Visualisation of CellML Models

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CellML

- CellML is an implementation-independent simulation modelling language.

- It is mainly used for understanding the dynamics of complex biological processes.
A reaction modelled in CellML; L + R → Rl
Providing Visual Support

CellML Structure
(Biophysical View)

Underlying Biology
(Biological View)
Workflow

CellML-XML Model

CellML-OWL Model

Biophysical Model

Biological Model

Biophysical View

Biological View
Modularising CellML Models

CellML-XML Model

Modularisation

Modularised CellML-XML Model
Generation of CellML-OWL

CellML-XML Model

Modularised CellML-XML Model

Generation of CellML-OWL

CellML-OWL Model
Linking CellML-XML & CellML-OWL

- CellML-XML Model
- Modularised CellML-XML Model
- CellML-OWL Model

Linking CellML-XML & CellML-OWL
Generation of Biophysical Model

- CellML-XML Model
  - Modularised CellML-XML Model
  - CellML-OWL Model
    - Generation of Biophysical Model
      - Biophysical Model
Annotating Biophysical Models

CellML-XML Model

Modularised CellML-XML Model

CellML-OWL Model

Biophysical Model

Annotation

Annotated Biophysical Model
Biophysical View

CellML-XML Model

Modularised CellML-XML Model

CellML-OWL Model

Biophysical Model

Annotated Biophysical Model

Linking to glyphs
Biophysical View

CellML-XML Model

Modularised CellML-XML Model

CellML-OWL Model

Biophysical Model

Annotated Biophysical Model
Applying Reducing Rules

The rule set for collapsing

\[
\begin{align*}
P & \quad E \quad P \quad E \\
& \quad \Rightarrow \quad P
\end{align*}
\]

\[
\begin{align*}
P & \quad E \quad P \\
& \quad \Rightarrow \quad P
\end{align*}
\]

\[
\begin{align*}
E & \quad P \quad E \\
& \quad \Rightarrow \quad P
\end{align*}
\]

\[
\begin{align*}
E & \quad P \quad E \\
& \quad \Rightarrow \quad P
\end{align*}
\]
Generation of Biological Model

- CellML-XML Model
  - Modularised CellML-XML Model
    - CellML-OWL Model
      - Biophysical Model
        - Annotated Biophysical Model
          - Biophysical View
            - Generic Model
              - Generation of Biological Model
                - Biological Model
Biological View

CellML-XML Model

Modularised CellML-XML Model

CellML-OWL Model

Biophysical Model

Annotated Biophysical Model

Generic Model

Biological Model

Biophysical View
Conclusion

**Biophysical View**

**CellML Structure**

**Biological View**

\[
\begin{align*}
\text{J}_R &= k_1 \left( R_l \right) \\
\text{J}_L &= k_1 \left( L \right) \\
\end{align*}
\]
Future work

- Enhancing the tool to support automated layout of the diagrams.
- Enhancing the ontologies to support reasoning.
Thank You