

How to execute *insilico*IDE

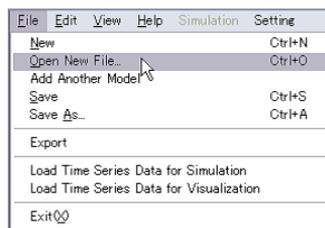
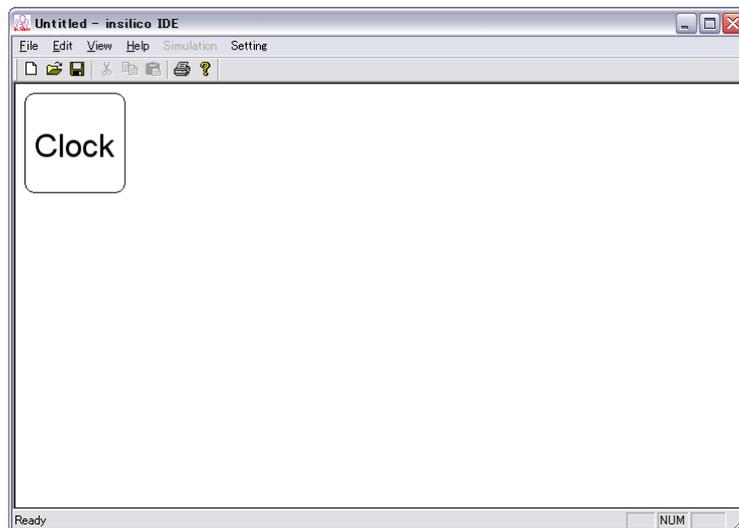
Introduction

Open *insilico*ML file

This tutorial shows how to enjoy sample models which are included in a archive of the *insilico*IDE which is available on our web site

<http://www.physiome.jp/downloads/index.html>

At first, launch the *insilico*IDE (ISIDE) by double clicking the file *insilico*IDE.exe. You can see a window of a white canvas as shown in the following figure.



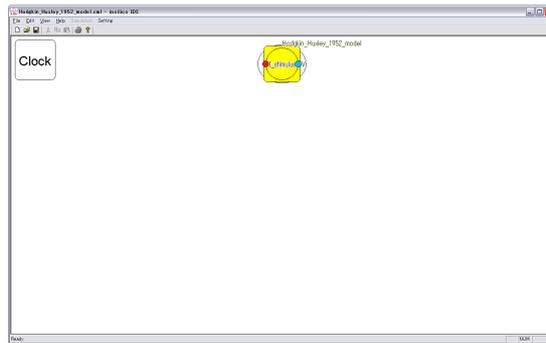
Select [File]-[Open New File] in the Menu-bar at left upper side of the window to open an *insilico*ML (ISML) model. If there is already a model on the canvas, this operation clears the currently edited model at first.

Add *insilico*ML file

If users select [File]-[Add Another Model] from the menu, the specified model is added into the currently edited model as one component. Then a dialog for setting simulation environment appears in which users can set the time unit and so on. Click [OK] button for continuing to edit the model.

Hodgkin Huxley model

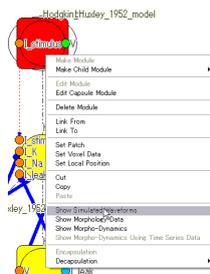
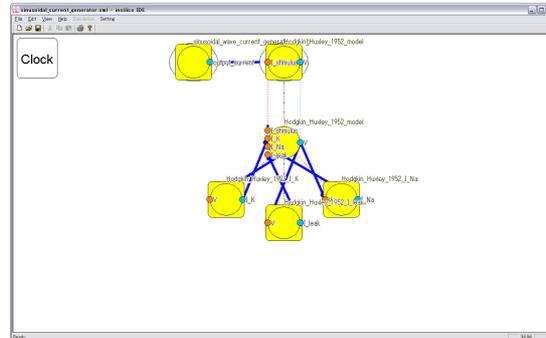
Hodgkin-Huxley model is a well-know conductance based neuron membrane potential model which takes into account several ion channel currents such as sodium and potassium and external stimulus current. Load Hodgkin_Huxley_1952_model.xml file into ISIDE. Then, one object composed of circle and yellow square appears on the canvas of ISIDE, which represents a graphical notation of the model, referred to as a Module.



