

Manual

3D Neuron Model

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Main window

- left mouse button – rotating neuron in X and Y-axis
- scroll – zooming
- right mouse button – add current to point under the cursor

Controls window

1. Active tab indicates used neuron model. There are two models to choose:

- $I_{na} - I_K$ model:

```
C_d = 1;
E_L = -80;
g_L = 8;
g_Na = 20;
g_K = 10;
E_Na = 60;
E_K = -90;
V_rest = -65;
I = 0;
tau_V = 1;
nV = -25;
tau = 0.1f;

V += tau * ((I + from_neighbors +
            -g_L * (V - E_L)
            - g_Na * m_inf(V) * (V - E_Na)
            - g_K * n * (V - E_K)
            ) / C_d);

n += tau * (n_inf(V, nV) - n) / tau_V;

m_inf(V) = (1.0 / (1.0 + Exp( (-20.0 - V) / 15.0 )));
n_inf(V, nV) = (1.0 / (1.0 + Exp( (nV - V) / 5.0 )));
```

- **Burster circle – circle model:**

```
C_d = 1;
E_L = -80;
g_L = 8;
g_Na = 20;
g_K = 9;
E_Na = 60;
E_K = -90;
g_K_s = 20;
g_Na_s = 3;
E_K_s = -90;
I = 0;
tau = 0.09f;

V += tau * ((I + from_neighbors +
            - g_L * (V - E_L)
            - g_Na * m_inf(V) * (V - E_Na)
            - g_Na_s * s1 * (V - E_Na)
            - g_K * n * (V - E_K)
            - g_K_s * s * (V - E_K_s)
            ) / C_d);

n += tau * (n_inf(V) - n);
s += tau * (s_inf(V) - s)/50;
s1 += tau * (s1_inf(V) - s1)/20;

m_inf(V) = (1.0 / (1.0 + Exp( (-20.0 - V) / 15.0 )));
n_inf(V) = (1.0 / (1.0 + Exp( (-25.0 - V) / 5.0 )));
s_inf(V) = (1.0 / (1.0 + Exp( (-20.0 - V) / 5.0 )));
s1_inf(V) = (1.0 / (1.0 + Exp( (-40.0 - V) / 5.0 )));
```

2. Reset button changes variables to initial values.

3. Apply button makes changes.

Loading mesh

1. Program uses AC3D file format. It is a very simple format from inivis.com and described here:

<http://www.inivis.com/ac3d/man/ac3dfileformat.html>

2. Neighbors file definition:

```
triangle_numer number_of_neighbors  
triangle_number_1  
triangle_number_2  
triangle_number_3  
etc.
```

- example:

```
0 3  
1  
3  
1513  
1 3  
0  
6  
576  
2 3  
3  
5  
15  
3 3  
0  
2
```

3. If you do not have computed neighbors file, program will do it for you.
4. If you want to use texture, check if in mesh file there is a proper texture coordinate value.