

Simport : A Simulink Model Importer for Scicos

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Simport

A comprehensive translator from Simulink models to Scicos and VisSim SIMULATE (VSS) models

- Entirely written in OCaml (91k lines of code)
- Designed as a compiler (semantics passes + code generation)
- Easy to maintain and extend

Joint work:

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Capabilities

Simport translates Simulink models to Scicos/VSS models:

- Preserving model hierarchy and diagram topology
- Respecting visual aspects of the original model
- Aiming to preserve semantics consistency
- Supporting both MDL and SLX file formats
- Embedding of supporting Matlab M-files into Scicos/VSS models

Translator front-end

The front-end generates the Scicos/VSS model description of the Simulink model.

- Parsing (lex/yacc) from Simulink model source file to shadow abstract syntax trees (model AST)
- Semantics analysis to obtain deep syntax from shadow syntax (deep syntax contains the semantics of the Simulink model)
- Translation from deep syntax to explicit syntax:
 - inheritance is made explicit
 - Simulink lines are converted to Scicos/VSS connectors and split blocks

Translator back-end

Target code is defined as an abstract Scicos/VSS API.

- Scicos/VSS API instructions: abstract API for Scicos/VSS to instantiate and parameterize blocks, lines, diagrams and model properties
- Simport generates this abstract code (list of API function calls)
- Generated code is host language independent (NSP or Scilab for Scicos, HyperMath for VSS target)
- In the last stage of translation, the abstract code is converted into a script for the host language

Simport block translation library

Simport translation library covers a large set of Simulink basic blocks.

Each source block is translated either into

- an equivalent Scicos block, or
- a Super Block specialized according to the parameters of the source block, or
- an empty Super Block for user completion, if source block not yet supported

Block translation generates corresponding abstract API code.

Target code translation

Abstract API instructions are translated to concrete code of the Scicos/VSS host language, with:

- Provision for model simulation parameters
- Support for syntax and semantics peculiarities of the host language
- Translation of various Simulink model expressions to the host language (e.g. Matlab expressions and Matlab supporting M-files)

SLX format translator

SLX files are the current output format for Simulink; file format is OPC (Open Packaging Convention): a zip archive with XML files describing the model.

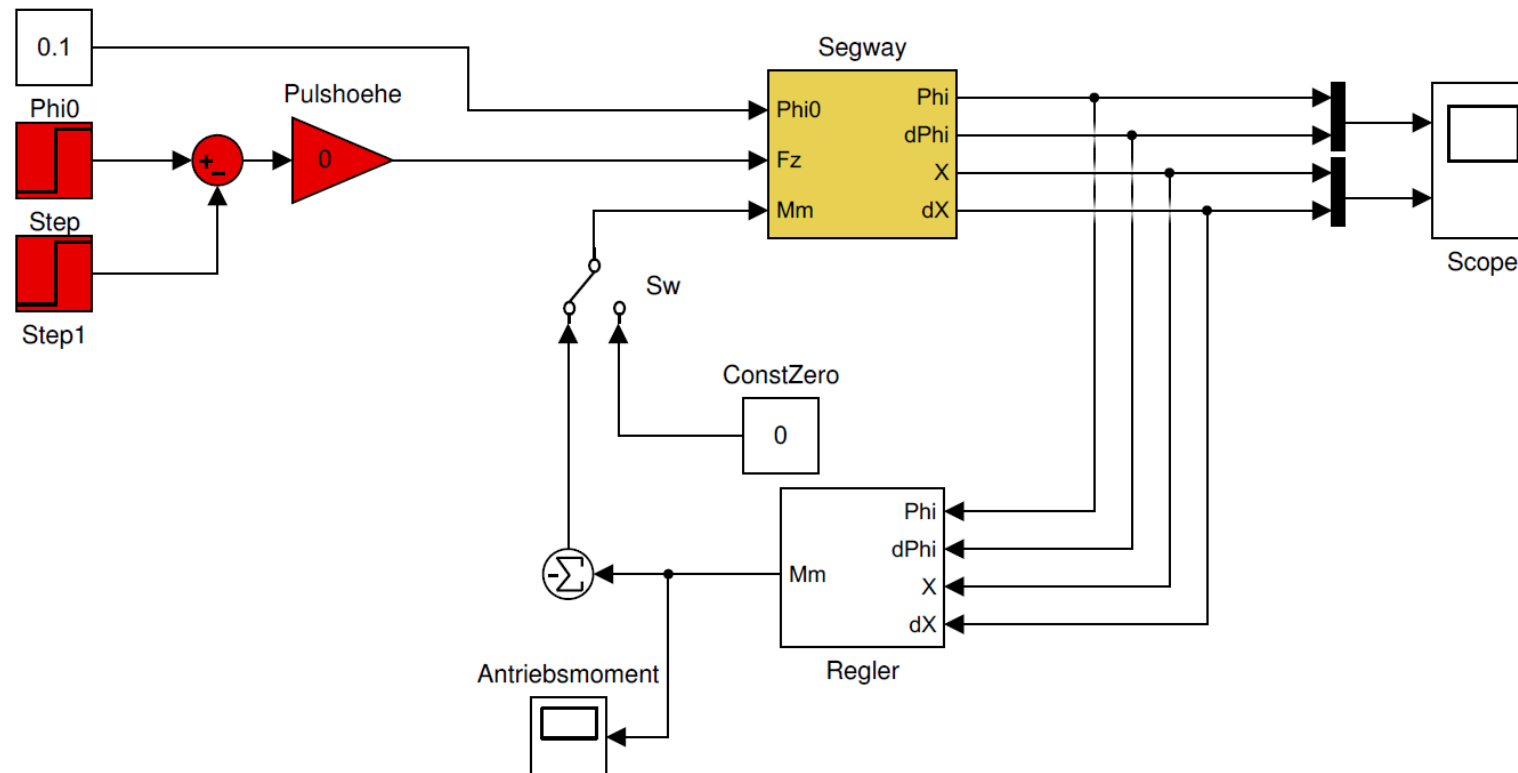
SLX files are converted to model abstract syntax trees as follows:

