

Modelling SMIB system using OpenIPSL

Spoken Tutorial Project
<https://spoken-tutorial.org>

National Mission on Education through ICT
<http://sakshat.ac.in>

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Learning Objectives

In this tutorial, we will learn:



Learning Objectives

In this tutorial, we will learn:

- ▶ **What is a controlled SMIB system**



Learning Objectives

In this tutorial, we will learn:

- ▶ **What is a controlled SMIB system**
- ▶ **How to model a controlled SMIB system**



Learning Objectives

In this tutorial, we will learn:

- ▶ **What is a controlled SMIB system**
- ▶ **How to model a controlled SMIB system**
- ▶ **How to connect the components**



System Requirements



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- ▶ **OpenModelica version 1.12.0**

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- ▶ **Ubuntu Linux OS 16.04**



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- ▶ **OpenModelica version 1.12.0**
- ▶ **Ubuntu Linux OS 16.04**
- ▶ **Windows, Mac OS X or FOSSEE OS on ARM**

Prerequisites

To follow this tutorial, you should have knowledge of :



Prerequisites

To follow this tutorial, you should have knowledge of :

- ▶ Power systems



Prerequisites

To follow this tutorial, you should have knowledge of :

- ▶ Power systems
- ▶ Modeling using OpenModelica



Prerequisites

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- ▶ Power systems
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Prerequisite tutorials are available on <https://spoken-tutorial.org>

Prerequisites

In earlier tutorials we have already seen



Prerequisites

In earlier tutorials we have already seen

- ▶ how to simulate a SMIB system and



Prerequisites

In earlier tutorials we have already seen

- ▶ how to simulate a SMIB system and
- ▶ how to interpret its results



What is a controlled SMIB system?



What is a controlled SMIB system?

- ▶ **The SMIB system which we are going to model is a controlled one**



What is a controlled SMIB system?

- ▶ **The SMIB system which we are going to model is a controlled one**
- ▶ **The generator is controlled with the help of Automatic Voltage Regulator(AVR) and Power System Stabilizer(PSS).**



What is a controlled SMIB system?

Automatic Voltage Regulator (AVR)

- ▶ AVR regulates the generator terminal voltage



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Automatic Voltage Regulator (AVR)

- ▶ AVR regulates the generator terminal voltage
- ▶ This is done by controlling the amount of current supplied to the generator field winding by the exciter.

What is a controlled SMIB system?

Automatic Voltage Regulator (AVR)

- ▶ AVR regulates the generator terminal voltage
- ▶ This is done by controlling the amount of current supplied to the generator field winding by the exciter.
- ▶ AVR improves the voltage regulation of the system



What is a controlled SMIB system?

Power System Stabilizer(PSS)

- ▶ PSS is installed with AVR to damp the low frequency oscillations in power system



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Power System Stabilizer(PSS)

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What is a controlled SMIB system?

Power System Stabilizer(PSS)

- ▶ PSS is installed with AVR to damp the low frequency oscillations in power system
- ▶ This is done by providing a supplementary signal to the excitation system
- ▶ PSS improves the damping of the system



What is a controlled SMIB system?

- ▶ **Optimal tuning of AVR controller and PSS parameters is necessary**
- ▶ **This is to obtain better voltage regulation and oscillation damping in the system.**

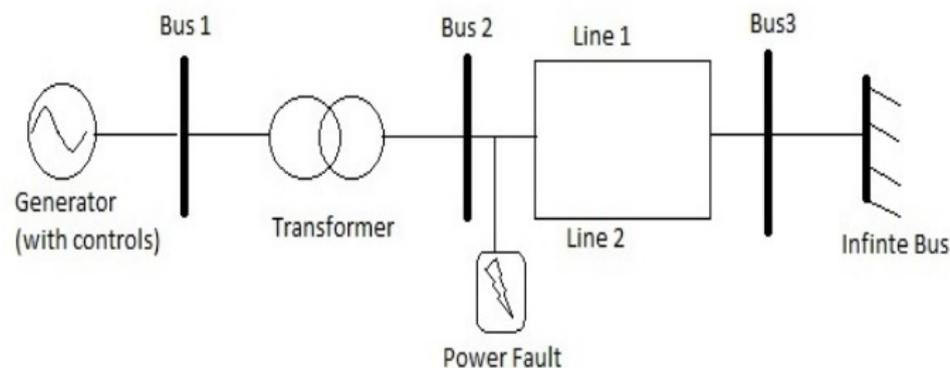


How to model a SMIB system?

