Virtual Physiology Updates: Corrections and Extensions (Nov 2017)

Here are some notes concerning recent updates, corrections and extensions of the Virtual Physiology labs that have been made since our last circular mail.

Multi-User Operation:

Major changes have been made towards more flexible and more comfortable multi-user operation.

First of all, all restrictions to run the same program on the same computer the same time by multiple users have been removed. The second point is, so far only of relevance for SimNeuron, that new preparations will now be saved in an additional "ViPhy" folder which will be generated in "My documents" of each individual user . This is to avoid confusion when several users would save their neurons' at the same location (previously was in "program-files/ViPhy") then eventually reloading neurons that other users have generated.

Hence, with corresponding "pre-settings", at the end of each session the parameter lists of new neurons' will be saved in "My Documents/ViPhy/SimNeuron/files/sim-original". On next program start, these parameter files will be overtaken, into the SimNeuron folder in "program-files/ViPhy" from where the program is executed.

We are working to implement such features also in other programs, i.e. allowing to save the parameter lists of previously used preparations to reloading them for further examination – what quite soon shall be available for SimNerv and SimMuscle.

Copy and paste of recordings (SimNeuron, SimNerv and SimMuscle)

As you know, you can save your recordings as graphic files on your hard disk pressing the SAVE button in the task bar of the virtual lab. In the new version of SimNeuron, SimNerv and SimMuscle you have also the option from there to directly overtake your recordings with copy and paste into any appropriate file that will be open, e.g. in the Word file of your protocol form. It's no longer necessary first to save the recordings in a separate graphics file (typically .jpg) on your HD which, of course, is still possible.

SimNeuron: "Standard Neuron", "Pacemaker" and "General Neuron".

In more recent SimNeuron versions, in addition to the "Standard-Neuron" and the "Pacemaker" also a so-called "General Neuron" is offered. This neuron, different from the "Standard Neuron", allows to demonstrate so-called "anode break potentials" appearing at the end of a hyperpolarizing current pulse of sufficient duration. This can happen when Na currents activate already below the resting membrane potential.

However, as a consequence, complete blockade of K-currents by TEA leads to depolarized membrane potential oscillations instead of an only lengthened action potential. Hence, while the "General Neuron" can demonstrate the "anode break potentials" one needs to come back to the "Standard neuron" to demonstrate the lengthening of the action potential after TEA application. We didn't succeed designing a neuron that allows demonstrating both effects. If you can find a solution with the given currents, please, let us know. As an alternative, we are thinking of implementing the possibility of only partial blockade of K- and also Na-currents, what anyhow already has been suggested by some users.

The "Standard Neuron", the "Pacemaker" and the "General Neuron" are offered whenever the SimNeuron program is opened. They are stored in the subfolder "sim_original" in "program-files/SimNeuron/files/. If you would like to remove one of them you have to manually delete the undesired neuron from this folder - or just change the extension ".var".

SimNeuron: Setting Marks in Current and Voltage Clamp recordings

When pressing the left mouse button within the recording charts of SimNeuron you will see a little circle appearing at the tip of the mouse pointer. Additionally, the numerical values of the coordinates, time and voltage or current, respectively, will be indicated. Simultaneously pressing the right mouse button will leave the circle as a mark at the current mouse position. The x/ y- values (ms/mV or ms/nA), will be indicated in the chart's upper divisions. Pressing "Delete" (or "Clear") on your key board will remove the last marks.

SimNeuron: Zero-line of current stimuli can be shifted

The previously fixed zero line of current stimuli can now be shifted with click on the "0" at the abscissa. The scaling can still be adjusted by click on the minimum or maximum values - now in terms of nA/DIV.

SimNeuron: Text edit boxes for stimulus adjustment remain visible

When the end of a given stimulus or its amplitude is no longer visible, e.g. when the scaling has been enlarged, the text edit boxes will still be accessible for stimulus adjustment.

SimNeuron: Reactions on ramp stimuli – error corrected

In a previous SimNeuron version (2.4.1) application of ramp stimuli, under certain stimulus conditions, might have delivered incorrect results (e.g. action potentials at the beginning of the ramp followed by a pause). Since version 2.4.2 this error is corrected.

SimMuscle: Curve of Isometric Contractions adjusted

Following users' requests to show more clearly the typical impression of the curve of isometric maxima in its upper part we had to better adjust the curve of isometric contractions to the passive stretch-force curve i.e. reducing the strength of isometric contractions in comparison to the effects of passive weights.

SimNerv: Tutorial extended

The English version of the SimNerv tutorial has been extended by an additional chapter (as already included in previous German versions) describing "Special features of extracellular stimulation and recording" (Chapter III.5) like the effects of bipolar recordings or the physiological basis of "Pfügers Twitch Rule".

Preparation Videos

After some stagnancy we also could make progress with the high resolution preparation videos. You can view and/or download different versions of the SimHeart and SimVessel videos from our website "http://www.virtual-physiology.com/Video). These videos, however, are still missing voice over, i.e. spoken information, or it is only given in form of a test version in German language. Shootings of SimNerv and SimMuscle videos have recently been made but post-production will still need some time.