- Uncompress the SLX file
- Parse the model XML files
- Analyze the XML AST
- Translate XML AST to model shadow AST

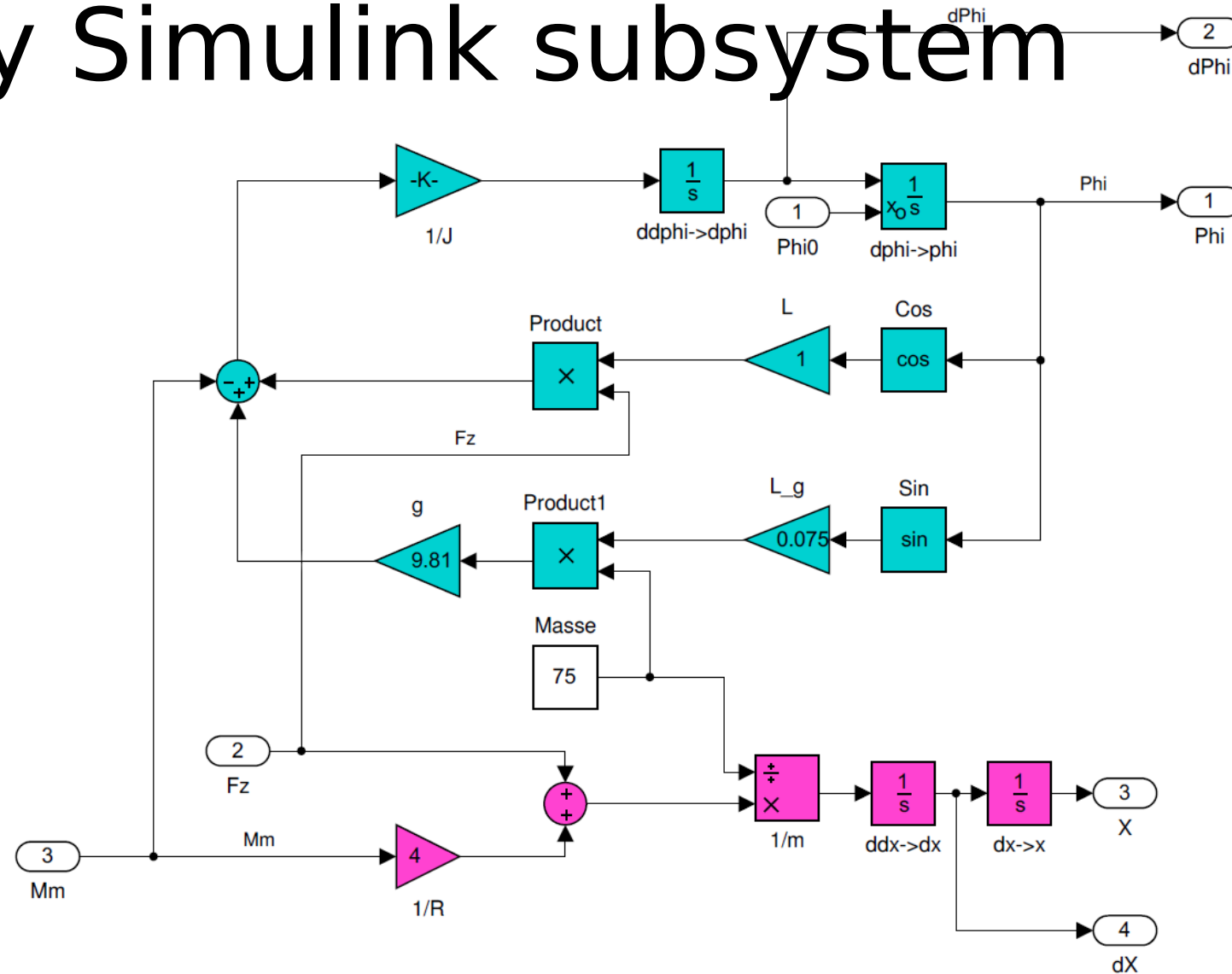
Proceed as before by calling the translator semantics analysis steps

