Current State of JUMMP

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Agenda

1 Introduction

2 Current State of Development

3 Development
Agenda

1. Introduction

2. Current State of Development

3. Development
**What is JUMMP?**

**Goals**

- Modular framework for handling any Model file
- Replacement for existing BioModels DB
- Easy setup on sites outside the EBI
- Secure access to Models
- Collaborative Model Development

**Who develops it**

- Computational Systems Neurobiology Group at EBI
- Data Management Group of TBI at DKFZ
- **Community**: JUMMP is Open Source
Software

Stack

- General Model Management Platform
- Not limited to SBML
- Strong use of Plugins
- Web Application using Grails Framework
- Easy to Extend and Contribute
1. Introduction

2. Current State of Development

3. Development
Implemented Features

- Uses JSBML
- Extract all information
- Online Validation of submitted files
- Prototype views like Biomodels
- Submodel Generation
- Reaction Graph

Reactions (0)
Rules (9)

Rate Rule
\[
\frac{d(x_1)}{dt} = \alpha_1 x_1 g^{11} x_2 g^{21} - (\beta_1 x_1)
\]

Rate Rule
\[
\frac{d(x_2)}{dt} = \alpha_2 x_1 g^{12} x_2 g^{22} - (\beta_2 x_2)
\]

Rate Rule
\[
\frac{d(y_2)}{dt} = k_2 y_2 - (k_1 y_1)
\]

Assignment Rule
\[
x_1 = \begin{cases} x_1 - x_1_{\text{bar}} & \text{if } x_1 > x_1_{\text{bar}} \\ 0 & \text{otherwise} \end{cases}
\]

Assignment Rule
\[
x_2 = \begin{cases} x_2 - x_2_{\text{bar}} & \text{if } x_2 > x_2_{\text{bar}} \\ 0 & \text{otherwise} \end{cases}
\]

Assignment Rule
\[
\frac{1 - g^{22}}{\gamma_{\text{alpha1}}} \alpha_2 x_1 g^{12} x_2 g^{21} = x_1_{\text{bar}}
\]

Assignment Rule
\[
\frac{1 - g^{12}}{\gamma_{\text{alpha2}}} \alpha_1 x_1 g^{11} x_2 g^{22} = x_2_{\text{bar}}
\]

Assignment Rule
\[
g_{12} g^{21} - ((1 - g^{11})(1 - g^{22})) = \gamma_{\text{gamma}}
\]

Assignment Rule
\[
0.15 \text{ if } \text{time} \geq 1 \land \text{time} < 2
\]

Assignment Rule
\[
-0.5 \text{ otherwise}
\]
Annotation Module

Implemented Features

- Import of MIRIAM registry dump
- Generates identifiers.org URLs
- Web Services for name resolving
- Annotations are resolved during SBML upload
- Stored in database
- Search Models by Gene-Ontology Tree

Implemented Features:

- GO:0005575: cellular_component
- GO:0003674: molecular_function
- GO:0005488: binding
- GO:0005215: transporter activity
- GO:0003824: catalytic activity
- GO:0044003: positive regulation of molecular function
- GO:0044092: negative regulation of molecular function
- GO:0065009: regulation of molecular function
- GO:0000869: molecular transducer activity
- GO:0001701: nucleic acid binding transcription factor activity
- GO:0030234: enzyme regulator activity
- GO:0005188: structural molecule activity
- GO:0016269: antioxidant activity
- GO:0009855: electron carrier activity
- GO:0016247: channel regulator activity
- GO:0030545: receptor regulator activity
- GO:00030547: receptor inhibitor activity
- GO:0030293: transmembrane receptor protein tyrosine kinase inhibitor activity
  - Chen2009_ErbB_Signaling
- GO:0008150: biological_process
Implementation Features

- Publication Information Support
- Retrieved from Webservice
- Automatically extracted from SBML file
- Stored in Database
- Manual insert possible

| PubMed ID | 20488988 |
| Journal   | Science 2010 Jun; 328(5984): 1404-8 |
| Title     | Covering a broad dynamic range: Information processing at the erythropoietin receptor. |
| Authors   | V Becker, M Schilling, J Bachmann, U Baumann, A Raue, T Maiwald, J Timmer, U Klingmüller |
| Affiliation | Division Systems Biology of Signal Transduction, DKFZ-ZMBH Alliance, German Cancer Research Center; 69120 Heidelberg, Germany. |
| Abstract  | Cell surface receptors convert extracellular cues into receptor activation, thereby triggering intr... |
Version Control

Implemented Features

- Models under version control
- Bives: Diff between Revisions
- Public/Private Revisions
- Deletion of latest Revision
- Grant Read/Write Permission to Collaborators

Moves

<table>
<thead>
<tr>
<th>Elements in revision 2</th>
<th>Elements in revision 3</th>
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<td><strong>Reaction</strong></td>
<td><strong>Reaction</strong></td>
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<tr>
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<td>speciesName = Species 2</td>
</tr>
<tr>
<td>stoichiometry = 1</td>
<td>stoichiometry = 1</td>
</tr>
</tbody>
</table>

Multiple Backends

- git
- svn
- Plugins...
Flexibility

- First start to configure the application
- Stored in simple Java Properties file
- Multiple authentication backends:
  - Database
  - LDAP
  - More possible through Spring-Security
- User Registration and Administration
JUMMP Loader

External Command Tool to Load SBML files

- Uses IPC to communicate with JUMMP
- Written in Qt/C++
- Able to load all SBML models in a directory
- Can directly publish the model

Linux Packages on OBS

DEMO
1. Introduction

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Features planned/under development

- Flexible Tagging System
- Search
- Curation/Annotate Process
- User Groups
- Web Service
- User Interface
Alpha/Beta Release

Alpha Release planned to be released soon.

Announcement

Release will be announced when done
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How to Contribute

Everyone is Welcome

- General Wiki: https://bitbucket.org/jummp/jummp/wiki/Home
- Development Wiki: https://bitbucket.org/mgraesslin/jummp/wiki/Home
- Fork on Bitbucket: https://bitbucket.org/mgraesslin/jummp/fork
- Issue Tracker: https://bitbucket.org/mgraesslin/jummp/issues
- Mailing Lists: jummp-discuss@googlegroups.com and jummp-dev@googlegroups.com

Plugins

Development is very easy due to flexible Plugin Infrastructure
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Acknowledgement

- Jürgen Eils
- Roland Eils
- Robert Hälke
- Camille Laibe
- Nicolas Le Novère
- Jochen Schramm
- All other members of the Data Management Group