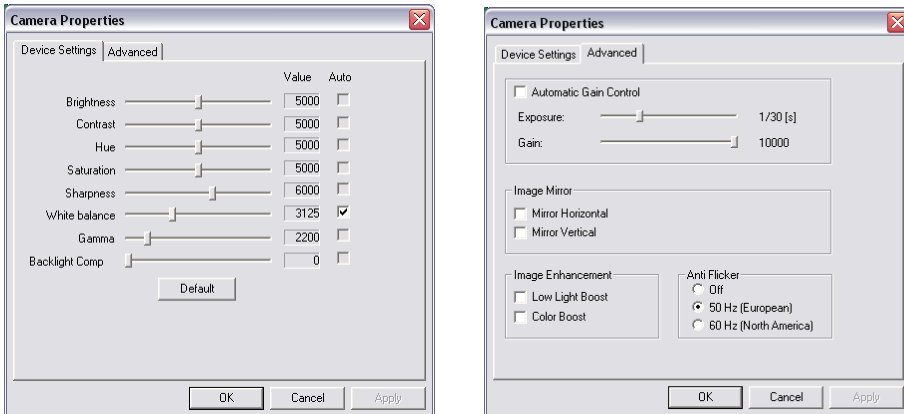
To select the resolution, and the video quality of your Webcam use the Settings -> Stream menu.



Here in the "Capture Properties" window you can select the frame rate (the higher the frame rate the more fluid the movement); compression and Resolution. Its best to set it for a compromise between the highest frame rate and resolution.

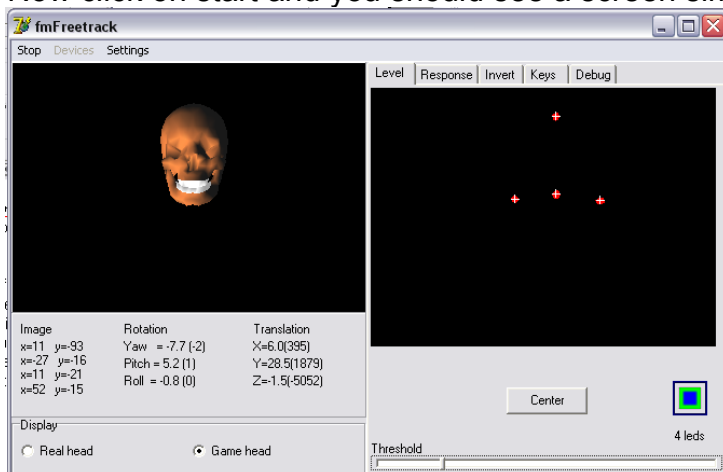


In Settings - > Camera you can tweak the parameters of your Webcam. You may find it useful in the advanced tab to set the gain to maximum and bring the exposure time down low for more fluid movement. You will need to tweak the exposure so as to not pick up any other bright spots other than the LED's on your headgear.

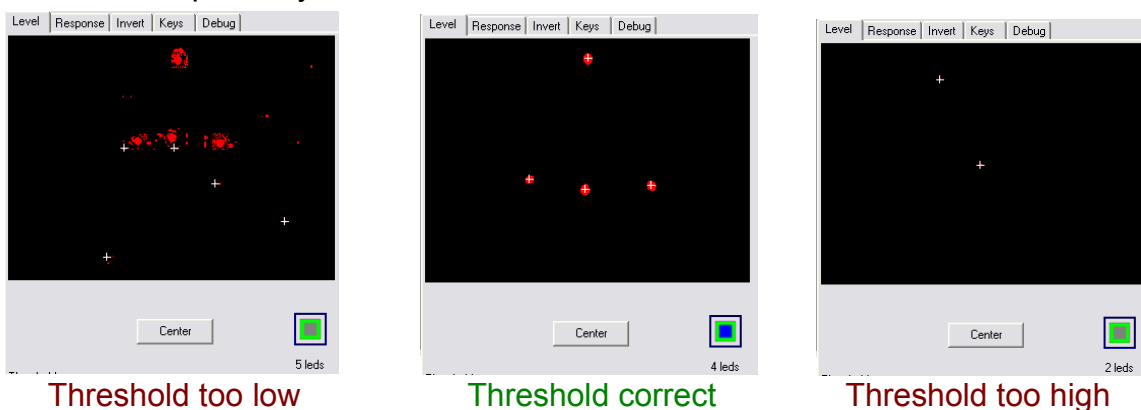


Note: Due to the vast amount of different Webcams out there with different capabilities, some of the options shown here may be grayed out, not visible or unadjustable.