Segway Example

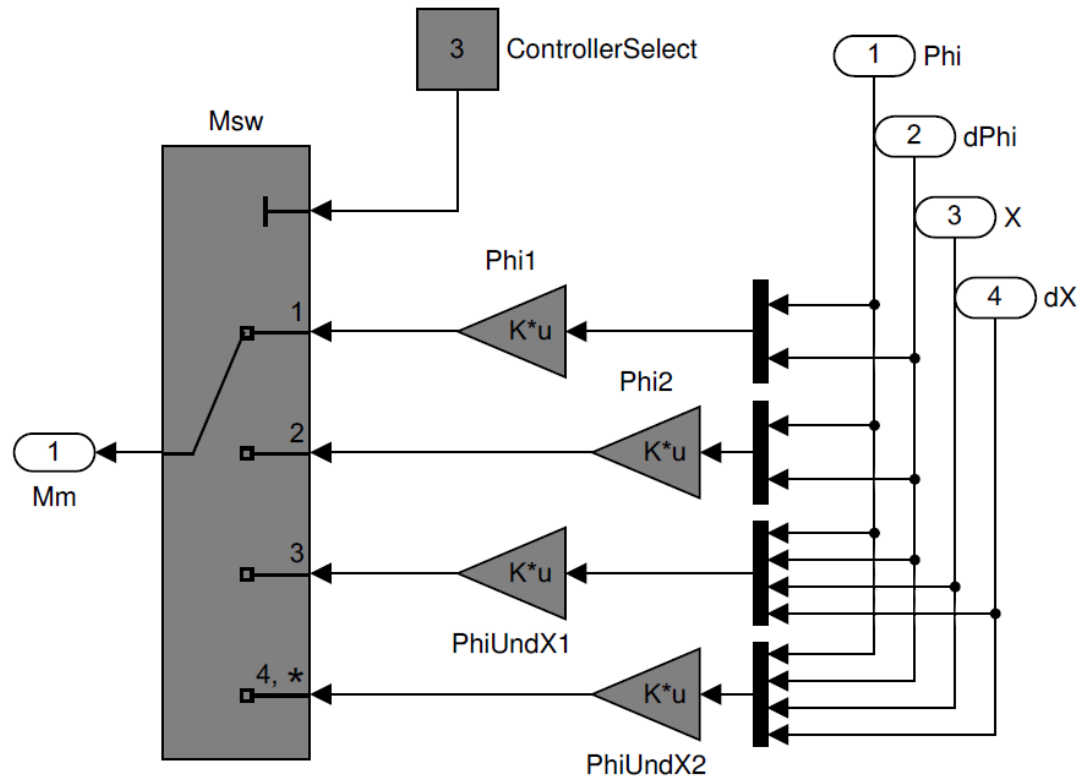
Given the Segway Simulink model, saved in file Segv



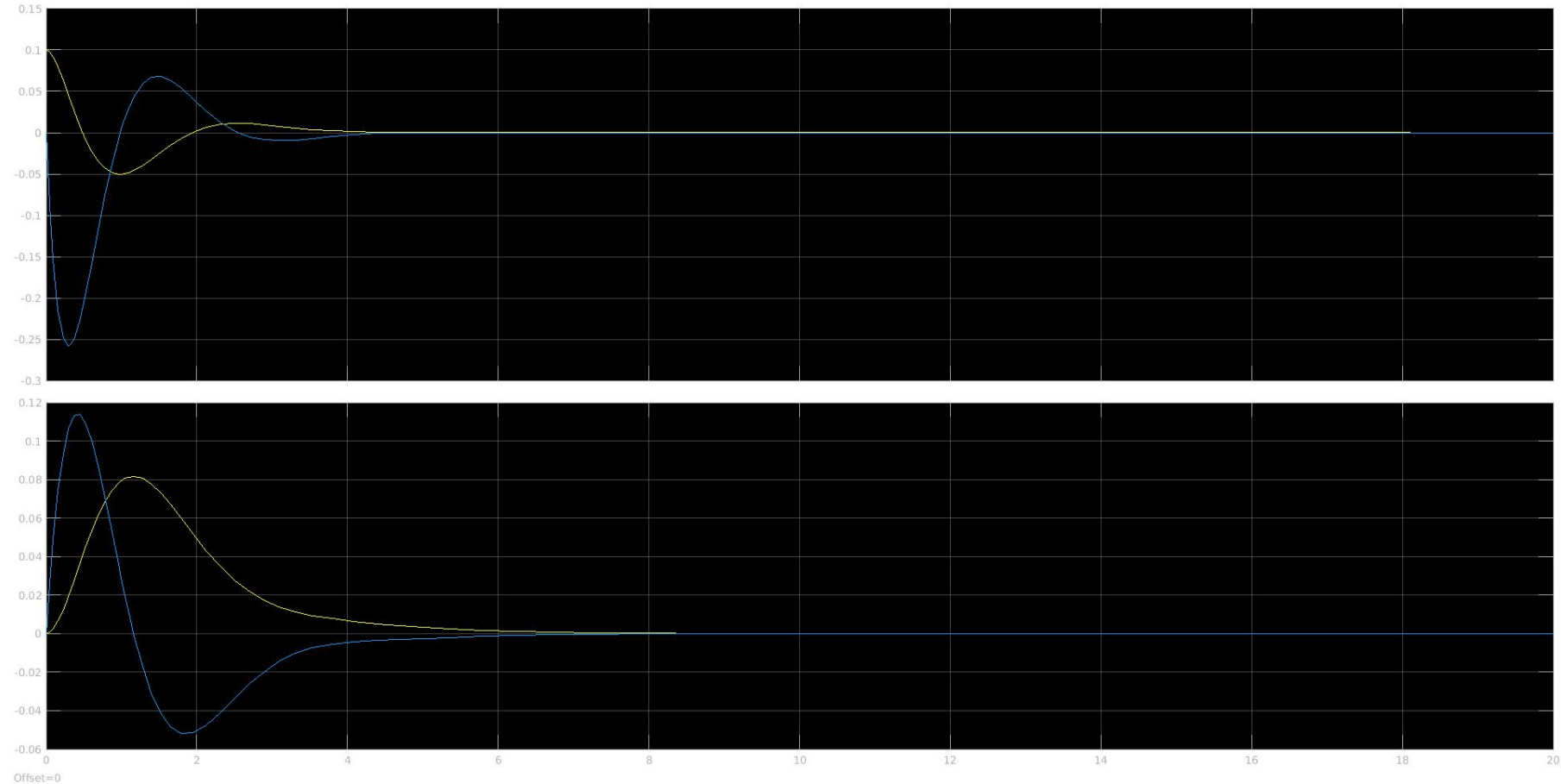
Segway Simulink subsystem



Segway controller Simulink subsystem



Segway Simulation result in Simulink



Translating the Simulink Segway model

Segway model is translated into HyperMath via the command:

```
$ simport -sv vss -tl hml Segway.mdl
```

