

OpenCell Development

(the COR-like view)

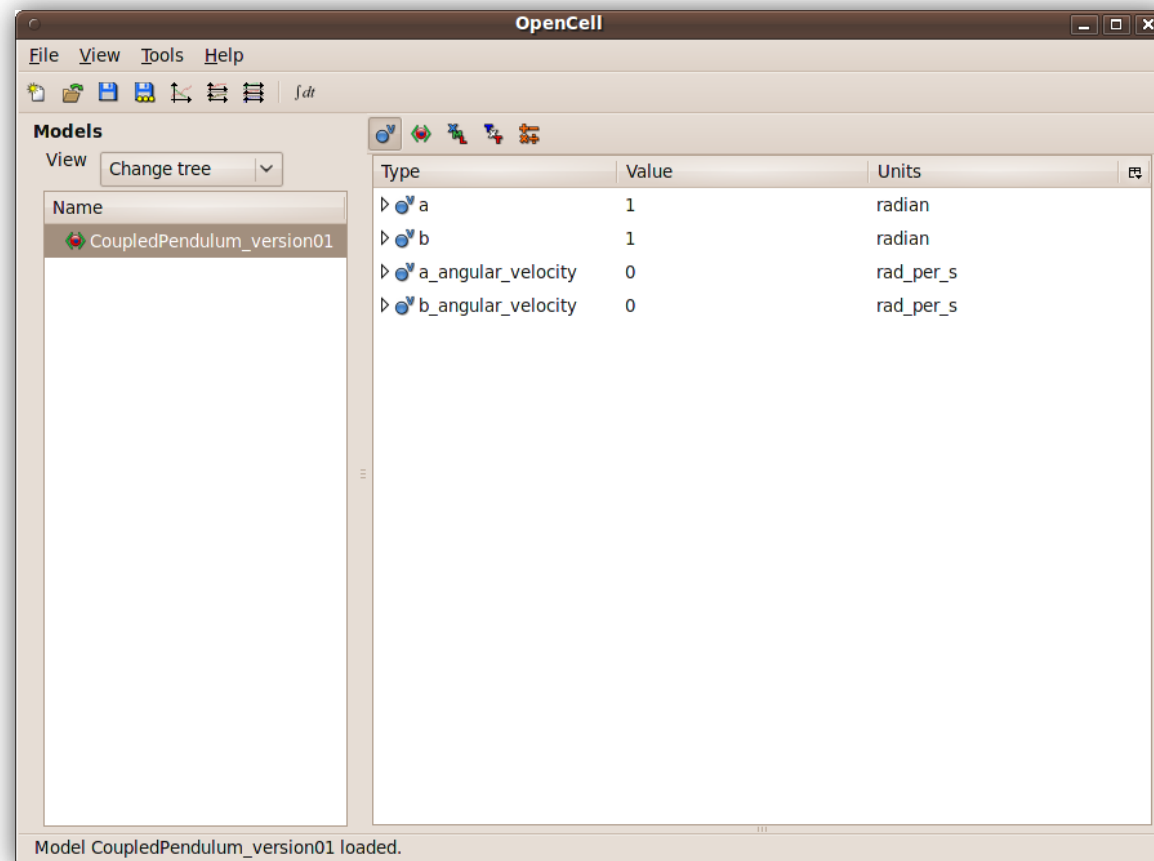
Alan Garny

alan.garny@dpag.ox.ac.uk



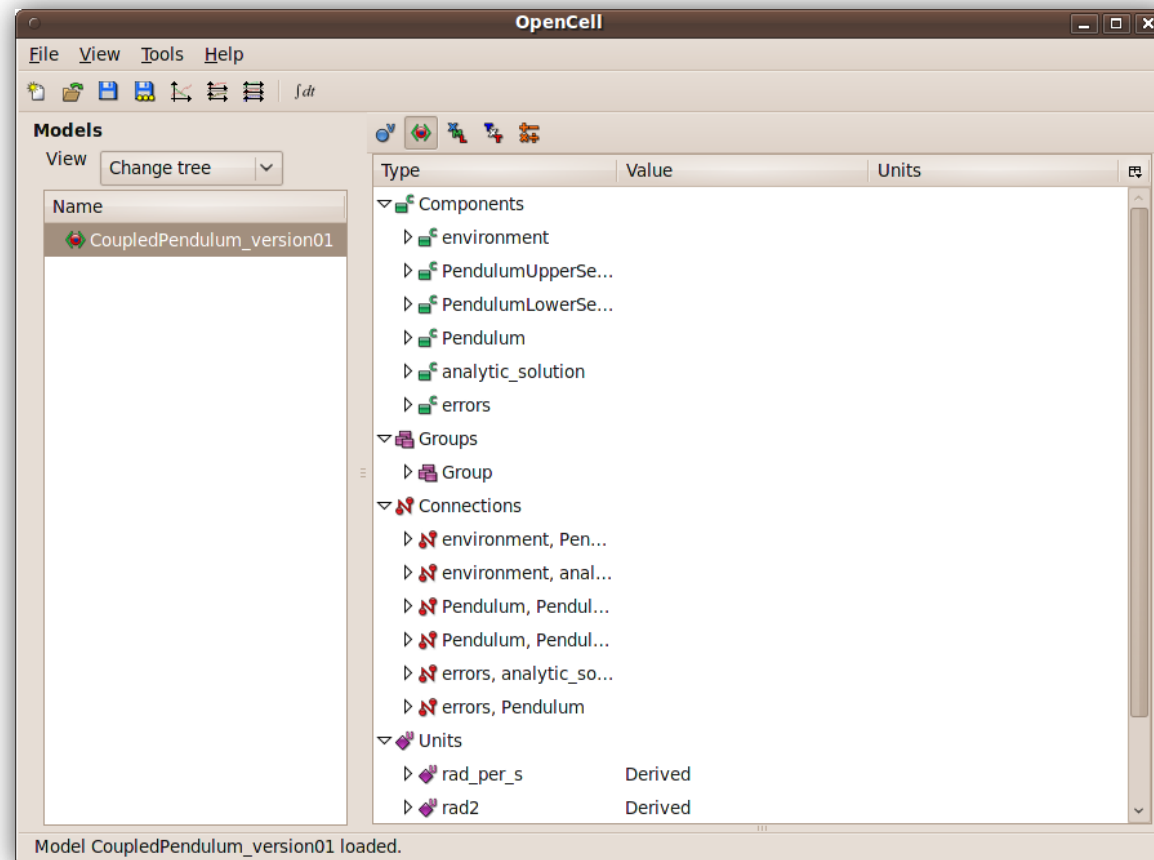
INTRODUCTION

- Editing of CellML files can be done using:
 - The initial conditions/constants view;