Usually a model is composed of an aggregation of modules. By considering a group of modules as like one module, a hierarchical structure of a model is represented. ISIDE can show users the under layers of the model by double clicking the Module as shown in the figure below. Relationships between modules are indicated by lines called Edges with several types.

This model needs an external stimulus current for performing simulation. Add a new model which provides a sinusoidal stimulus current. The file is sinusoidal_current_generator.xml. (Note: do not [Open New File] instead of [Add Another Model]. Otherwise the Hodgkin-Huxley model is replaced by the stimulus model.) Then, users see a new module labeled as sinusoidal_wave_current_generator_membrane beside the module representing the Hodgkin-Huxley model. The stimulus module outputs a current via an output port graphically represented as a small blue ball at the right-hand-side of the module. To make a functional (input-output) relationship between the stimulus module and the Hodgkin-Huxley model module, drag a mouse pointer with pressing left button from a blue small circle on the stimulus module to a orange small ball (input port) at the left-hand-side of the

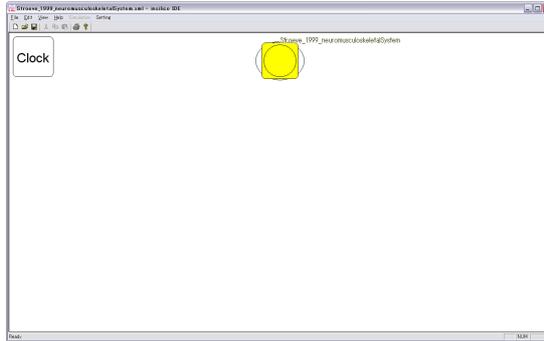
Hodgkin-Huxley model module, which is named I_stim. Then these two ports (blue and orange) are connected a line called a functional edge, meaning that sinusoidal stimulus come from the stimulus module is lead to input to the Hodgkin-Huxley model via the input port.



Finally we try to draw a graph of the dynamics of the membrane potential. At first left click on a output port of the Hodgkin_Huxley_1952_model module labeled as V. Then select [Show Simulated Waveforms] in the context menu that appears by right clicking on the Module. Then, the model is simulated in background and the new dialog appears in which a graph of time-series of the membrane potential is displayed.

Stroeve Model

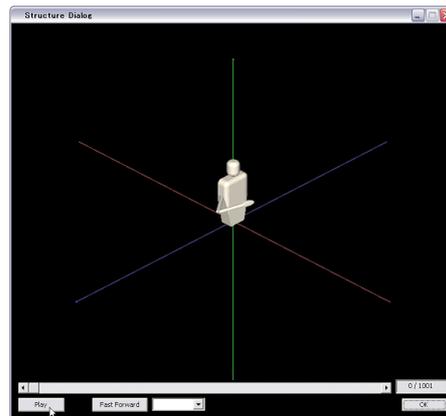
Stroeve model(: Stroeve_1999_neuromusculoskeletalSystem.xml) into ISIDE. Then, ISIDE show the object(: Module) which is similar with ball as follows on the window. This Module means Stroeve model.



Stroeve model include the morphology data. This data file is in the folder whose name is VisualModel, which is in the same Folder with ISML file. Please select menu [Show Morphology Data] which is appeared by right click on Module. ISIDE show the morphology data.



You can see the Morpho-Dynamics shown by usinig time-series data which is gotton by simulation. After appearing the OpenGLDialog, please push the [Play] button.

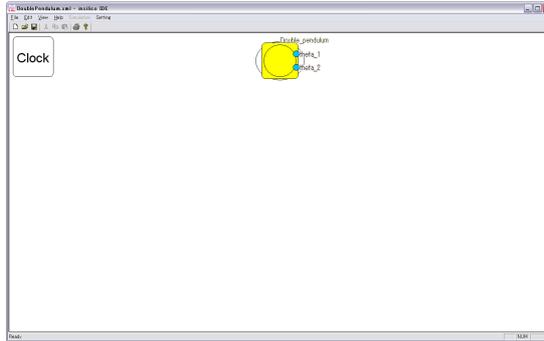


You can adjust the size of object by input command as follows.