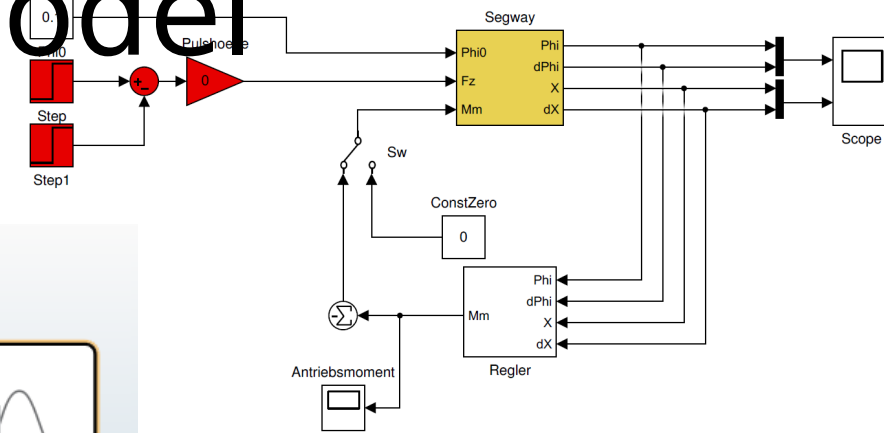
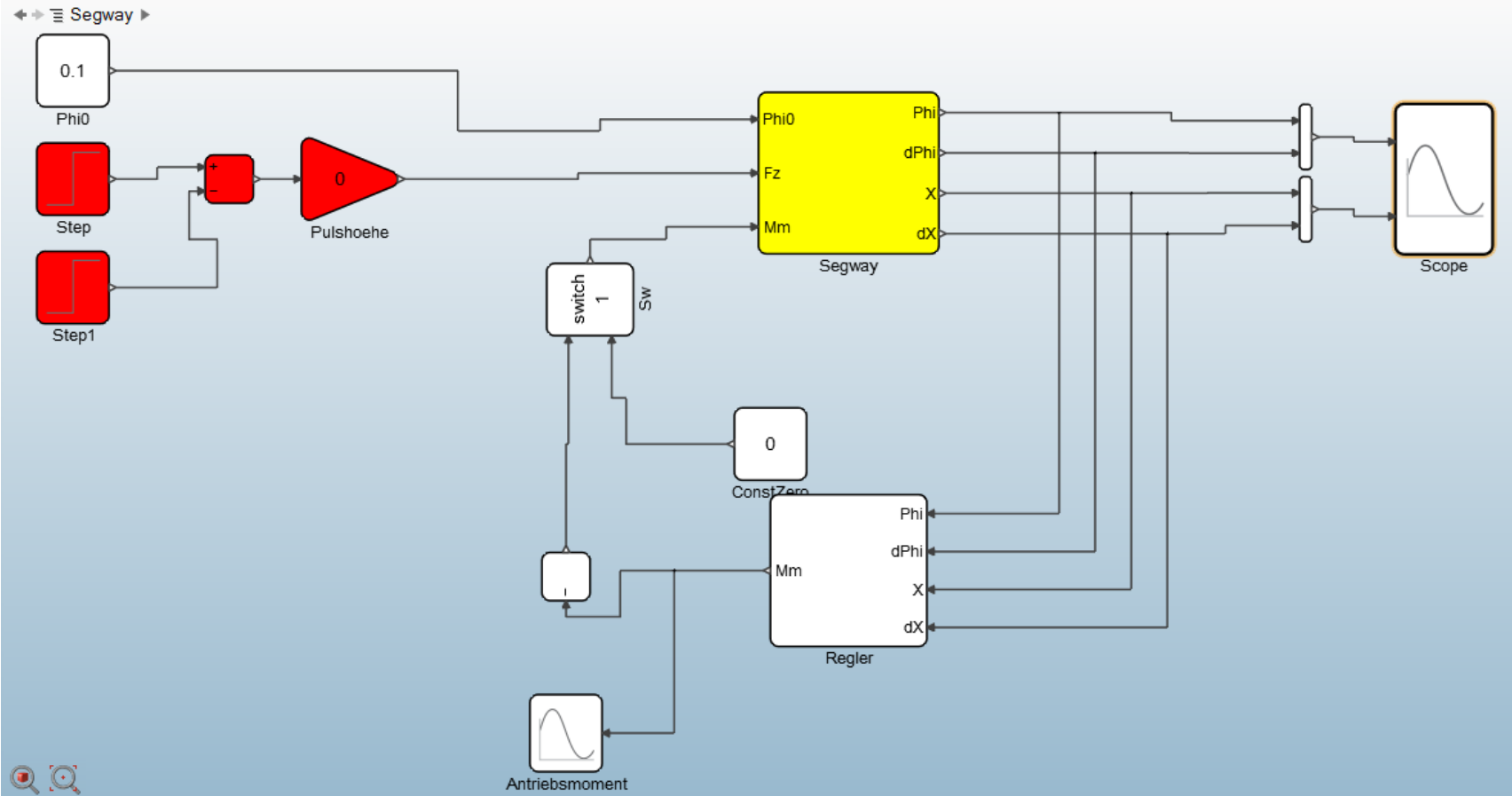
- sv: Scicos variant (scicos or vss)
- tl: Host language (nsp, scilab or hml)

producing the file Segway.hml.

