

Physiome Model Repository

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Te Whare Wānanga o Tāmaki Makaurau

PMR is...

- Used to power the CellML model repository.
- Able to support the presentation of FieldML through the ZINC plugin.
- The Physiome Model Repository.

The screenshot shows the CellML Model Repository homepage. At the top, there is a navigation bar with links for Home, Exposures, Documentation, and a search box. Below the navigation bar, the main heading is "CellML Model Repository". A sub-heading "Main Model Listing" is followed by a paragraph explaining the list of processed model exposures. A "Please note" section provides information about the repository's curators. A "Browse by category" section lists various biological categories such as Calcium Dynamics, Cardiovascular Circulation, Cell Cycle, Cell Migration, Circadian Rhythms, Electrophysiology, Endocrine, Excitation-Contraction Coupling, Gene Regulation, Hepatology, Immunology, Ion Transport, Mechanical Constitutive Laws, Metabolism, Myofibril Mechanics, Neurobiology, pH Regulation, PDE, Signal Transduction, and Synthetic Biology. A "Searching" section at the bottom states that searching can be done anywhere on the site using the search box in the upper right hand corner.

The screenshot shows a specific model page in the CellML Model Repository. The title is "Reconstruction of the action potential of ventricular myocardial fibres". The page includes a "Model Status" section with a description of the model's origin and a "Model Curation" section with a list of curators and their ratings. A "Source" section provides the full citation for the model. A "Downloads" section offers options to download the complete archive or individual files. A "Views available" section lists various views such as Model Metadata, Mathematics, Generated Code, Cite this model, Source View, and Simulate using OpenCell. A "License" section states that the work is licensed under a Creative Commons Attribution 3.0 Unported License. A "Navigation" section at the bottom provides a link to the model's page. The main content area features a diagram of a rectangular network of interconnected cells, representing the ventricular myocardial fibres.

Features Overview

- Version controlled storage of models
 - They are encapsulated as **Workspaces**.
- Content management system (CMS) for presentation of models.
 - The set of presentation views is known as **Exposures**.
- User access control to models.
 - Provided as a standard Plone CMS feature
- Foundation for a plug-in system, to allow plug-ins to be built with relative ease.
- All presentation views and storage backends are implemented as plug-ins, and is enabled on-demand.

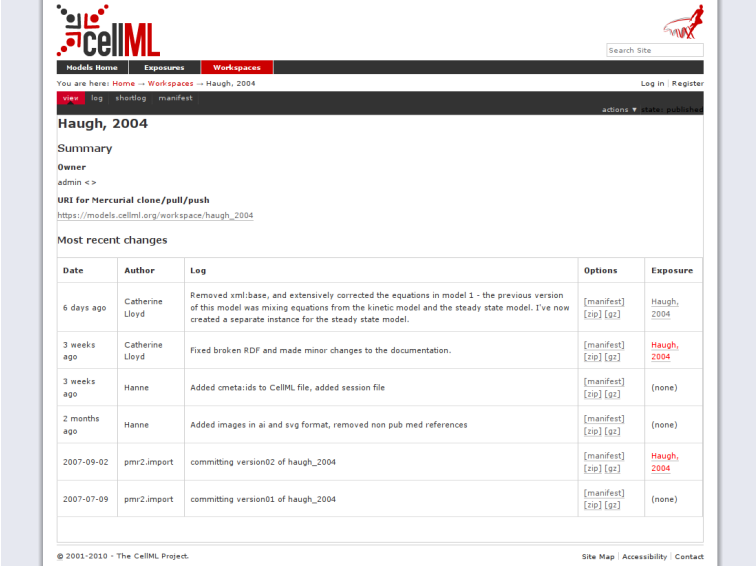
Version control system

- An original goal of the CellML Model Repository was to allow the tracking of changes between versions.
- Need user friendly client
 - Such as Tortoise(SVN|Hg) for Windows.
- Avoid single point of failure.
 - Distributed version control system (DVCS).
- Mercurial was chosen at first.
- Git support under development.
 - Version of large files using git-annex (tentatively).