Now click on start and you should see a screen similar to that below:

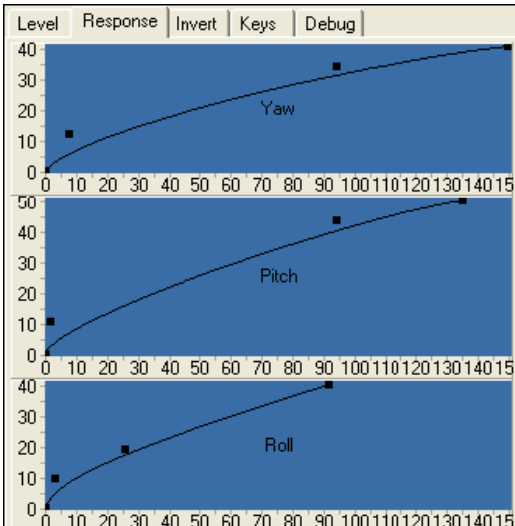


Adjust the threshold slider until you have 4 red dots representing your LED's visible with no other red spots anywhere.



Clicking the center button will center the virtual head in the window and your game. Click on the "Game Head" radio button to see how your movements translate to the game. FreeTrack exaggerates the movement of your head so that you can keep the screen in view!

Next you can adjust the response and sensitivity of the 3 axis.



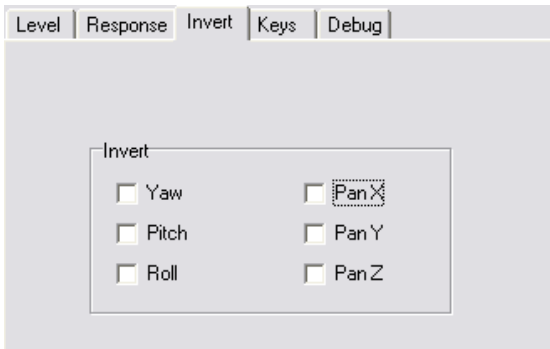
Yaw = looking left and right.

Pitch = looking up and down.

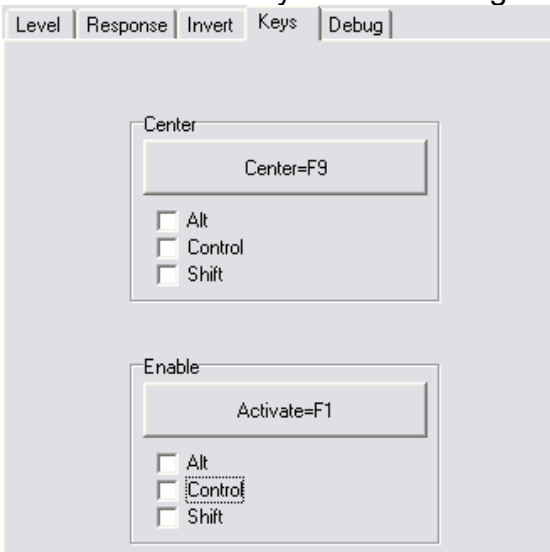
Roll = tilting your head from side to side.

The vertical axis corresponds to the movement of your head. You can adjust the parameters by clicking and dragging the black blocks. Experiment with each to get just the right feel and movement to suit you and your game.

For some games you may need to invert one or two of the axis, the invert tab allows you to do this. Just tick which ever axis need inverting.



The Keys tab allows you to select which keys you want to use to center and activate/deactivate your head mid-game.



To select a key click on the button and press the key you would like to assign. You can then tick Alt, Control or Shift if you wish to have say Shift+Control+F1 to activate.

The Debug tab is there to verify operation and for testing. It will most likely disappear in future versions of FreeTrack.