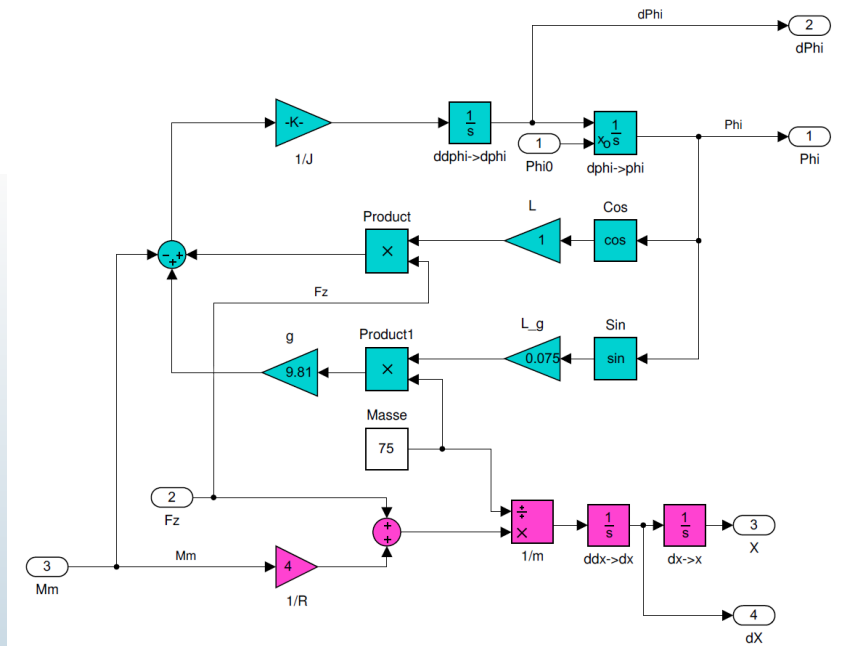
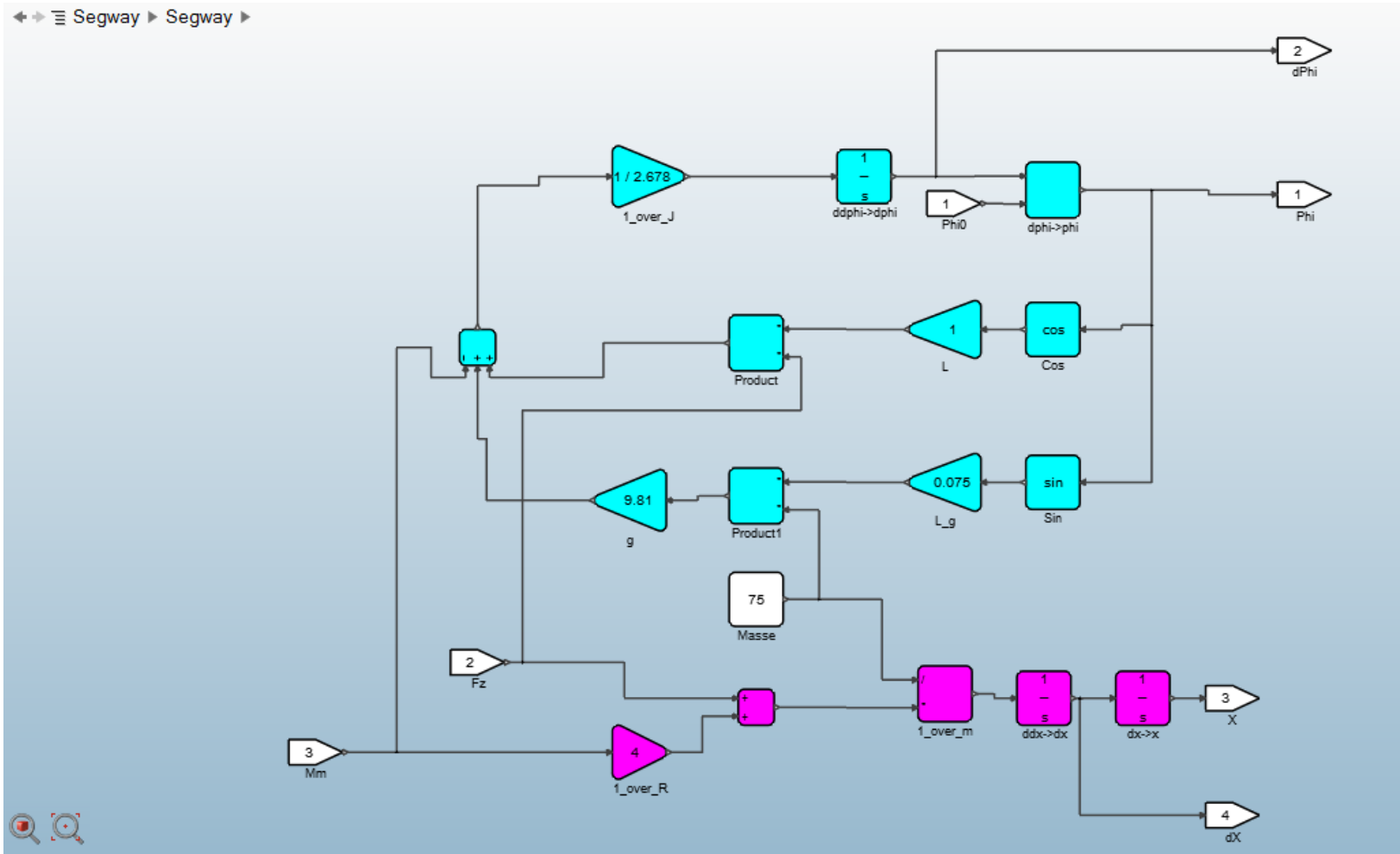
Segway.hml script execution produces corresponding VSS model