Before launching OMEdit let us look at the Single Line Diagram of the SMIB system



How to model a SMIB system?



Single Line Diagram(SLD) of SMIB system

How to model a SMIB system?

The following are the components required to model SMIB system



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- ▶ Generator Order VI



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- ▶ **Generator Order VI**
- ▶ **Buses**



How to model a SMIB system?

The following are the components required to model SMIB system

- ▶ Generator Order VI
- ▶ Buses
- ▶ Two winding transformer



How to model a SMIB system?

The following are the components required to model SMIB system

- ▶ **Generator Order VI**
- ▶ **Buses**
- ▶ **Two winding transformer**
- ▶ **Power System Stabilizer (Order II)**



How to model a SMIB system?



How to model a SMIB system?

- ▶ **Automatic Voltage Regulator (Order III)**



How to model a SMIB system?

- ▶ **Automatic Voltage Regulator (Order III)**
- ▶ **Power Line**



How to model a SMIB system?

- ▶ **Automatic Voltage Regulator (Order III)**
- ▶ **Power Line**
- ▶ **Infinite Bus**



How to model a SMIB system?

- ▶ **Automatic Voltage Regulator (Order III)**
- ▶ **Power Line**
- ▶ **Infinite Bus**
- ▶ **Power Pin**



How to model a SMIB system?

- ▶ **Automatic Voltage Regulator (Order III)**
- ▶ **Power Line**
- ▶ **Infinite Bus**
- ▶ **Power Pin**
- ▶ **Fault Block**



How to model a SMIB system?

- ▶ **Automatic Voltage Regulator (Order III)**
- ▶ **Power Line**
- ▶ **Infinite Bus**
- ▶ **Power Pin**
- ▶ **Fault Block**
- ▶ **System Data**



Summary

Let's summarize:

- ▶ **What is a controlled SMIB system**
- ▶ **How to model a SMIB system**
- ▶ **How to connect the components**



Assignment

- ▶ We recommend that you take an example network from any textbook or publications.
- ▶ Using the OpenIPSL library components, connect and model the network.



Power System Simulation Project

The FOSSEE team

- ▶ Invites contributions to develop power system networks using OpenIPSL library
- ▶ Gives honararium and certificates to those who do this
- ▶ For more details, please visit this site
<https://om.fossee.in/powersystems>



About the Spoken Tutorial Project

- ▶ Watch the video available at https://spoken-tutorial.org/What_is_a_Spoken_Tutorial
- ▶ It summarises the Spoken Tutorial project
- ▶ If you do not have good bandwidth, you can download and watch it



Spoken Tutorial Workshops

The Spoken Tutorial Project Team

- ▶ Conducts workshops using spoken tutorials
- ▶ Gives certificates to those who pass an online test
- ▶ For more details, please write to contact@spoken-tutorial.org



Forum to answer questions

- ▶ **Do you have questions in THIS Spoken Tutorial?**
- ▶ **Choose the minute and second where you have the question.**
- ▶ **Explain your question briefly.**
- ▶ **Someone from the FOSSEE team will answer them.**

Please visit <https://forums.spoken-tutorial.org/>



Forum to answer questions

- ▶ **Questions not related to Spoken Tutorial?**
- ▶ **Do you have general / technical questions on the software?**
- ▶ **Please visit the FOSSEE Forum**
<https://forums.fossee.in/>
- ▶ **Choose the software and post your question**



Textbook Companion Project

- ▶ **The FOSSEE team coordinates coding of solved examples of popular books**
- ▶ **We give honorarium and certificate to those who do this**

For more details, please visit this site:

<https://OM.fossee.in/Textbook-Companion-Project>



Lab Migration Project

- ▶ **The FOSSEE team helps migrate commercial simulator labs to OpenModelica**
- ▶ **We give honorarium and certificates to those who do this**

For more details, please visit this site:

<https://OM.fossee.in/lab-migration-project>



Acknowledgements

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- ▶ **It is supported by the National Mission on Education through ICT, MHRD, Government of India**
- ▶ **More information on this Mission is available at <https://spoken-tutorial.org>**

/NMEICT-Intro



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Thanks!

<https://openmodelica.org>