Workspaces

- Every users within the system can create workspaces.
- Different policies for avoiding id clashes can be used.
- Can be forked/cloned at will, like other DVCS providers.



CellML

Models Home Exposures Workspaces

You are here: Home → Workspaces → Haugh, 2004

Log in Register

view log shortlog manifest

adons T state publish

Haugh, 2004

Summary

Owner
admin < >

URI for Mercurial clone/pull/push
https://models.cellml.org/workspace/haugh_2004

Most recent changes

Date	Author	Log	Options	Exposure
6 days ago	Catherine Lloyd	Removed xml:base, and extensively corrected the equations in model 1 - the previous version of this model was mixing equations from the kinetic model and the steady state model. I've now created a separate instance for the steady state model.	[manifest] [zip] [gz]	Haugh, 2004
3 weeks ago	Catherine Lloyd	Fixed broken RDF and made minor changes to the documentation.	[manifest] [zip] [gz]	Haugh, 2004
3 weeks ago	Hanne	Added cmetaxids to CellML file, added session file	[manifest] [zip] [gz]	(none)
2 months ago	Hanne	Added images in ai and svg format, removed non pub med references	[manifest] [zip] [gz]	(none)
2007-09-02	pim2.import	committing version02 of haugh_2004	[manifest] [zip] [gz]	Haugh, 2004
2007-07-09	pim2.import	committing version01 of haugh_2004	[manifest] [zip] [gz]	(none)

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Site Map Accessibility Contact

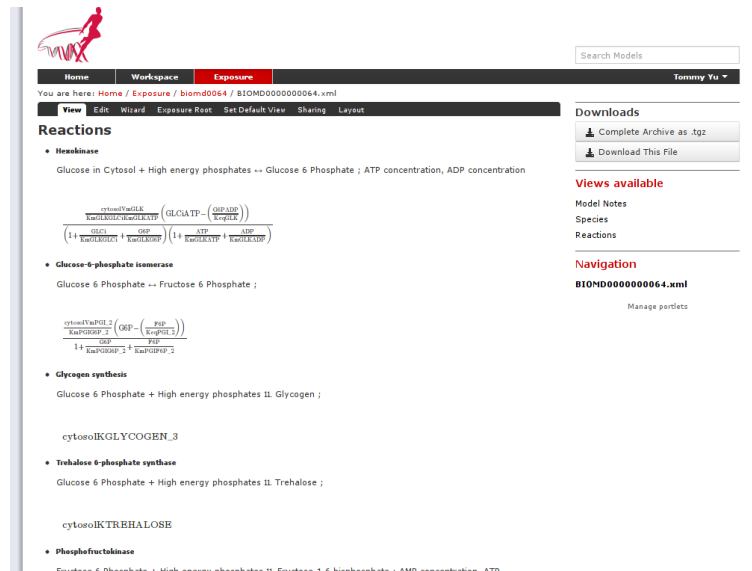
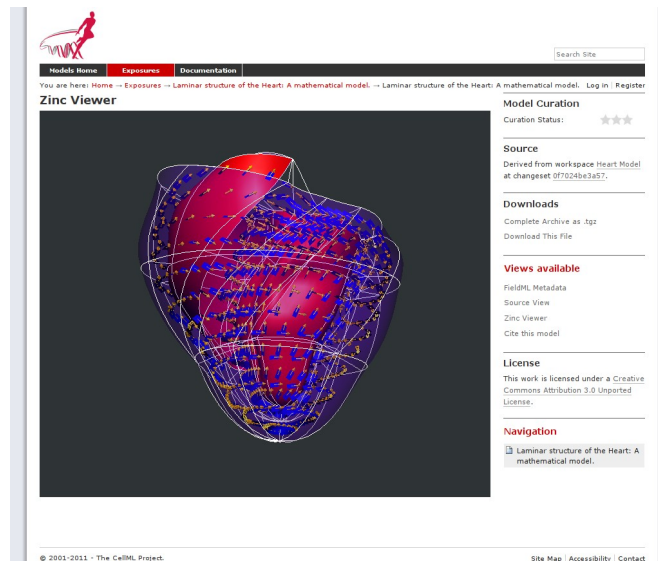
Presentation of models and data