An import assistant tool based on Simport is provided for Scicos and VSS tools

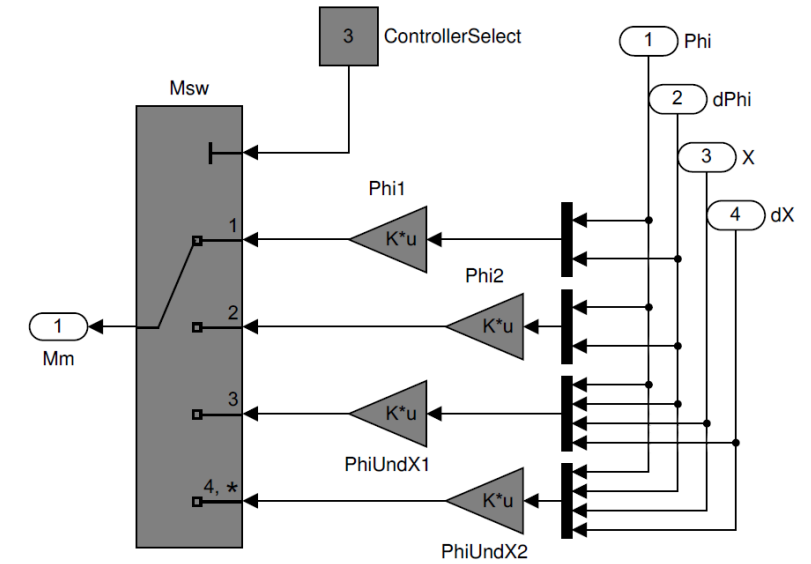
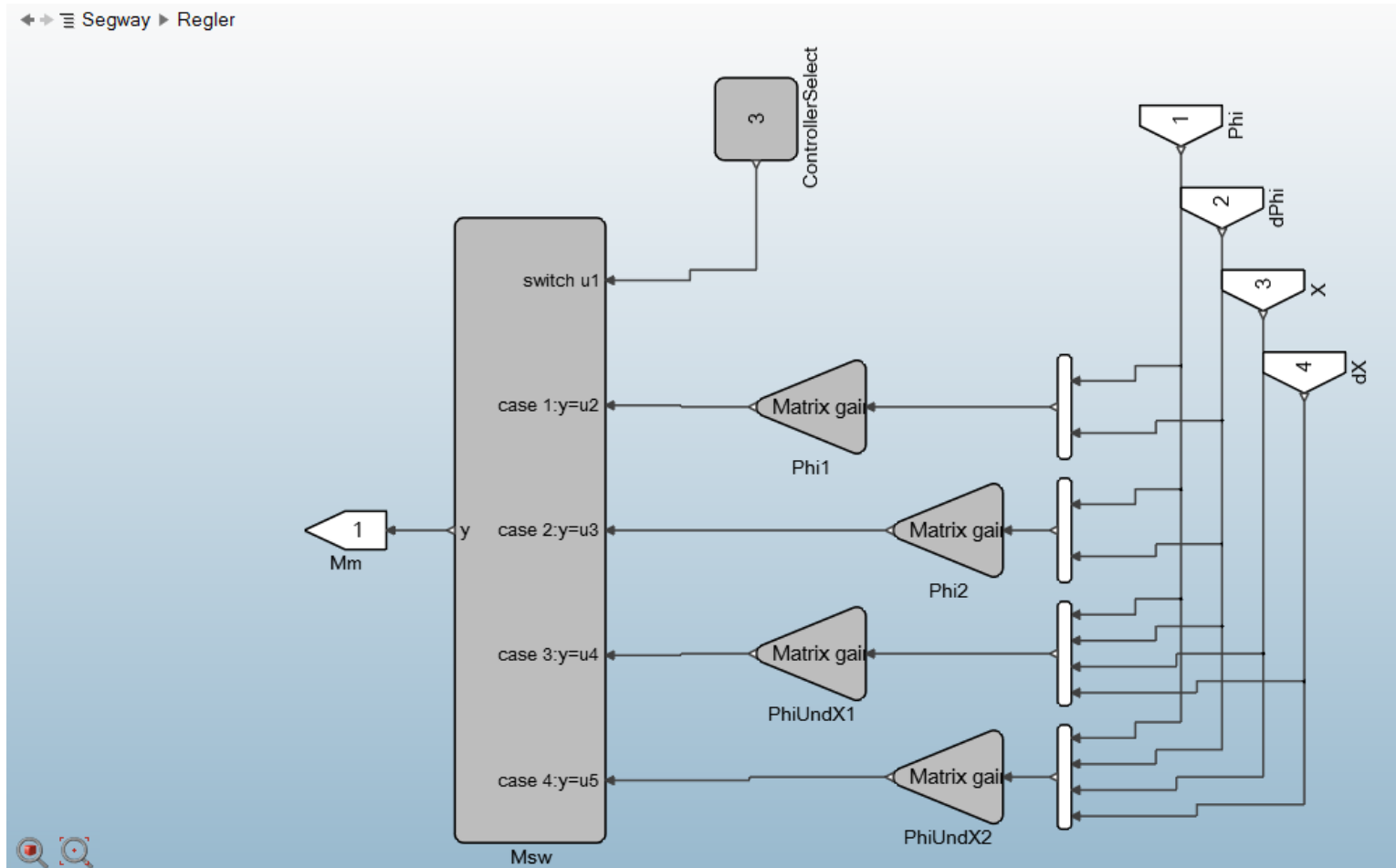
Resulting Segway VSS model