When you minimize FreeTrack it minimizes to the system tray. There it can have one of three icons representing its current state:



FreeTrack is running but no image capture is enabled



FreeTrack is running but cannot see all of the LED's



FreeTrack is functioning perfectly.

Note: Sometimes the virtual head in the interface window can disappear, however if the numbers below the virtual head window are changing, FreeTrack is still functioning perfectly. This happens when a game is launched and it uses the DirectX resources.

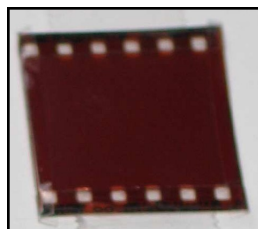
Image	Rotation	Translation
x=4 y=-88	Yaw = -7,9 (-6)	X=-12,3(-809)
x=-36 y=-12	Pitch = -4,5 (-1)	Y=-10,3(-680)
x=11 y=-21	Roll = 4,4 (1)	Z=-1,4(-4524)
x=60 y=-20		

You can start and stop tracking with the start and stop menu item, or press your assigned start and stop key.

It is highly recommended to minimize FreeTrack before starting your game in order to reduce processor usage.

It is possible to reduce jitter of your virtual view in FreeTrack by modifying the Average value of the section [Defaults] of the FreeTrack.ini file.

To reduce the amount of stray light picked up by your Webcam, fit an IR filter over its lens.



This filter can be something as simple as a film negative. However for optimum performance visit a local photographic supply shop and purchase an IR filter. Lee Filters in the UK can provide a IR filter gel that can be trimmed to nicely match your camera. Visit www.leefilters.com for more information. Filter type 87

6. FreeTrack.ini

FreeTrack.ini is the configuration file crucial to correct operation of FreeTrack. This section will explain the various parts of it to allow you to customize and tweak FreeTrack to your liking.

[YawCfg]

[PitchCfg]

[RollCfg]

These three parameters are configured by the Yaw, Pitch and Roll controls in the FreeTrack user interface, so these three need not be adjusted.

[Defaults]

Average= This value enables you to smooth your movements and possibly reduce any jitter of the image in your games.

Focal= This parameter influences the sensitivity to your movements. It allows you to widen the angle of rotation of the game head, but in doing so reduces the precision. If it is increased, movements increase, as well as instability.

If this value is modified it is necessary to click on the Center button to reset your view to center. keep parameters between 5 and 50. All axis X, Y and Z will be amplified or reduced.

[Leds]

This section informs FreeTrack of the position of your LEDs. It must be properly setup for correct use of FreeTrack. Each parameter is in millimeters and referenced from the crossover point of your LED mounting frame. So if your top LED is mounted 95mm up from the cross bar then you will want to enter Led_0.y=95 etc.

[Mapping]

This section refers to the keys assigned in the Keys tab of the interface. Hence it need not be adjusted.

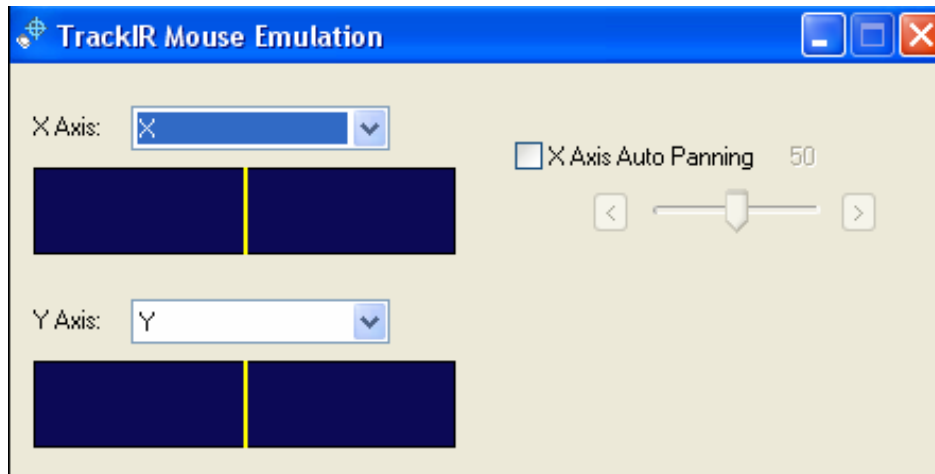
Note: Any errors in the FreeTrack.ini can result in software malfunction. It is advised to back up the .ini file before modifying manually.

