Contents

1. Installation of LightPipes for Python on a Windows PC.

Tested on Windows 7 and 8.1, 64- or 32 bits machines.

1.1. Installation of Python:

1. Download from: http://www.python.org/download/releases/2.7.8/
2. Execute: 'python-2.7.8.msi'
3. Choose default directory: 'C:\Python27'
4. Choose: 'Add Python.exe to Path' and restart the computer
5. Test Python in command window('cmd.exe'), enter: 'Python'. The Python prompt ('>>>') should appear. Type 'quit()' to leave it.

1.2. Installation of Python packages:

1. The installation of some packages requires a c++ compiler. Download command line compilers from: http://aka.ms/vcpython27 'VCForPython27.msi' Execute 'VCForPython27.msi' to install the compiler

2. Modify the Path: right-click 'Start, Computer', 'Properties', 'Advanced system settings', 'Environment Variables…'. Add to the Path variable: 'C:\Python27\;C:Python27\Lib\site-packages\;' and restart the computer.
3. Download from: https://pypi.python.org/pypi/setuptools 'ez_setup.py' (Save the python script displayed by: https://bootstrap.pypa.io/ez_setup.py in a text- file called 'ez_setup.py')
4. Open command window (cmd.exe). Go to 'C:\Python27\Scripts'
5. Type at the windows prompt: 'python ez_setup.py'
6. Type at the windows prompt: 'easy_install pip' to install the python package installer 'pip'
7. Check at the windows prompt the installed packages by typing: 'pip list'. The response should be like:
   pip(1.5.6)
   setuptools(7.0)
8. For LightPipes you need the 'Numpy' package. For graphics: the 'matplotlib' package.
9. Install 'Numpy' by typing at the windows prompt: 'pip install numpy' (takes a while…)
10. The VCForPython27 compiler needs the .NET Framework 3.5 . A window should pop-up to invite you to install it. If it does not, you must install it by hand.
11. Install 'matplotlib' by typing at the windows prompt: 'pip install matplotlib'.
12. Check the installed packages again: Type 'pip list'. The response should be like:
    matplotlib(1.4.2)
    numpy(1.9.0)
    pip(1.5.6)
    pyparsing(2.0.3)
    python_dateutil(2.2)
    pytz(2014.7)
    setuptools(7.0)
    six(1.8.0)
13. Your system is now ready for LightPipes for Python.

1.3.Install LightPipes for Python:

1. Open the windows command window and type (copy/paste) at the windows prompt: 'easy_install ftp://*user*:*passwrd*@84.82.74.38/LPDownload /LightPipes-1.0.0-py2.7-win32.egg'. Where *user* and *passwrd* has to be replaced by your username and password respectively.
2. This will download the installation from our ftp server and installs LightPipes for Python.
3. Check by typing 'pip list'. The list should now contain 'lightpipes (1.0.0)'. You could uninstall LightPipes by typing 'pip uninstall LightPipes'.

1.4.Installation of a very nice editor 'Geany':

1. Geany is a very useful editor for editing program files including Python.
2. Download from: http://www.geany.org/Download/Releases 'geany-1.2.4setup.exe'.
3. Execute: 'geany-1.2.4setup.exe'.
4. Choose the default settings and install directory.

2. Installation of LightPipes for Python on a Macintosh.

Tested on a MAC with a 64 bit Intel processor and Yosemite 10.6 OSX.

2.1.Installation of Python:

1. Python 2.7 is already pre-installed in Yosemite 10.6. Otherwise download from the official Python site: https://www.python.org/downloads/mac-osx/. The LightPipes package is made for Python version 2.7, so download Python 2.7. (Not version 3)

2.2.Installation of Python packages:

1. The packages 'setuptools' and 'pip' are already installed in Yosemite 10.6. Otherwise go to https://pythonhosted.org/setuptools/setuptools.html and https://pip.pypa.io/en/latest/installing.html respectively and follow the instructions on these sites.
2. For LightPipes you might need the 'Numpy' package. For graphics: 'matplotlib' package.
3. Open a terminal window and install 'Numpy' by typing at the prompt: 'pip install numpy' (takes a while…)
4. Install 'matplotlib' by typing at the prompt: 'pip install matplotlib'.
5. Check the installed packages: Type 'pip list'. The response should be like:
   matplotlib(1.4.2)
   numpy(1.9.0)
   pip(1.5.6)
   pyparsing(2.0.3)
   python_dateutil(2.2)
   pytz(2014.7)
   setuptools(7.0)
   six(1.8.0)
6. Your system is now ready for LightPipes for Python.

