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= Layering Toolbox, V1.0 =
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General Information:

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The Layering Toolbox is a toolbox for Matlab to create and simulate the layers of a biomolecular model. It is based on the article

T Prescott, M Lang A Papachristodoulou (2014) "Quantification of Interactions between Network Functionalities by Cascaded Layering of Dynamic Signalling and Metabolic Models" (submitted).

We refer to the article for more information about the layering framework and interpretation of the calculated quantities.

Licence:

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The Layering Toolbox is published under the GNU GENERAL PUBLIC LICENSE.

For more information, see COPYING.txt.

Some of the examples provided with the Layering Toolbox contain third party SBML models (.xml files) under different licences.

Please read the files COPYING_XX.txt in the respective folders for more information.

Requirements:

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- Matlab, R2010a or higher. Visit <http://www.mathworks.ch/products/matlab/> for more information.
- Symbolic Math Toolbox. Visit <http://www.mathworks.ch/products/symbolic/>
- libSBML for Matlab. Download free at <http://sbml.org/Software/libSBML>
- SBMLToolbox 4.1 or higher. Download free at <http://sbml.org/Software/SBMLToolbox>
- SBToolBox2. Download free at <http://www.sbtoolbox2.org/main.php>

Tested Under:

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- Windows 7, Matlab R2010a working
- Windows 7, Matlab R2014a working
- Red Hat Enterprise Linux 6.5, Matlab R2010a working
- Red Hat Enterprise Linux 6.5, Matlab R2011a working
- Red Hat Enterprise Linux 6.5, Matlab R2012a working
- Red Hat Enterprise Linux 6.5, Matlab R2013a. simulation working, createLayers not tested (no SBToolBox2 available).

Installation:

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Download and unpack the .zip file into any folder accessible by Matlab.

Open Matlab and type in "pathtool" (without quotation marks). Add main folder of Layering Toolbox and press "Save".

Usage:

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The Layering Toolbox comes with three examples based on the the article (see above). These examples are located in the sub-folder "examples/".

Each example contains two Matlab scripts, "createLayers.m" and "simulateExample.m", as well as an SBML model (*.xml).

To create the models of layers from the corresponding SBML file, navigate in Matlab to the corresponding folder and type in "createLayers". This step is not necessary since the models are already created in the current distribution. Thus, the scripts "createLayers.m" mainly serve for reference on how to create layer models for other SBML models.

The scripts "simulateExample.m" demonstrate how the Layering Toolbox is intended to be used.

These scripts reproduce some of the results from the article. To learn how to use the

Layering Toolbox, we recommend to first take a look into the files in the folder

"examples/Controller", then into "examples/McClean2007", and finally "examples/Hynne2001". This order

corresponds to increasing complexity of the examples.

All examples and all functions of the Layering Toolbox are intensively documented. Type in "help <function_name>", with <function_name> the name of a function of the Layering Toolbox, to view the corresponding documentation.

The functions which should be of highest interest are-in our opinion-the following:

- createLayering: creates the models of the layers of a network based on an SBML model and the definition of which reaction belongs to which functionality.
 - simulateLayers: simulates the layers for a given ordering of functionalities.
 - createLayerGraph: efficiently derives the dynamics for all layers of all orderings of functionalities, and returns them as a layering graph.
 - getXXXFromLayerGraph: functions to extract the layer dynamics, the mutual dynamics, incompatibilities and cooperativities from the layering graph.
- Most of the other functions correspond to helper functions typically not called directly. We refer to the corresponding documentations for more information.

Contact:

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If there are questions, please contact:

Prof. Antonis Papachristodoulou

Department of Engineering Science, University of Oxford, Oxford, United Kingdom

http://sysos.eng.ox.ac.uk/control/sysos/index.php/Main_Page

E-Mail: antonis at eng point ox point ac point uk