7. Mouse Emulation:

It is possible to emulate mouse movement with FreeTrack for games which do not support FreeTrack natively. To do this you will need to download and install the TrackIR software and then copy the file TIRMouse.exe to your FreeTrack install directory.



Run FreeTrack and then TIRMouse and select which two axis you would like to emulate.



Once setup, run your game.

Note: Mouse emulation does not work for ALL games that have a mouse look function.

8. Joystick Emulation

It is possible to emulate a joystick with FreeTrack as well for games that do not support head tracking natively. To do this you will need to download two utilities and configure them as per these instructions. They can be found on the following web sites:

TIR2joy:

http://www.dikant.de/index.php?option=com_remository&Itemid=12&func=select&id=7

PPJoy:

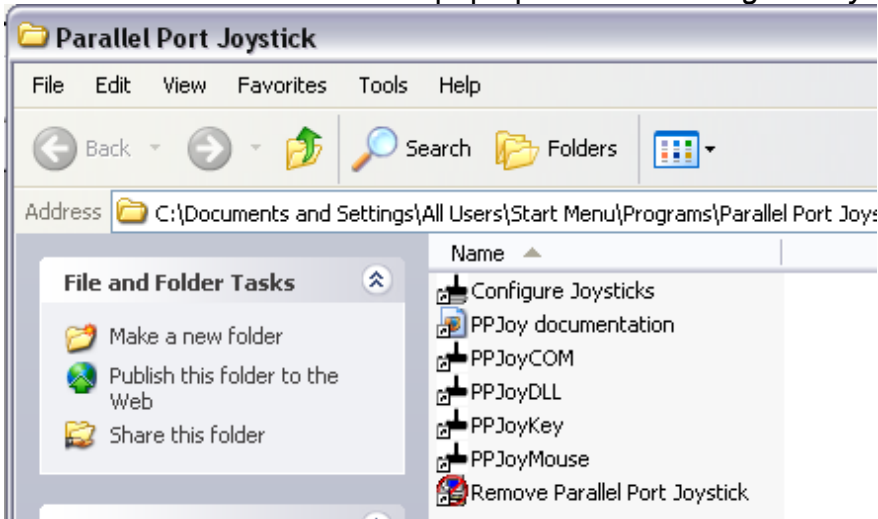
<http://www.geocities.com/deonvdw/PPJoy.htm>

Run FreeTrack

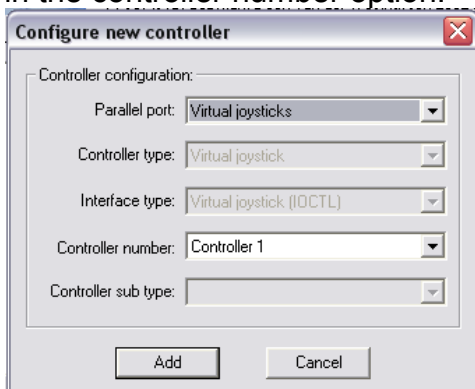
Then install PPJoy, whilst installing this you may “*Windows Software Certification*” error, just click “*continue anyway*”. It is recommended that you install it in the prompted location.



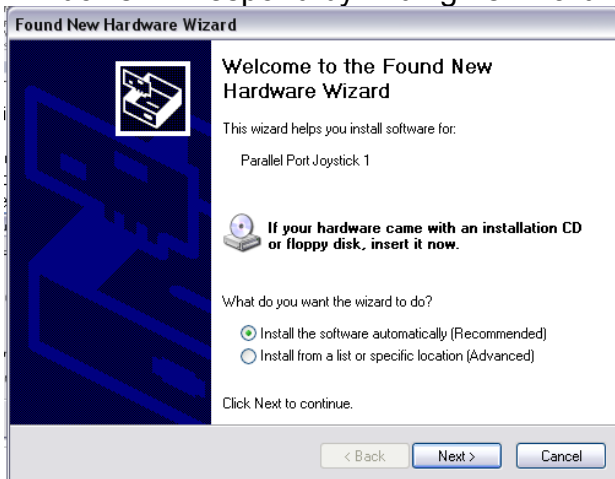
After installation a window will pop up. Select “*Configure Joysticks*”