- ↑ **Key** and ↓ **Key** rotate around x-axis(red axis).
- ← **Key** and → **Key** rotate around y-axis(green axis).
- Page Up Key** and **Page Down Key** zoom in or zoom out

DoublePendulum Model

DoublePendulum model(: DoublePendulum.xml) into ISIDE. Then, ISIDE show the object(: Module) which is similar with ball as follows on the window. This Module means DoublePendulum model.



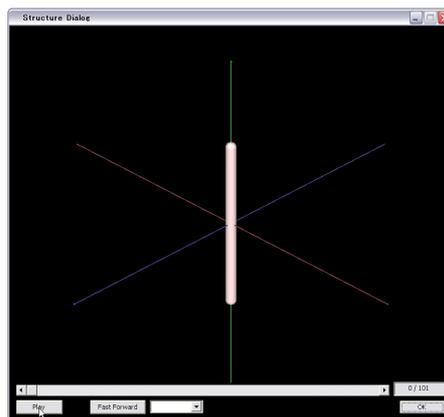
DoublePendulum model include Matrix operation. To simulate this model, Lapack will be used. Please check the setting by watching the dialog which appear by select menu [Setting]-[Matrix Operation Library] on menu bar.



DoublePendulum model include the morphology data. This data file is in the folder whose name is VisualModel, which is in the same Folder with ISML file. Please select menu [Show Morphology Data] which is appeared by right click on Module. ISIDE show the morphology data.

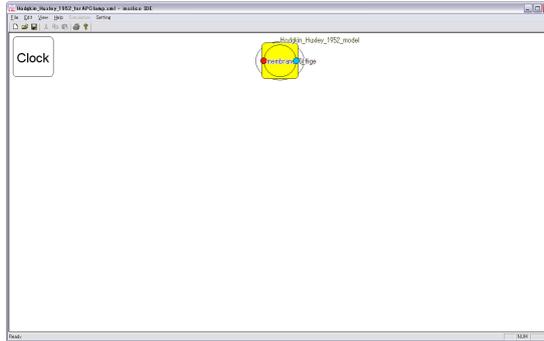


You can see the Morpho-Dynamics shown by usnig time-series data which is gotton by simulation. After appearing the OpenGLDialog, please push the [Play] button.



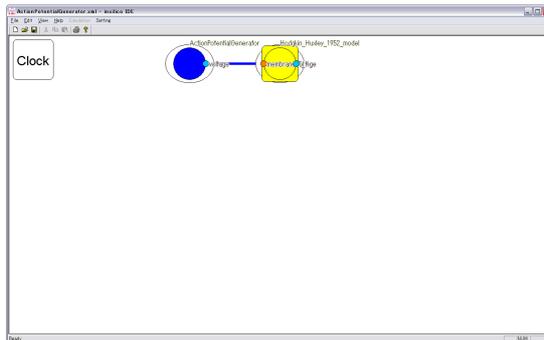
ActionPotentialClamp Model

Load Hodgkin-Huxley model(: Hodgkin_Huxley_1952_model_forAPClamp.xml) into ISIDE. Then, ISIDE show the object(: Module) which is similar with ball as follows on the window. This Module means Hodgkin-Huxley model.



This model need input about membrane voltage from other Module. So, please add new model(: ActionPotentialGenerator.xml) which generate data of voltage.

This added Module is driven by existing time-series data. This time-series data file is in the Folder the name is TimeSeriesData, which is in the same Folder that ISML file is. Please drag from voltage of ActionPotentialGenerator to membrane_voltage of Hodgkin_Huxley_1952_model



At last, please select [Show Simulated Waveforms] which is appeared by right click on Module, after click the L_K on Hodgkin_Huxley_1952_model. Then, the model is simulated and appear the new dialog which describes graph of time-series data.