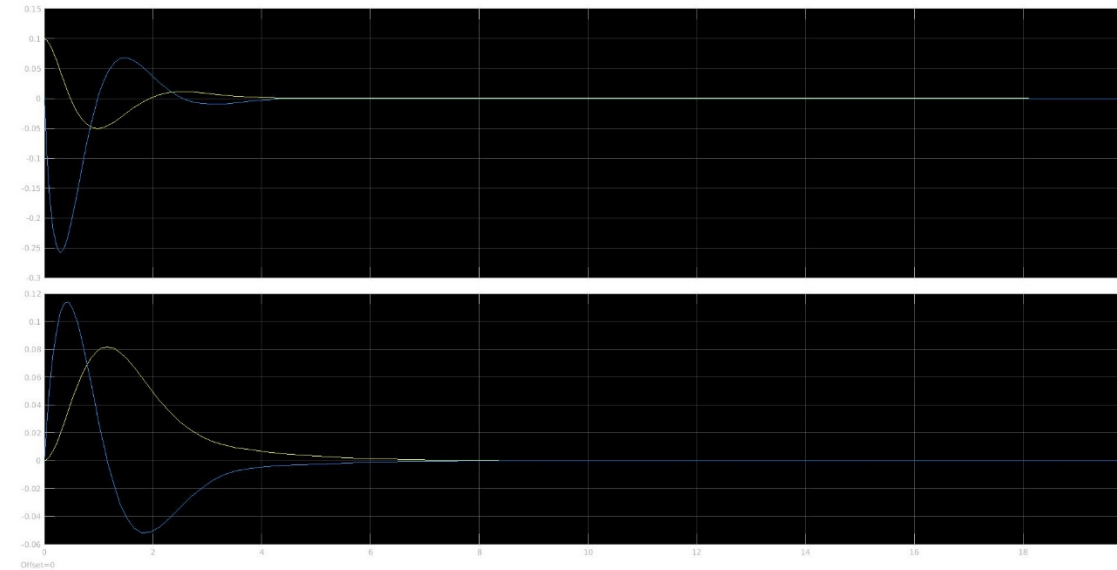
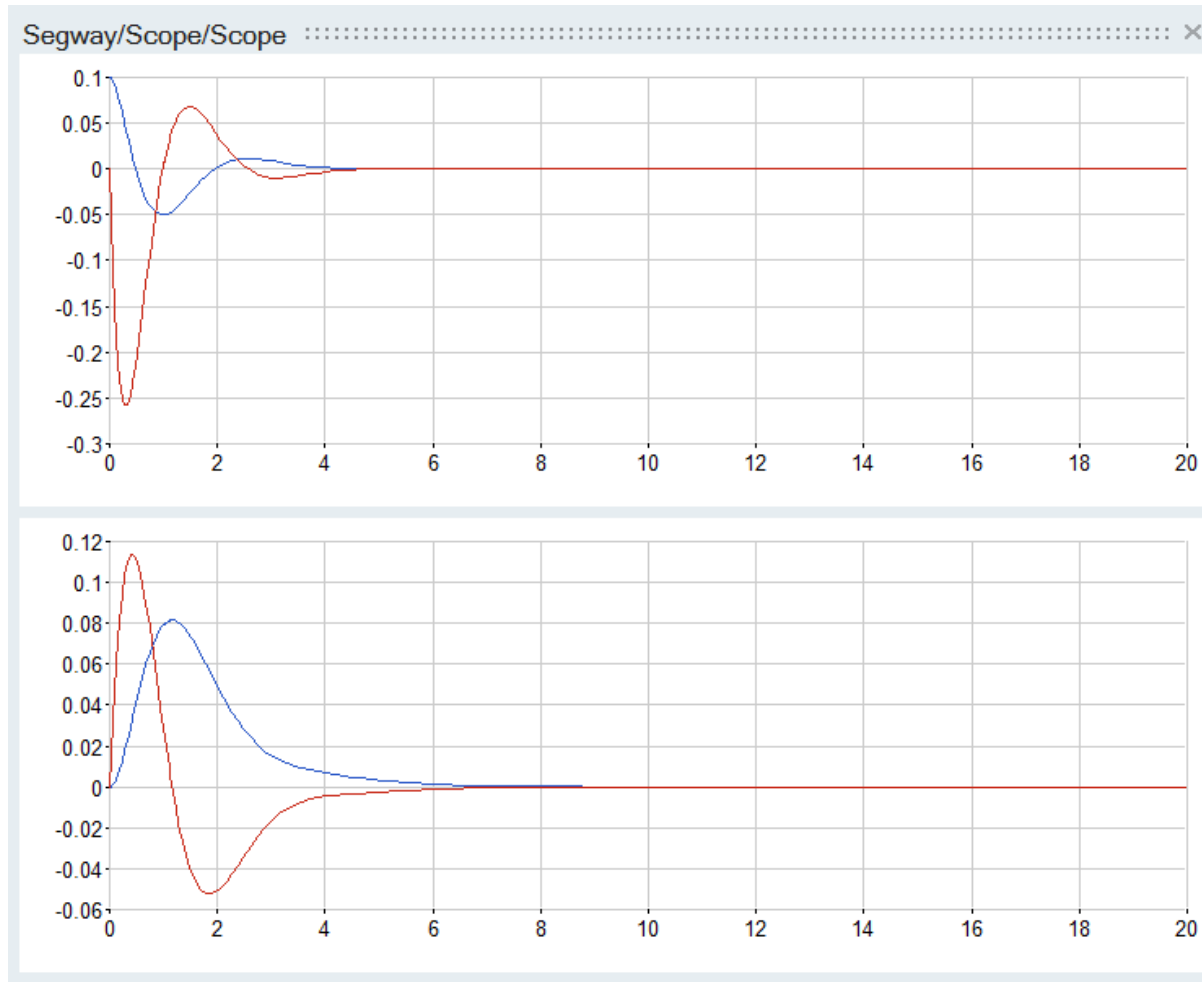
Segway VSS subsystem



