**Instructions for building Opensees**

Specific instructions for the version created by Maha Kenawy with nonlocal elements and material models.

**Using a Windows Sub-system for Linux (or Linux)**

* Activate the Windows Sub-system for Linux (this is a very simple two-step process)
  + Go to Control Panel > Programs > Turn Windows Features On Or Off. Enable the “Windows Subsystem for Linux” option in the list, and then click the “OK” button.
  + Restart computer
  + Download Ubuntu from the Microsoft store

More detailed guidance on this: <https://www.howtogeek.com/249966/how-to-install-and-use-the-linux-bash-shell-on-windows-10/>

* + Type Ubuntu in the Windows search bar. This will open a linux command line window.
* Clone the opensees git repository

git clone <https://github.com/mmkenawy/OpenSees.git>

* Install some prerequisites using the Ubuntu command line:

# sudo apt-get update

Note: the first time you use sudo, it will ask about the password you created when you downloaded the Ubuntu package.

# sudo apt-get install make

# sudo apt-get install tcl8.6

# sudo apt-get install tcl8.6-dev

# sudo apt-get install gcc

# sudo apt-get install g++

# sudo apt-get install gfortran

# sudo apt-get install python3-dev

# mkdir lib

# mkdir bin

# cd OpenSees

# cp ./MAKES/Makefile.def.EC2-UBUNTU ./Makefile.def

* At this point, you need to make changes to Makefile.def. You can open file in the command line using this command:

# nano Makefile.def

*Alternatively, you can open a graphical user interface (GUI) based text editor as detailed at the end of this set of instructions.*

Change the home and base directories in the makefile.def

BASE = /usr/local

HOME = /home/*username*

Change the python version in the makefile.def from python 3.5 to python 3.6

Exit the text editor

* Build Opensees

# make

# cd SRC/interpreter

# make (NOTE: if you check you should find opensees.so in the ~bin directory and an OpenSees.exe cmpiled with -fPIC which is slow)

# cd ../..

# edit Makefile.def again, comment out INTERPRETER\_LANGUAGE=PYTHON (LINE 62) and UNCOMMENT INTERPRTETER\_LNAGUAGE=TCL (LINE 63)

# make wipe

# make (NOTE: new OpenSees.exe compiled with optimization flags)

After Opensees compiles successfully, you can navigate through the linux command line to any folder on your computer, and start opensees as usual by typing: OpenSees.

To open a GUI based text editor in Linux:

* Download and install an x-server application to run GUI linux applications at: <https://sourceforge.net/projects/vcxsrv/>
* Run the Xlauncher application
* Close and reopen the Ubuntu command line window
* Type the following commands:

# sudo apt-get install xterm

# nano ~/.bashrc

* Add the following line to the end of the file: export DISPLAY=:0
* Save the file and exit
* Close and reopen the Ubuntu window
* Install the GUI text editor:

# sudo apt-get install gedit

* Go to the Opensees directory if you are not there: cd OpenSees
* gedit Makefile.def

It will give you some warnings, but it should open a text editor so you can make changes to the Makefile as detailed above.