

Bug ID S-4: RelationGraph Runs Slowly

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1. Problem

When a model xml file uses `org.simBio.sim.analyzer.graph.RelationGraph`, the simulation runs much more slowly.

2. Solution

The `paintGraphSub` method of `RelationGraph` takes increasingly longer amounts of time to run as the simulation continues. Fix this method so that `RelationGraph` runs as quickly as the other `Graph` classes.

3. Modified file list

- `org.simBio.sim.analyzer.graph.RelationGraph`

4. Code explanation

`RelationGraph` was tested using the protocol xml file `RelationGraphTest.make.xml` in the folder `src/test/resources/org/simBio/sim/analyzer/graph`. In the original code, each time the `paintGraphSub` method was called it looped through all of the `TimeSeriesValues` from 0 until the current values, which took an ever increasing amount of time to complete, and slowed down the simulation.

```
long idxMin = 0;
long idxMax = values.getCurrentIndex();
for (long idx = idxMin; idx <= idxMax; idx++) {
    double x = axisX.p(values.getValue(idx, 0), plot, false);
    for (int i = nTargetOrigin; i < nTarget; i++) {
        int nGraph = i - nTargetOrigin;
        drawPoint(plot, graphics2d, x, axisY.p(values.getValue(idx, i) *
targetScale[i], plot, false), nGraph);
    }
}
```

In the new version of the code, `idxMin` and `idxMax` have been changed from local variables to private fields

```
private long idxMin = 0;
private long idxMax = 0;
```

The value of `idxMax` is assigned to `idxMin`, if the value of `values.getCurrentIndex()` is different to that of `idxMax`. Then `values.getCurrentIndex()` is assigned to `idxMax`.

```
if (idxMax != values.getCurrentIndex()) {
    idxMin = idxMax;
}
idxMax = values.getCurrentIndex();
```

If the value assigned to `idxMin` is lower than zero, it is changed to 0. The loop then runs from `idxMin`, which was the previous value of `idxMax`, until the current value of `idxMax`. Therefore it runs much more

quickly than the previous version, where the loop ran from 0 to idxMax each time paintGraphSub was called.

```
if (idxMin < 0) idxMin = 0;  
for (long idx = idxMin; idx <= idxMax; idx++) {
```

The next time paintGraphSub is called, the value of idxMax is assigned to idxMin again. Below is a comparison of the time taken for a simulation to run before and after the changes to RelationGraph.

Code changes	Execution time
Before	343 seconds
After	64 seconds