From model to models

Constructing libraries of modular CellML models

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Modular Models

- Construction with recombination in mind
- Fine-grained reuse – mathematical equation level
Registry of Standard Parts

Constitutive E. coli σ^70 promoters

This section lists promoters that are recognized by E. coli σ^70. RNAP, σ^70 is the major E. coli sigma factor so there should be RNAP present to transcribe these promoters under most growth conditions (although maximally during exponential growth).

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Description</th>
<th>Promoter Sequence</th>
<th>Positive Regulators</th>
<th>Negative Regulators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BBa_J14018</td>
<td>P(Bla)</td>
<td>...gtagcagagaggaagagccgag...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>BBa_J14022</td>
<td>P(Cat)</td>
<td>...gagcagagagacgacgccgag...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>BBa_J14034</td>
<td>P(Kan)</td>
<td>...gagcagagagacgacgccgag...</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBa_J1752021</td>
<td>Template for Building Primer</td>
<td>...gagcagagagacgacgccgag...</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBa_J142128</td>
<td>Reverse lambda-11 regulated</td>
<td>...gagcagagagacgacgccgag...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Our goal

- Registry of Standard Virtual Parts to complement the Registry of Standard Biological Parts

- Composition of models to provide *in silico* simulations
Example

‘System Models’

‘SVPs’ - Physical things or processes

‘Templates’ – Mathematical structures
Example

‘System Models’

‘SVPs’ - Physical things or processes

‘Templates’ – Mathematical structures
http://models.cellml.org

- Support for v1.1 models (multi-file, imports)
- ‘Sharing’ of models between projects through ‘embedded workspaces’
- Collaborative options
- (Distributed) version control
Next: Biomedical Applications

Modular Model Construction

Cooling et al. (2007) Biophys. J: 93, Fig 1.
Extensions - Annotations

....ccgcatgaaataaatccagggtattgatgatggttttgggtataatatgtacaatcattgccagcttta
tatgtgttagtaaatgggaagagagatccgcatgaaataaatccagggtattgatgatggttttgggtat
aatatgtacaactattgcctttatattgtcatggacagccttttttatttcattttgatagttcagcttaacacaaagggagaactttttv...
(Semi-Automated) Visualisation
(Semi-Automated) Composition
Summary

• Constructing libraries of modular reusable components in CellML
• Building larger models from those parts
• Goal: to make it easier to build and understand large models from reusable components.
  • Visualisation
  • Composition
  • Ontologies
  • Tools
• Practices not perfect....
Funding