This is where we configure our “Virtual Joystick” for use by FreeTrack to translate your head movements into joystick movements. A window will pop up listing the configured joysticks, as there are none configured, please click on the “Add” button. Then in the window that pops up select “Virtual Joystick” in the Parallel Port option and “Controller 1” in the controller number option:



Windows will respond by finding new hardware and bringing up the new hardware wizard:



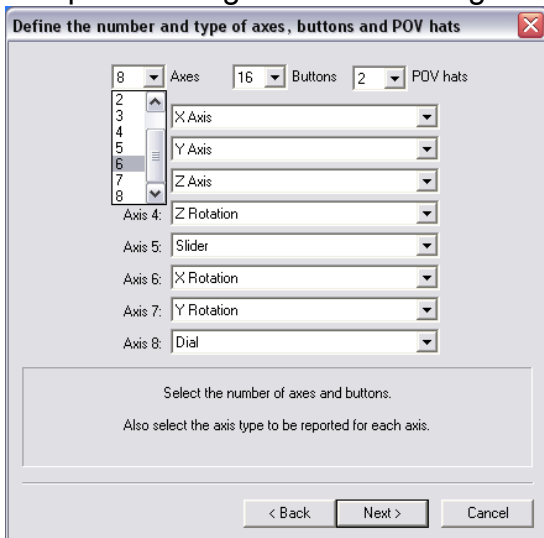
Select the “Install Software automatically” and wait until windows is finished, this make take a little time. It will then also want to install a HID compatible game controller, Do this as well.



Once done, Highlight the new Virtual joystick and select “Mapping”



Select “6 axis”, the other options can be left as they are. Click next, check that all axis are setup for Analogue. Click next again and click finish.



Your virtual joystick is now setup. Now launch TIR2Joy.



The numbers should change when you move your head.

Now comes the fun part. You need to calibrate the virtual joystick. This is done the same way one calibrates any joystick. Go to the control panel, Select Game controllers, properties and Calibrate. You will need to move your head for each of the individual axis, click next when done and hold your head in a central position and click next when it says to center the controller and push a button.

Once done all that is left to do is configure the appropriate axis to the appropriate movements in your game.

Note: Not all games will support this function.

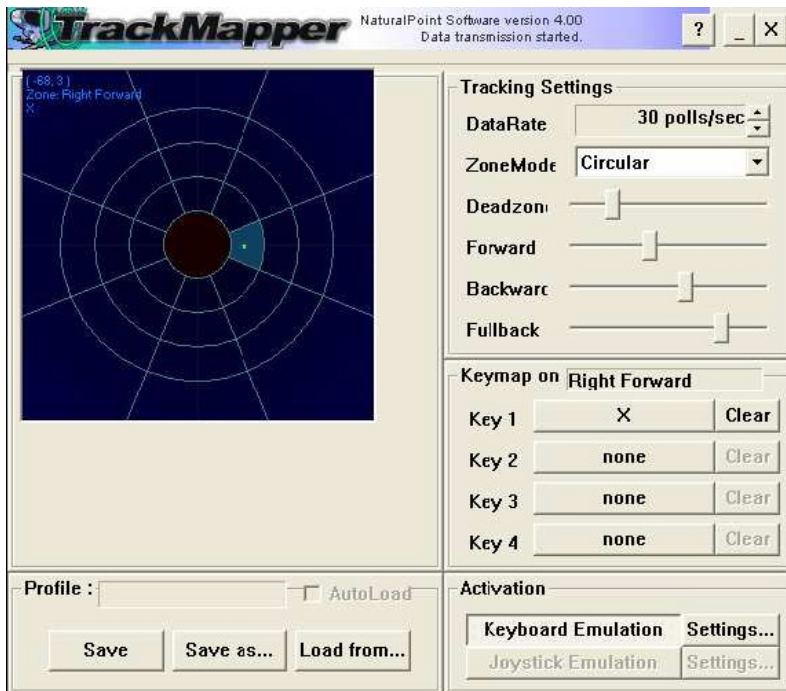
9. Keyboard Emulation

It is possible to emulate keystrokes for games which support look mode via keystrokes. For that you will need to download the utility TrackMapper v1.1a which you will find here:

