**AFM Simulator Documentation**

**REQUIREMENTS (IN ORDER):**

* Windows XP or higher (not yet tested on Linux and Macintosh)
* LabVIEW 2011 or higher (<http://www.ni.com/labview/>)
* Python 3.2 (<http://www.python.org/getit/releases/3.2/>)
* Visual Python for Python 3.2 (<http://vpython.org/contents/download_windows.html>)
* Python Imaging Library (PIL) for Python 3.2 (<http://www.lfd.uci.edu/~gohlke/pythonlibs/>)
* VI Package Manager (<http://jki.net/vipm/download>)

**INSTALLATION INSTRUCTIONS:**

1. Install requirements in order as listed above.
2. Open the LabVIEW package named "Laser Shutter". The VI Package Manager interface should open. Click the install button and wait for installation to complete.
3. Copy AFM.py to the application directory (same directory as LabVIEW program).
4. Change surfacepic.jpg to the image you wish to display in the simulator.

Now you should be able to use the simulator with LabVIEW.

**USAGE:**

When you open AFM.py, which should be in the application directory and which you should be able to open by double-clicking, a 3D model of the tip should become visible. To rotate the view around the center of the vision, right click the image and drag. To zoom in and out, simultaneously click both mouse buttons and drag the mouse vertically.

In the block diagram of your LabVIEW VI, there will be an “AFM Simulator” palette consisting of the following VI’s: Open Simulator, Relay Data and Global Variables. Open Simulator simply does as its name implies, opening the simulation window. To use the simulator, the global variables must be set. Their names, functions and default values are as follows:

|  |  |  |
| --- | --- | --- |
| Variable Name | Usage | Default Value |
| X | The X position of the tip in microns | 0 |
| Y the Y position of the tip | The Y position of the tip in microns | 0 |
| Voltage | The voltage being applied to the tip | 0 |
| Wire Width – the width | The radius of the wire in microns | 0.01 |
| Center of Vision | A view setting specifying the center of the focus in the simulator | (0,0,0) where (x,y,z) |
| Visible | Is the AFM tip visible | True |
| RGB Value | The color to be sent to the simulation | 0 |

Do not set the “Old” versions of these variables; these are for Relay Data.vi’s usage.

In order to set the RGB value according to the voltage, a color ramp indicator should be connected to the voltage with markers set according to the appropriate color values. Then a property node referring to the color ramp’s RGB value should be wired to the RGB Value global variable.

Every time data is read into the system from the AFM tip, the global variables should be set accordingly. Then the Relay Data VI should be executed, to send the values to the simulator.

At the moment, the AFM simulator can only officially accommodate for sketches of 30x30 micron resolution and only square images. To change the resolution of the image requires editing the python file: edit AFM.py and change the image\_size constant to new side length of the square image.

See Simulate Data.vi for an example of how to use LabVIEW with the simulator.

**CONTACT:**

Please contact me if there are any bugs, or if you have any comments or suggestions.

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