

Step 0: Install Python 3

(You can verify your Python version by running “python --version” in Command Prompt. Please note that Python 3.5.2 is not the latest version, so if you just installed Python 3, the version number is likely different.)

```
C:\Users\Sophia Li>python --version
Python 3.5.2
```

Step 1: Download Harmony

Download Harmony from the Harmony website: <https://www.cs.cornell.edu/home/rvr/harmony/>

Either highlighted links should work.

The screenshot shows a web browser window with the URL <https://www.cs.cornell.edu/home/rvr/harmony/>. The page content includes a sidebar with links: [Download book](#) and [Download Harmony](#). The main content area displays the code for Peterson's Algorithm in Harmony, enclosed in a box. Below the code, there is a paragraph explaining the assertion and the tool's capabilities. Further down, a section titled "Downloading and Installing Harmony" provides instructions for installing the tool, with the phrase "full system" highlighted in yellow. An arrow points from this highlight to the text "full system" in the instructions.

```
def process(self):
    # Enter critical section
    flags[self] = True;
    turn = 1 - self;
    while flags[1 - self] and (turn == (1 - self));
        pass;
    ;

    # critical section is here
    in_cs[self] = True;
    assert in_cs == [ self == 0, self == 1 ];
    in_cs[self] = False;

    # Leave critical section
    flags[self] = False;
;
flags = [ False, False ];
turn = choose({0, 1});

in_cs = [ False, False ];
spawn process(0); spawn process(1);
```

The assertion states that only the current process is in the critical section. Harmony allows two sources of non-determinism: interleaving of concurrent process executions and `choose(S)` expressions that select some element from set *S*. Running Harmony finds that no interleaving and no possible choices lead to the assertion being violated. Moreover, Harmony also finds that processes do not get *stuck*, indefinitely waiting to enter the critical section.

Learning programming in Harmony should be straightforward to those familiar with Python or similar languages. Harmony is described in a [free book](#) with many programming examples. Although in PDF, the book has many hyperlinks to simplify navigation. It is straightforward to port Harmony programs to Python.

Downloading and Installing Harmony

Harmony is a command-line tool. The simplest installation is to download the **full system** and unzip it in a convenient location (for example, your home directory). Linux and Mac OS X users then have to include this directory in their \$PATH. They can then execute Harmony from a Terminal window. For Windows users, run "python harmony.py [flags...] program.hny". For more detailed instructions, see the README.md file.

Step 2: Unzip Harmony in a convenient location, and change directory into that location

```
C:\Users\Sophia Li>cd Downloads
C:\Users\Sophia Li\Downloads>cd harmony-0.9
C:\Users\Sophia Li\Downloads\harmony-0.9>cd harmony-0.9
C:\Users\Sophia Li\Downloads\harmony-0.9\harmony-0.9>
```

Step 3: Test it out by running the Peterson's Algorithm in Harmony found on the Harmony website

“python harmony.py Peterson.hny”

```
C:\Users\Sophia Li\Downloads\harmony-0.9\harmony-0.9>python harmony.py Peterson.hny
#states = 96 diameter = 4

#components: 82
no issues found
Open file://C:\Users\Sophia Li\Downloads\harmony-0.9\harmony-0.9\harmony.html for more information
```

(You can also put your code elsewhere and then use relative or absolute path)

(Relative path: “python harmony.py example\Peterson.hny”)

(Absolute path: “python harmony.py D:\\harmony-0.9\\example-2\Peterson.hny”)

```
C:\Users\Sophia Li\Downloads\harmony-0.9\harmony-0.9>python harmony.py example\Peterson.hny
#states = 96 diameter = 4

#components: 82
no issues found
Open file://C:\Users\Sophia Li\Downloads\harmony-0.9\harmony-0.9\harmony.html for more information
```

```
C:\Users\Sophia Li\Downloads\harmony-0.9\harmony-0.9>python harmony.py D:\\harmony-0.9\\example-2\Peterson.hny
#states = 96 diameter = 4

#components: 82
no issues found
Open file://C:\Users\Sophia Li\Downloads\harmony-0.9\harmony-0.9\harmony.html for more information
```

Step 4: Try running Harmony with flags

For example, you can run the textbook example at the end of Chapter 2 as follows:

“python harmony.py -c N=100 example\triangle.hny”

```
C:\Users\Sophia Li\Downloads\harmony-0.9\harmony-0.9>python harmony.py -c N=100 example\triangle.hny
#states = 103 diameter = 1

#components: 103
no issues found
Open file://C:\Users\Sophia Li\Downloads\harmony-0.9\harmony-0.9\harmony.html for more information
```