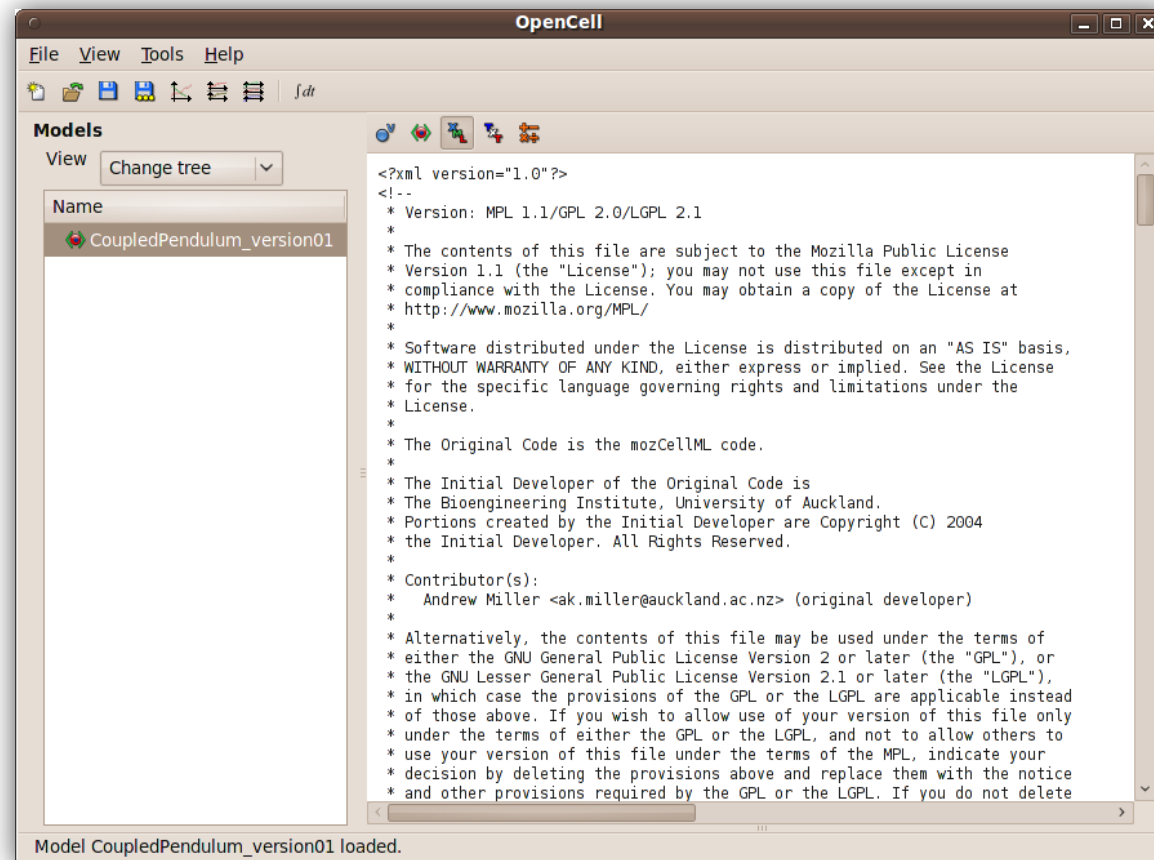
INTRODUCTION

- Editing of CellML files can be done using:
 - The initial conditions/constants view;
 - The complete model structure view;



