Run instructions

Once the required software is installed (NEURON with python, OPENSIM with python)

1. Open the terminal and navigate to templates folder

```
$cd templates
```

2. Compile the neuron mod files

```
$nrnivmodl
```

3. Copy the generated x86_64 to each of open_loop and close_loop simulation folders

```
$cp -R x86_64/ ../sim_o
$cp -R x86_64/ ../sim_c
$cd ..
```

4. Navigate to open_loop simulation folder

```
$cd sim_o
```

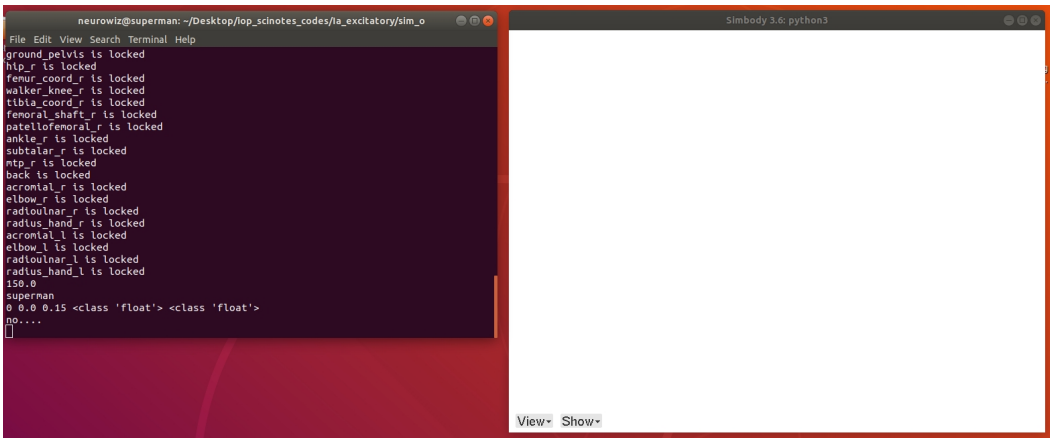
5. delete the contents of output folder

```
$cd output
$rm -rf
$cd ..
```

6. run the neuroid_osim_glue.py

```
$python neuroid_osim_glue.py
```

opensim graphics window pops-up and terminal waits for muscle activations from the neuronal simuilations -see the screenshot below for reference

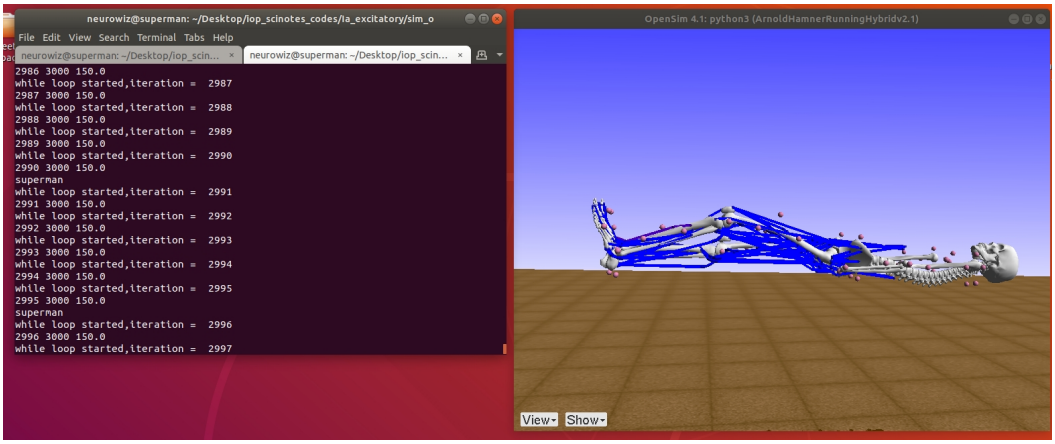


7. click open new tab in terminal

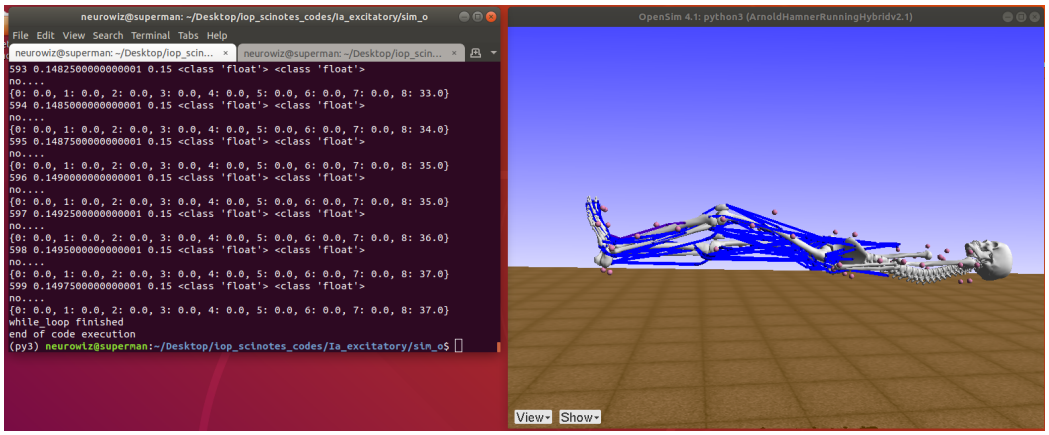
8. run main.py

$python main.py

Now the lower limb model appears in the opensim graphics window and we can see codes running on both the terminals.



