

Bug ID S-32: Time Step Bug

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1. Problem

The time steps for the CSV output files are uneven for some intervals. For example, when a time interval of 1.0 is chosen, the times in the CSV file are 0,1.1,2,3,4,5.1 etc but they should be 0,1,2,3,4,5 etc instead.

2. Solution

Make the time steps even by using a small epsilon number to compensate for rounding errors.

3. Modified file list

- org.simBio.sim.analyzer.csv.CsvMaker
- org.simBio.sim.gui.CsvDialog

4. Code explanation

4.1. org.simBio.sim.analyzer.csv.CsvMaker

A small epsilon number was added to CsvMaker.java to compensate for rounding errors in the calculations.

```
private double epsilon = 0.000001;
```

The original version of CsvMaker had the following code:

```
if ( t < nextTime) return;
```

This resulted in uneven time steps in the CSV output file, such as the following, produced from matsuoka_et_al_2003/model.xml, where dtMin = 0.1, dtMax = 0.1, and the interval = 1.0:

```
time (ms), simulation/model/cell/Vm, simulation/model/cell/Na,
simulation/model/cell/K
0.0, -85.9575, 4.925761, 143.1837
1.1, -85.9559, 4.925753, 143.1838
2, -85.9552, 4.925746, 143.1838
3, -85.9547, 4.925739, 143.1838
4, -85.9544, 4.925731, 143.1838
5.1, -85.9543, 4.925723, 143.1839
```

In the modified version, the epsilon value is subtracted from nextTime in the comparison:

```
if ( t < nextTime - epsilon ) return;
```

After this code change the CSV output file has even time steps:

```
time (ms), simulation/model/cell/Vm, simulation/model/cell/Na,
simulation/model/cell/K
0, -85.9575, 4.925761, 143.1837
1, -85.956, 4.925754, 143.1838
2, -85.9552, 4.925746, 143.1838
3, -85.9547, 4.925739, 143.1838
4, -85.9544, 4.925731, 143.1838
5, -85.9543, 4.925724, 143.1839
```

4.2. org.simBio.sim.gui.CsvDialog

The same kind of time step bug occurred in the CSV files created using the menu option File -> Export to CSV. This was fixed by adding an epsilon value to CsvDialog and changing code in the csvMaker method from this

```
if ( nextTime > time) { continue; }
```

to this

```
if ( nextTime - epsilon > time) { continue; }
```