- Define models as content to present to all users.
- Must be fully extensible;
 - Need to support all model formats developed as part of the Physiome Project.
- Also need user access control;
 - E.g. enable prepublication reviewer access.
- All are traits of content management system.
 - We decided on Zope/Plone due to existing usage of this system and its feature-completeness.



Exposures, presentational plugins

- Examples of extensibility includes:
 - CellML Code Generation with syntax highlighting.
 - Zinx viewer
 - A demo plugin for displaying basic SBML info.



More presentation goodness

- Cross platform math rendering with the aid of CellML API and MathJAX.
- Ability to provide limited customizable views for specific file types from within workspaces, such as images being displayed and structured text formats are rendered.

Component: INa

$$GNa = \begin{cases} 11.5 & \text{if tissue} = 0 \\ 411.5 & \text{otherwise} \end{cases}$$

$$gNa = GNa m m H J$$

$$INa = gNa (V - ENa)$$

$$ah = \begin{cases} 0 & \text{if } V \geq -40 \\ 0.135 e^{\frac{80+V}{-6.8}} & \text{otherwise} \end{cases}$$

$$aj = \begin{cases} 0 & \text{if } V \geq -40 \\ \frac{((-1.271465) e^{0.244V} - (3.47465 e^{(-0.04391)V})) (V + 37.78)}{1 + e^{0.311(V + 79.23)}} & \text{otherwise} \end{cases}$$

$$bh = \begin{cases} \frac{1}{0.13 \left(1 + e^{\frac{V - 10.68}{-11.1}} \right)} & \text{if } V \geq -40 \\ 3.56 e^{0.079V} + 3.1 e^{5e^{0.35V}} & \text{otherwise} \end{cases}$$

$$bj = \begin{cases} \frac{0.3 e^{(-2.535e-7)V}}{1 + e^{(-0.1)(V + 32)}} & \text{if } V \geq -40 \\ \frac{0.1212 e^{(-0.01092)V}}{1 + e^{(-0.1378)(V + 40.14)}} & \text{otherwise} \end{cases}$$

$$am = \frac{0.321(V + 47.13)}{1 - \left(e^{(-0.1)(V + 47.13)} \right)}$$

Recently implemented features

- Wizard for creating Exposures (i.e. presentation views).
- Web services that adheres to REST/Hypermedia principals.

Selected file type: CellML

File
The file within the workspace that requires special processing to be presentable in this exposure.

beeler_reuter_1977.cellml ▼

[-] Subgroups

Documentation Generator

Documentation File
The file where the documentation resides in. If this object is already a file, leaving this field unselected means the current file will provide the data from which the document will be generated from.

beeler_reuter_1977_documenta ▼

View Generator
The selected generator will be used to attempt to generate text for the default document view.

HTML annotator ▼

Basic Model Curation

Curation Flags
Curation flags assigned to this object.

COR
2 star ▼

JSim
2 star ▼

OpenCell
2 star ▼

Curation Status
2 star ▼

Import/Export (synchronization)

- Import raw models from external repositories
 - Allow users to host their models on other repositories, like bitbucket (or github once we get git support).
 - Providing a simple way to import models into PMR as an incentive for keeping models in DVCS.
- Export/import of Exposure structures
 - Allow the work that might have been done on another instance of PMR2 be imported into the main instance seamlessly.

Web services

- Adhere to REST/Hypermedia principals
 - Reliance on a single canonical URI per resource; the web service is simply a matter of specifying the accepted content type.
- Nearly all resources have some form JSON representations for them.
- OAuth 1.0 for authorizing third-party client access to private user content.