2.3.Install LightPipes for Python:

1. Open the terminal and type (copy/paste) at the prompt:
   'easy_install ftp://*user*:*passwrd*@84.82.74.38/LPDownload /LightPipes-1.0.0-py2.7-mac10.6-intel.egg'. Where *user* and *passwrd* has to be replaced by your username and password respectively.
2. This will download the installation from our ftp server and installs LightPipes for Python.
3. Type: 'pip list'. LightPipes(1.0.0) should be in the list now. You could uninstall LightPipes by typing 'pip uninstall LightPipes'.

2.4.Installation of a very nice editor 'Geany':

Not available for the mac. Use 'IDLE' for editing python documents.

3. Installation of LightPipes for Python on a UNIX machine.

Tested 32 and a 64 bit machines with linux MINT 17.

3.1.Installation of Python:

1. Python 2.7 is already pre-installed in linux MINT. Otherwise download from the official Python site: https://www.python.org/ . The LightPipes package is made for Python version 2.7, so download Python 2.7. (Not version 3)

3.2.Installation of Python packages:

1. The packages 'setuptools' and 'pip' could be pre-installed. Otherwise go to https://pythonhosted.org/setuptools/setuptools.html and https://pip.pypa.io/en/latest/installing.html respectively and follow the instructions on these sites or use the software manager of MINT to install them (recommended).
2. For LightPipes you may need the 'Numpy' package. For graphics: 'matplotlib' package.
3. Open a terminal window and install 'Numpy' by typing at the prompt: 'pip install numpy' (takes a while…) or use the software manager.
4. Install 'matplotlib' by typing at the prompt: 'pip install matplotlib' or use the software manager (recommended).
5. Check the installed packages: Type 'pip list'. The response should be like:
   matplotlib(1.4.2)
   numpy(1.9.0)
   pip(1.5.6)
   pyparsing(2.0.3)
   python_dateutil(2.2)
   pytz(2014.7)
   setuptools(7.0)
   six(1.8.0)
6. Your system is now ready for LightPipes for Python.

3.3.Install LightPipes for Python:

1. Open a terminal and type (copy/paste) at the prompt:
   'easy_install ftp://*user*:*passwrd*@84.82.74.38/LPDownload /LightPipes-1.0.0-py2.7- linux-x86_64.egg' for the 64-bits version or:
   'easy_install ftp://*user*:*passwrd*@84.82.74.38/LPDownload /LightPipes-1.0.0-py2.7- linux-i686.egg' for the 32-bits version. Where *user* and *passwrd* has to be replaced by your username and password respectively.
2. This will download the installation from our ftp server and installs LightPipes for Python.
3. Type: 'pip list'. LightPipes(1.0.0) should be in the list now. You could uninstall LightPipes by typing 'pip uninstall LightPipes'.

3.4.Installation of a very nice editor 'Geany':