<http://kaf.tri6.net/trackmapper/>

Launch FreeTrack and then TrackMapper.exe. If all is well you will see the dot in the middle of the TrackMapper screen move. You may need to adjust your sensitivities for the pitch and yaw to enable you to move the point over the entire Trackmapper map.

You can then go ahead and map the keys for each marked zone. Once mapped, save the profile for recall later. See the TrackMapper web site for more information



Note: This technique is not supported by all games.

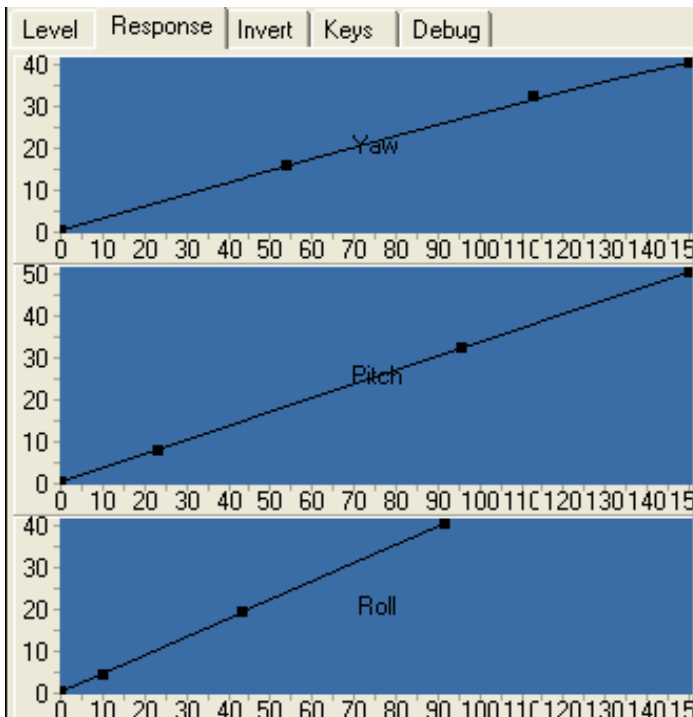
10. Profile Creation

FreeTrack behaves differently for each game, therefore it will become necessary to have a profile for each of your games you wish to use it in.

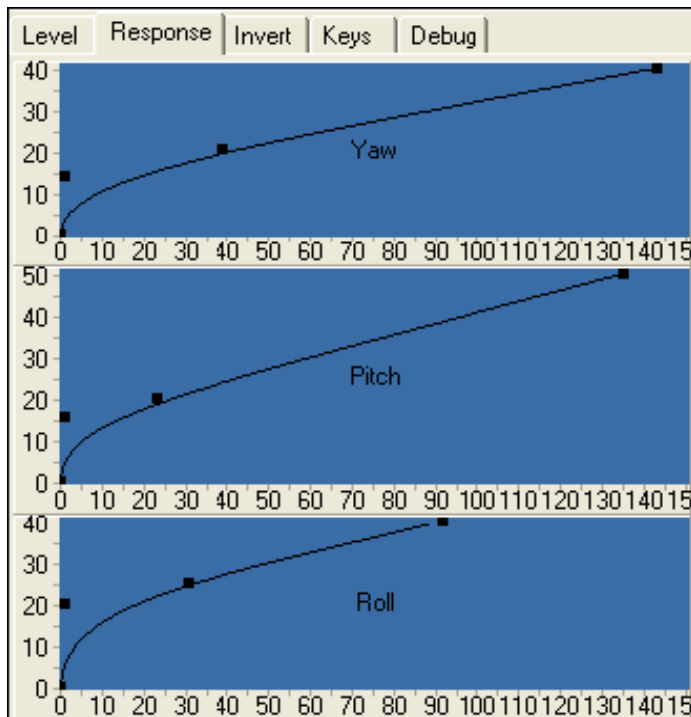
You will find predefined profiles on line at:
<http://freetrack.online.fr/>