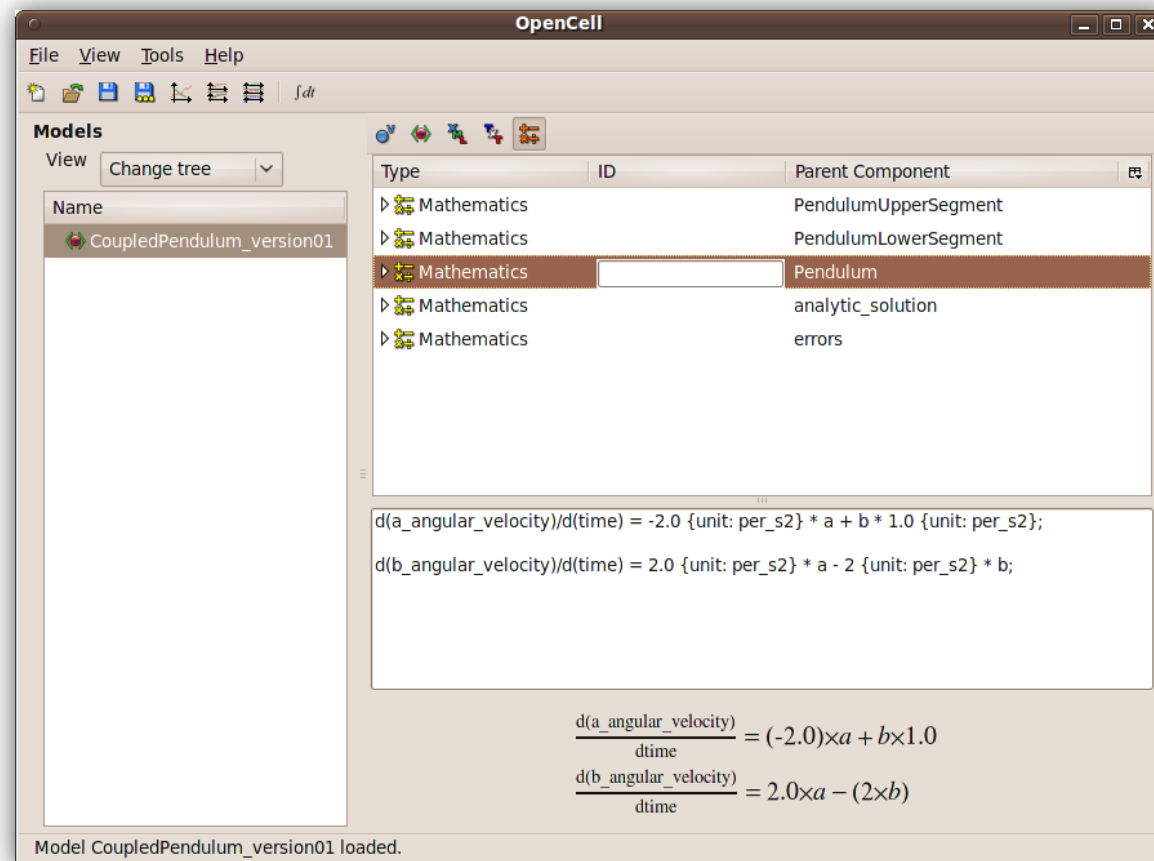
INTRODUCTION

- Editing of CellML files can be done using:
 - The initial conditions/constants view;
 - The complete model structure view;
 - The XML view; or



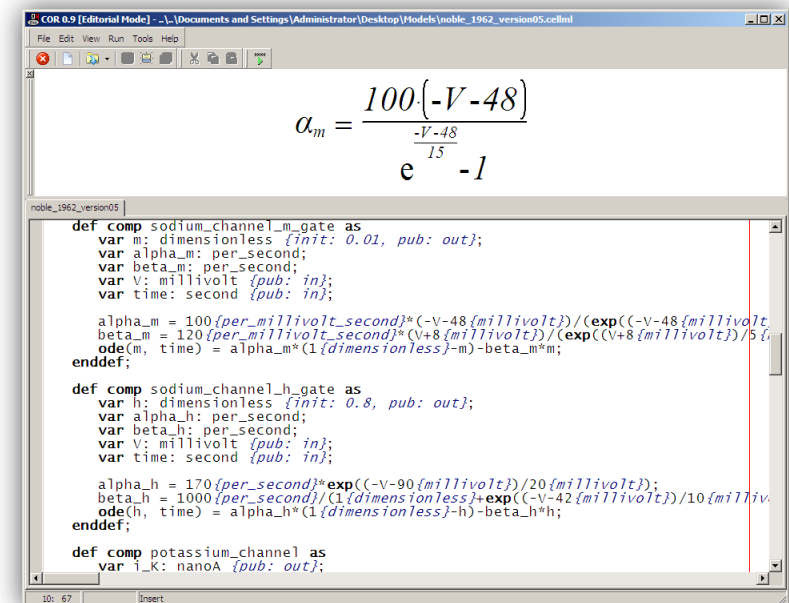
INTRODUCTION

- Editing of CellML files can be done using:
 - The initial conditions/constants view;
 - The complete model structure view;
 - The XML view; or
 - The equations view.



INTRODUCTION

- Editing of CellML files can be done using:
 - The initial conditions/constants view;
 - The complete model structure view;
 - The XML view; or
 - The equations view.
- However, this may not always be the fastest and/or obvious way to edit a CellML file.
- Another possible approach is the one taken by COR which relies on a proprietary language.



COR-LIKE VIEW IN OPENCELL

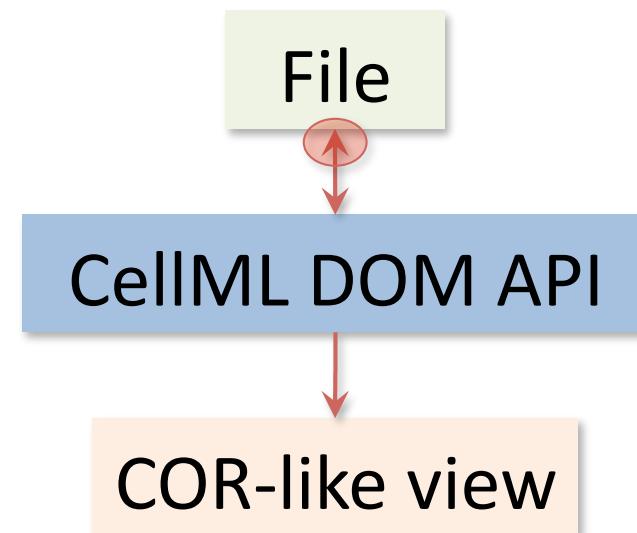
```
<model name="hodgkin_huxley_squid_axon_1952"
  cmeta:id="hodgkin_huxley_squid_axon_1952"
  xmlns=http://www.cellml.org/cellml/1.0#
  xmlns:cellml="http://www.cellml.org/cellml/1.0#"
  xmlns:cmeta="http://www.cellml.org/metadata/1.0#">
  ...
  <units name="millisecond">
    <unit prefix="milli" units="second" />
  </units>
  ...
  <component name="sodium_channel">
    <variable name="i_Na" public_interface="out"
      units="microA_per_cm2" />
    ...
    <math xmlns="http://www.w3.org/1998/Math/MathML">
      <apply id="E_Na_calculation"><eq />
        <ci>E_Na</ci>
        <apply><plus />
          <ci>E_R</ci>
          <cn cellml:units="millivolt">115.0</cn>
        </apply>
      </apply>
      <apply id="i_Na_calculation"><eq />
        <ci>i_Na</ci>
        <apply><times />
          <ci>g_Na</ci>
          <apply><power />
            <ci>m</ci>
            <cn cellml:units="dimensionless">3.0</cn>
          </apply>
          <ci>h</ci>
          <apply><minus />
            <ci>V</ci>
            <ci>E_Na</ci>
          </apply>
        </apply>
      </apply>
    </math>
  </component>
  ...
</model>
```