Web services

models.cellml.org/e/c1/beeler_reuter_1977.cellml/@@cmeta

Model Metadata

CellML Model Authorship

Title:
Author: Catherine Lloyd
Organisation: Auckland Bioengineering Institute, University of Auckland

Citation

Authors:

- Beeler, G
- Reuter, H

Title: Reconstruction of the action potential of ventricular myocardial fibres
Source: Journal of Physiology
Identifier: urn:miriam:pubmed:874889
Model Keywords: cardiac, cardiac_electrophysiology, electrophysiological, electrophysiology, ventricular_myocyte



Web services

The screenshot shows a web browser window with the address bar displaying the URL: `models.cellml.org/e/c1/beeler_reuter_1977.cellml/@@cmeta`. The page content is titled "Model Metadata" and "CellML Model Authorship". It lists the following information:

- Title:**
- Author:** Catherine Lloyd
- Organisation:** Auckland Bioengineering Institute, University of Auckland
- Citation**
 - Authors:**
 - Beeler, G
 - Reuter, H
 - Title:** Reconstruction of the action potential of ventricular myocardial fibres
 - Source:** Journal of Physiology
 - Identifier:** urn:miriam:pubmed:874889
 - Model Keywords:** cardiac, cardiac_electrophysiology, electrophysiological, electrophysiology, ventricular_myocyte

Web services

```
>>> import requests
>>> r = requests.get(
...     'http://models.cellml.org/e/c1/beeler_reuter_1977.cellml/@@cmeta')
>>> len(r.content)
14064
```

Web services

```
>>> from pprint import pprint
>>> import requests
>>> r = requests.get(
...     'http://models.cellml.org/e/c1/beeler_reuter_1977.cellml/@@cmeta',
...     headers={'Accept': 'application/vnd.physiome.pmr2.json.0'})
>>> len(r.content)
623
>>> r.json()['citation_title']
u'Reconstruction of the action potential of ventricular myocardial
fibres'
>>> pprint(r.json()['keywords'])
[[u'#beeler_reuter_1977', u'cardiac electrophysiology'],
 [u'#beeler_reuter_1977', u'cardiac'],
 [u'#beeler_reuter_1977', u'electrophysiology'],
 [u'#beeler_reuter_1977', u'electrophysiological'],
 [u'#beeler_reuter_1977', u'ventricular myocyte']]
```

Web services

```
GET /pmrdemo/workspace HTTP/1.1
```

```
Host: localhost
```

```
HTTP/1.1 200 OK
```

```
...
```

```
Content-Length: 13730
```

```
Content-Type: text/html; charset=utf-8
```

```
<!DOCTYPE html>
```

```
...
```

```
    <a  
href="http://localhost/pmrddemo/workspace/beeler_reuter_1977"  
class="state-published contenttype-workspace" title="">  
    <span>Beeler, Reuter, 1977</span>  
  </a>
```


Web services

```
GET /pmrdemo/workspace HTTP/1.1
```

```
Host: localhost
```

```
Accept: application/vnd.physiome.pmr2.json.0
```

```
HTTP/1.1 200 OK
```

```
...
```

```
Content-Length: 192
```

```
Content-Type: application/vnd.physiome.pmr2.json.0
```

```
[{"target":  
"http://localhost/pmrdemo/workspace/beeler_reuter_1977",  
"title": "Beeler, Reuter, 1977"}, {"target":  
"http://localhost/pmrdemo/workspace/HH-sbml", "title": "Hodgkin  
Huxley SBML"}]
```

Future

- Work in progress
 - Integration with RICORDO metadata framework.
 - Or any other external services to index models in PMR in a more comprehensive manner, which in turn allow PMR to leverage their search services on that index.

Finally

- Facilitates collaborative model development in a generic, service agnostic manner.
- Provide a foundation to build services to store, access and interact with models.
- Link with external web-services to provide semantic reasoning against metadata across models over all the available resources, so that the most appropriate models be made known to users.

Acknowledgments

- Maurice Wilkins Centre for Molecular Biodiscovery
- VPH Network of Excellence.



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