Try setting the curves Yaw, Pitch and Roll all in a nice straight line as shown below (The further they are to the right the more the movements of your head are amplified)



You will note that your head movements react very quickly and in manner consistent to the way in which you move your head. This is the ideal theoretical curve, however you will notice that when you hold your head still that the virtual FreeTrack head seems to jitter and tremble. There are a few ways to resolve this problem. First you can increase the average value in the FreeTrack.ini file however this will add a delay to your movements



Another and more desirable solution is to smooth the curves in order to remove jitter. You can adjust the curves with FreeTrack in action. Keep your head still and adjust the first and second point on the curve until you are happy with the jitter and the deadzone. The third point on the curve relates to how far the game head reacts. The further to the right, the more it reacts. For example, set the third point midway on the Yaw control and your game head will swing about 180 degrees for about 45 degrees of your head. Set it all the way to the right and it will swing about 270 degrees (allowing you to look behind yourself in games) for about the same 45 degree real head movement. Due to the nature of FreeTrack, a perfectly jitter free head is near unobtainable, but it can be reduced to being barely noticeable.

Keep an eye on the numbers shown below the virtual head.

Image	Rotation	Translation
x=6 y=-90	Yaw = -0,1 (0)	X=1,6(103)
x=-42 y=-13	Pitch = 2,3 (0)	Y=0,9(60)
x=10 y=-28	Roll = -0,2 (0)	Z=-0,1(-168)
x=65 y=-20		

The more these stable these values are the less jitter in your game.

Keep in mind other factors that affect stability of the virtual head:

- The higher the focal value in the .ini file, the more instability, but it gives more movement of the virtual head in relation to your real head.
- The lower the average value in the .ini file is the faster your movements are, but more jitter will be introduced. The more you raise this value the smoother the movements will become however you'll end up with the virtual head lagging behind your movements.

It is this essential to find a compromise between all these parameters, something that will take a bit of time and experimentation.

Once you have finished your adjustments, close FreeTrack write the changes to freetrack.ini and then copy the .ini file and rename it as a desired profile. Eg: profile.ini
To activate different profiles just copy your chosen profile.ini and rename it to freetrack.ini

To simplify this you can create a batch file with the notepad, saving each one by profile name. You will then just be able to double to click activate profiles you have created wished (Profile saving and loading may be incorporated in future FreeTrack releases)

Example Batch file:

```
@echo off  
Copy profile.ini freetrack.ini /y
```

Note: In case you corrupt your .ini file and FreeTrack fails to function, just delete the .ini file from the FreeTrack directory and run FreeTrack again. It will create a new .ini file and you just have to re enter the position of your LED's

11. List of Games and their possible movements

The following is a list of games tested with FreeTrack and lists the Degrees Of Freedom possible in each game. This list is by no means complete and there are many more games compatible with FreeTrack.

Aces High II v2.10 patch 2

rFactor v1.250

Grand Prix Legends (GPLShift 7.3.2)*

Live for Speed S2 (W47 ou supérieur)**

Nascar Racing 2003***

Future Pinball

Flight Simulator 2004 ***

Flight Simulator X ***

TrainZ Simulator 2006 ou 2007



* for Grand Prix Legends, it is necessary to use the patch file GPLShift version 7.3.2 as well as to re-elect freetrack.exe in TrackIR.exe and to have the NClient.dll file in c:\program files \ naturalpoint \ TrackIR4, it is also necessary to enter the following key in the registry:

```
[HKEY_CURRENT_USER\Software\NaturalPoint\NATURALPOINT\NPClient Location]
"Path"="C:\\Program Files\\NaturalPoint\\TrackIR4"
```

** Roll axis must be inverted

*** Joystick emulation must be used

Note: Babasior, The_target and Gweeds, cannot be held for responsible for any damage, loss of data or personal injury caused by the use of the FreeTrack product and/or information contained in this handbook. The use and handling which you carry out are at your risk.