Wait for both the codes to completely execute



9. Navigate to close-loop folder

$cd ../sim_c

10. Repeat steps 5,6,7,8

11. plot the output from both the simulation folders

$cd ../
$python plots.py

python plot windows are popped up – see the screenshot below

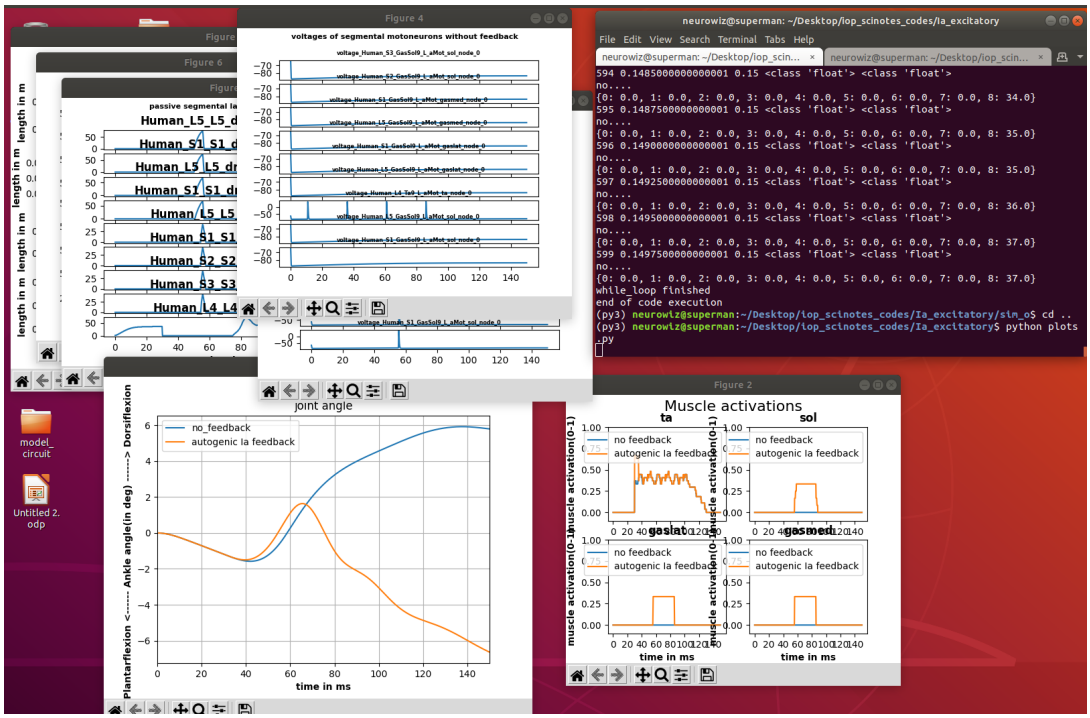


Figure 4
voltages of segmental motoneurons without feedback
Figure 6
passive segmental la
length in m
Human_L5_L5_d
Human_S1_S1_d
Human_L5_L5_dr
Human_S1_S1_dr
Human_L5_L5_
Human_S1_S1_
Human_S2_S2_
Human_S3_S3_
Human_L4_L4_
joint angle
Figure 2
Muscle activations
ta
sol
gaslat
gasmed
no feedback
autogenic Ia feedback
muscle activation(0-1)
time in ms
neurowiz@superman: ~/Desktop/iop_scinotes_codes/Ia_excitatory
File Edit View Search Terminal Tabs Help
neurowiz@superman: ~/Desktop/iop_scin...
neurowiz@superman: ~/Desktop/iop_scin...
594 0.1485000000000001 0.15 <class 'float'> <class 'float'>
no....
{0: 0.0, 1: 0.0, 2: 0.0, 3: 0.0, 4: 0.0, 5: 0.0, 6: 0.0, 7: 0.0, 8: 34.0}
595 0.1487500000000001 0.15 <class 'float'> <class 'float'>
no....
{0: 0.0, 1: 0.0, 2: 0.0, 3: 0.0, 4: 0.0, 5: 0.0, 6: 0.0, 7: 0.0, 8: 35.0}
596 0.1490000000000001 0.15 <class 'float'> <class 'float'>
no....
{0: 0.0, 1: 0.0, 2: 0.0, 3: 0.0, 4: 0.0, 5: 0.0, 6: 0.0, 7: 0.0, 8: 35.0}
597 0.1492500000000001 0.15 <class 'float'> <class 'float'>
no....
{0: 0.0, 1: 0.0, 2: 0.0, 3: 0.0, 4: 0.0, 5: 0.0, 6: 0.0, 7: 0.0, 8: 36.0}
598 0.1495000000000001 0.15 <class 'float'> <class 'float'>
no....
{0: 0.0, 1: 0.0, 2: 0.0, 3: 0.0, 4: 0.0, 5: 0.0, 6: 0.0, 7: 0.0, 8: 37.0}
599 0.1497500000000001 0.15 <class 'float'> <class 'float'>
no....
{0: 0.0, 1: 0.0, 2: 0.0, 3: 0.0, 4: 0.0, 5: 0.0, 6: 0.0, 7: 0.0, 8: 37.0}
while_loop finished
end of code execution
(py3) neurowiz@superman:~/Desktop/iop_scinotes_codes/Ia_excitatory/sim_o$ cd ..
(py3) neurowiz@superman:~/Desktop/iop_scinotes_codes/Ia_excitatory$ python plots
.py
model_
circuit
Untitled 2.
odp
Plantarflexion <------ Ankle angle(in deg) ------> Dorsiflexion
no_feedback
autogenic Ia feedback
time in ms