File

CellML DOM API

COR-LIKE VIEW IN OPENCELL

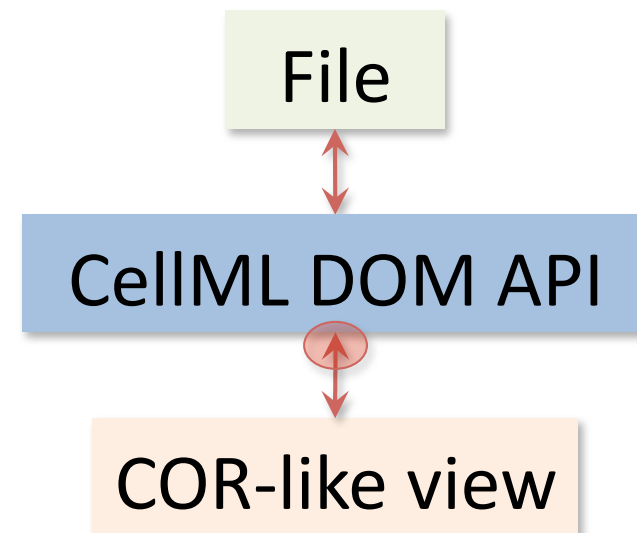
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            <ci>E_Na</ci>
          </apply>
        </apply>
      </apply>
    </math>
  </component>
  ...
</model>
```