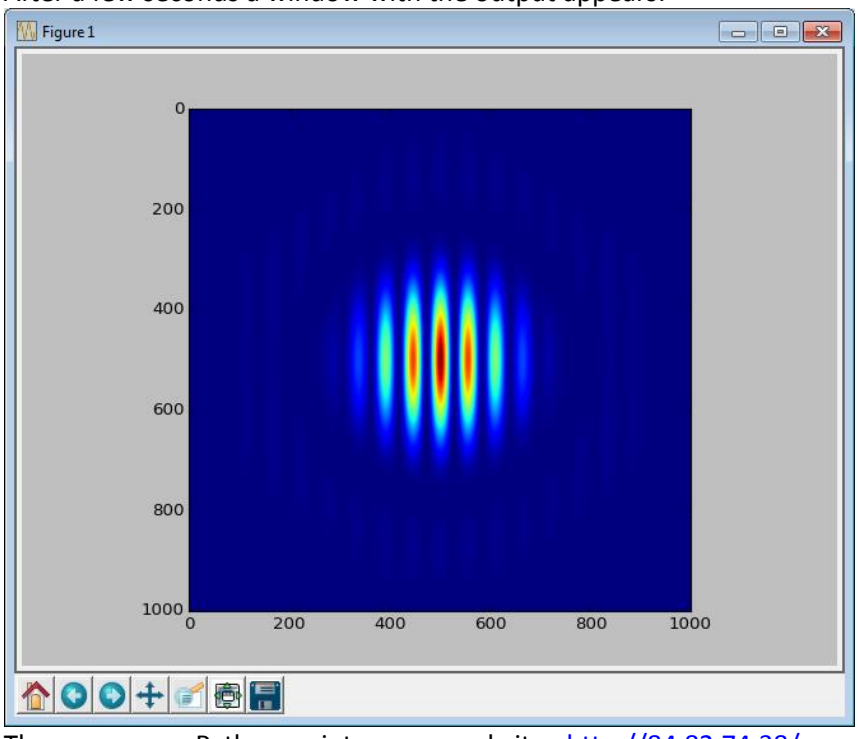
1. Geany is a very useful editor for editing program files including Python.
2. Download from: http://www.geany.org/ , or use the software manager.

4. Make your first LightPipes script file.

1. Start Geany (or IDLE for MAC), open a new document and type (or copy/paste) the following script:

```
import LightPipes
import matplotlib.pyplot as plt
m=1
nm=1e-9*m
um=1e-6*m
mm=1e-3*m
cm=1e-2*m

try:
   LP=LightPipes.Init()

   wavelength=20*um
   size=30.0*mm
   N=1000

   F=LP.Begin(size,wavelength,N)
   F1=LP.CircAperture(0.15*mm, 0, -0.6*mm, F)
   F2=LP.CircAperture(0.15*mm, 0, 0.6*mm, F)
   F=LP.BeamMix(F1,F2)
   F=LP.Fresnel(10*cm,F)
   I=LP.Intensity(2,F)
   plt.imshow(I)
   plt.show()

finally:
  del LightPipes
```

2. Save the document as 'Young.py', and push in Geany the execute button or open a terminal window and type at the prompt: 'python Young.py' Or in IDLE, do 'Run', 'Run Module'.
3. After a few seconds a window with the output appears:



4. There are more Python scripts on my website, http://84.82.74.38/

4.1 Explanation of the commands:

Import LightPipes	imports the LightPipes library (from 'LightPipes.pyd')
import matplotlib.pyplot as plt	imports matplotlib for the graphics
LP=LightPipes.Init()	initiates LightPipes (make a new instance of LightPipes called 'LP') for a grid-size, grid-dimension and wavelength defined by the Begin command.
wavelength=20*um size=30.0*mm N=1000	Define the wavelength, grid-size and grid-dimension.
F=LP.Begin(size,wavelength,N) F1=LP.CircAperture(0.15*mm, 0, -0.6*mm, F) F2=LP.CircAperture(0.15*mm, 0, 0.6*mm, F) F=LP.BeamMix(F1,F2) F=LP.Fresnel(10*cm,F) I=LP.Intensity(2,F)	The simulation of Young's experiment: A plane wave hits a screen with two holes. The interference pattern is observed at a distance of 10 cm.
plt.imshow(I) plt.show()	Plot and show the output interference pattern
finally: del LightPipes	Be sure that everything is cleaned-up after execution (this is normally not necessary but is good practice)

Enjoy LightPipes for Python!
Fred van Goor, December 2, 2014.