Controller VSS subsystem



Simulation result of Segway VSS model



File Edit View Tools **Simplet**
Simulink Diagram

Files Model Diagram Simulate

Super Block Mask Orient Align Center

Home

Project Browser

Palette Browser

System

- Base
- Advanced

Property Editor

Name	Value
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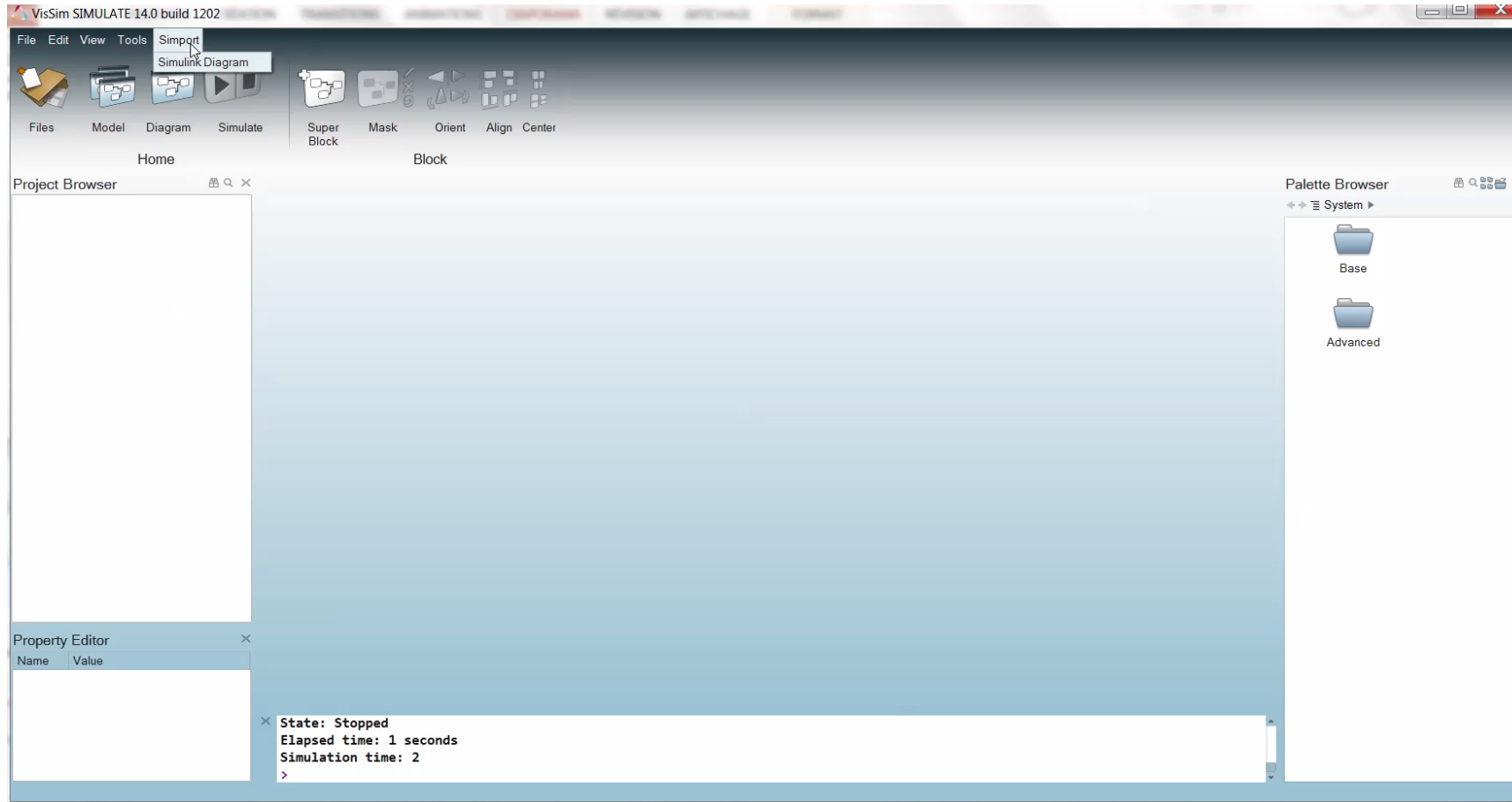
State: Stopped
Elapsed time: 0 seconds
Simulation time: 20
>

Simport features

The Simport translator

- Preserves model hierarchy and graphical aspects
- Supports initialization Matlab scripts and functions
- Fully supports Subsystem Masks
- Handles Atomic subsystems
- Partially supports Buses
- Supports User-defined functions such as the block **Fcn**

Masked subsystem and initialization script



Simport limitations

- Not all Simulink basic blocks are covered
- Partial coverage of some semantics constructions (Enabled, Triggered and Action subsystems,...)
- No translation for Stateflow and Simscape components (there is currently no Scicos/VSS equivalents)
- No S-Function support
- Limited support for Matlab blocks (only syntactic translation)

Conclusion

Simport is a fast and reliable translator from Simulink models in MDL and SLX file formats to Scicos or VSS models.

- It is freely available for Unix, MacOS X and Windows (<http://bazaar.inria.fr/simport/>)
- Simport is already distributed with NSP/Scicos (<http://scicos.org/>).
- Professional services available by Sciworks Technologies company (<http://sciworkstech.com/>):
 - specific block and library translation developments
 - Simport based migration services