```
def model hodgkin_huxley_squid_axon_1952 as
  def unit millisecond from
    unit second {pref: "milli"};
  enddef;
  ...
  def comp sodium_channel as
    var i_Na: microA_per_cm2 {pub: out};
    ...
    E_Na = E_R+115.0{unit: "millivolt"};
    i_Na = g_Na*pow(m, 3.0{unit: "dimensionless"})*h*(V-
      E_Na);
  enddef;
  ...
enddef;
```

COR-LIKE VIEW IN OPENCELL

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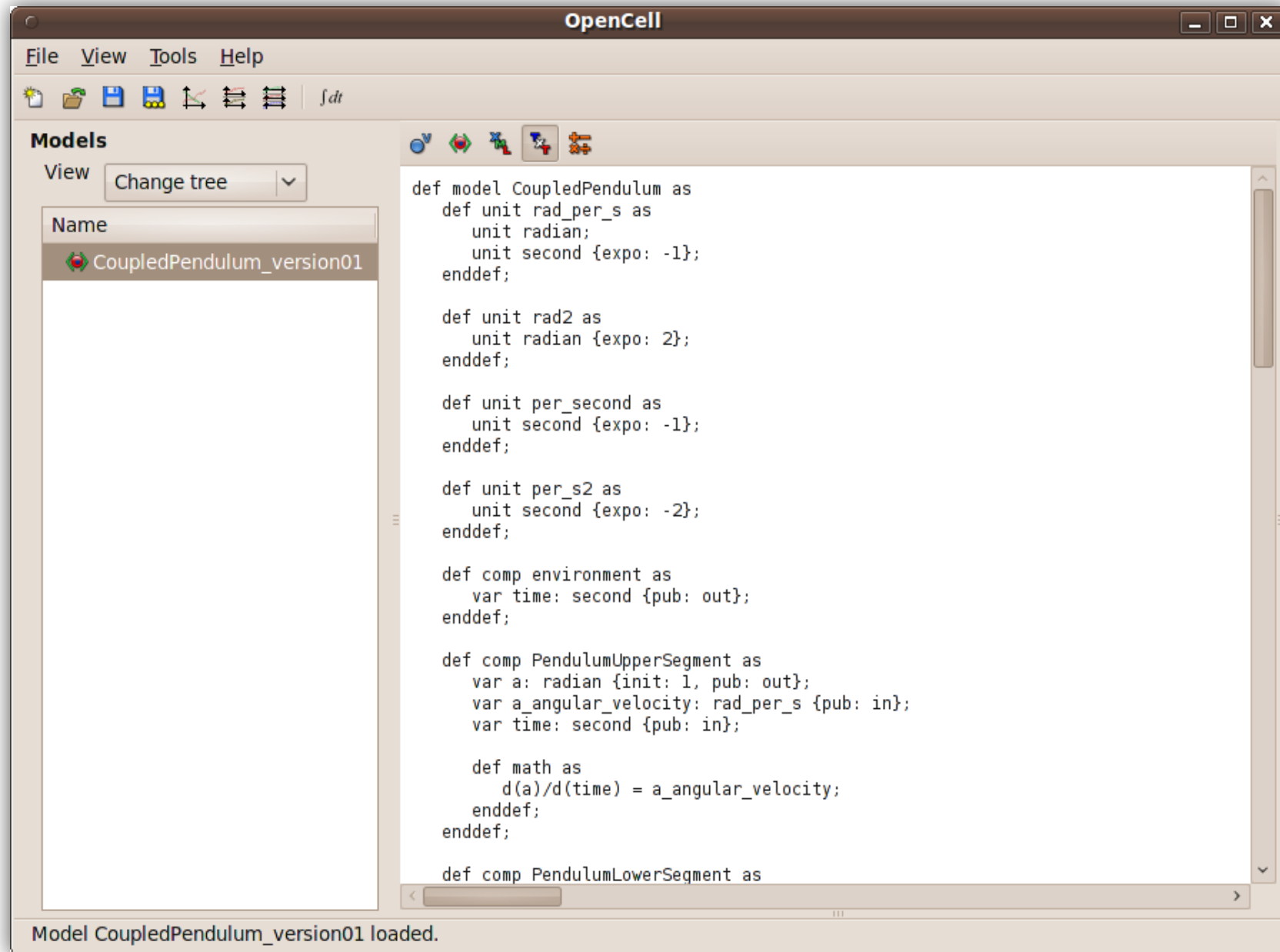


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    var i_Na: microA_per_cm2 {pub: out};
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    E_Na = E_R+115.0{unit: "millivolt"};
    i_Na = g_Na*pow(m, 3.0{unit: "dimensionless"})*h*(V-
    E_Na);
  enddef;
  ...
enddef;
```

REQUIREMENTS

- The proprietary language used in COR and in OpenCell should, ideally, be the same.
- The order of a CellML file's contents should be reflected in the COR-like view.
- The overall behaviour of the COR-like view should be the same as that of the XML view.

COR-LIKE VIEW IN OPENCELL



KNOWN DIFFERENCES/LIMITATIONS

- The editor used in the COR-like view is very limited (also the case for the XML view).

- Differences between the COR-like view and COR:

```
i_Stim = piecewise(  
    case time >= 10{  
then  
    -20{unit: microA  
else  
    0{unit: microA_per_cm2  
);  
def group as  
    type containment;  
    ...  
enddef;  
= 10.5{unit: millisecond}  
OpenCell
```

```
i_Stim = sel  
    case time >= 10{mil  
    -20{microA_per_cm2  
otherwise:  
    0{microA_per_cm2};  
endsel;  
def group as containment for  
    ...  
enddef;  
COR  
COR
```

- Nested piecewise statements are supported;
 - Groups can be of more than one type; and
 - Overall, still far too many unnecessary spaces and parentheses.
- Editing of metadata is not currently supported.

CONCLUSION

- A COR-like view has been added to OpenCell.
- It will, however, only be available in OpenCell 0.8.
- Further work includes:
 - Thorough user testing of the COR-like view;
 - 'Fix' remaining syntactical issues (e.g. **power** rather than **pow**);
 - Support metadata editing (somehow!); and
 - Use a better editor!

www.opencellproject.org



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