eSim: An Open Source CAD Software for Circuit Simulation

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1st Asia/South Pacific MOS-AK Workshop
Delivered Online from IIT Bombay
26 February 2021
Outline

1. eSim
2. eSim promotion
3. Collaborative content creation
eSim

- Mixed Signal Simulation platform
- GPL
eSim is made from

- KiCAD
- Ngspice
- GHDL
XSPICE Code Model

ADC

Digital Simulation

DAC

Spice3

Analog Simulation
1. analog signal

ADC

2. event generation and code model invocation

XSPICE Code Model

3. start server and push event

4. digital signal

5. simulated values

Microcontroller

6. push back simulated values

7. simulated digital signal

Digital Simulation in GHDL

DAC

8. analog signal

Spice3

Analog Simulation

Server Module

Testbench (corresponds to a digital model)

commands to interact with client

NGHDL Server

C model

Core Module

facilitates sharing of variables and functions

Utility Module (VHDL model)

VHDL model

Peripheral Module
Oscad
An open source EDA tool for circuit design, simulation, analysis and PCB design

Yogesh Save, Rakhi R, Shambulingayya N. D.
Rupak M. Rokade, Ambikeshwar Srivastava
Manas Ranjan Das, Lavitha Pereira
Sachin Patil, Srikant Patnaik
Kannan M. Moudgalya

http://oscad.in

Salient Features of Oscad

- It is an acronym for Open source computer aided design
- It is a free and open source EDA (Electronic Design Automation) tool, developed at IIT Bombay
- It can be downloaded from http://oscad.in
- It is created using open source software packages, such as KiCad, Ngspice, Scilab and Python
- It can create circuit schematics, perform simulations and design PCB layouts
- It can create/edit new device models and subcircuits
- It has a Scilab based Mini Circuit Simulator (SMCSim) that is capable of giving the circuit equations
- It runs on GNU/Linux at present - efforts are underway to port it to Windows and Mac OS X
- It also runs on Aakash: The world's lowest cost computing device

About this book

- It explains how to install Oscad and to use it
- It explains each of circuit schematic creation, performing simulations, design of PCB layouts and creation of models and subcircuits in separate chapters with screenshots and illustrations
- It demonstrates the use of Oscad through solved examples on the topics of Diode, BJT, MOSFET, Op-amp and CMOS
- It explains the porting of Oscad on to Aakash with a few photographs
- It gives details of how one can get free training on the use of Oscad through Spoken Tutorial based SELF workshops
- It explains how the academic and the professional community can work together to use and to improve Oscad through (1) Spoken Tutorial based SELF workshops (2) Textbook Companion project (3) Lab Migration project and (4) Student and volunteer projects

Oscad effort is a part of the FOSSEE project, funded by the National Mission on Education through ICT, MHRD, Government of India


SHROFF PUBLISHERS & DISTRIBUTORS PVT. LTD.

fossee better education
- Printed 9,000 copies
- Price: $1
- Distributed to a workshop participants
- Changed the name to eSim
Promoting eSim
Motive: Employment through IT

- 50% of Indians are below 25 years
Motive: Employment through IT

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- Two thirds below 35 years
Motive: Employment through IT

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- Pain points
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- In terms of markets and opportunities, India is like a continent
Motive: Employment through IT

- 50% of Indians are below 25 years
- Two thirds below 35 years
- Pain points
  - Education quality, finding good teachers, providing jobs
- In terms of markets and opportunities, India is like a continent
- Information Technology (IT) training can improve employment potential
Came up with the idea of Spoken Tutorials for training
Spoken Tutorial is a 10 minute long audio-video tutorial
Created for Self Learning

Novice check of the underlying script
Design for Self Learning Tutorials

1. **Create/improve Script**

2. **Can a beginner understand it?**
   - **No**
   - **Yes**

3. **Record a video using the script**
Not fluent in English

- Make available in our languages
Hindi Dubbed Spoken Tutorial
Dub into all 22 Indian languages
Employment in IT industry needs English
Employment in IT industry needs English

Dub only the audio
- Employment in IT industry needs English
- Dub only the audio
- Dubbing requires only 5% effort
Useful in neighbouring countries

- Bangladesh, Nepal, Sri Lanka, Pakistan
- Without any additional expense!
- We have common languages
We dub in international languages also!
Spanish
Persian
Vietnamese
Sample dubbing also in Thai, Khmer, Arabic, etc.
No good Internet access

Made an offline application

Can download an entire series as a zip file

Copy into all PCs and use offline
No good Internet access

- Made an offline application
- Can download an entire series as a zip file
- Copy into all PCs and use offline
Spoken Tutorial access went up by 100 times!
Workshop for 250+ people with offline version of Spoken Tutorials
- Workshop for 250+ people with offline version of Spoken Tutorials
- Can conduct such trainings for 1,000 in one go
Myanmar workshop with no Internet, no electricity
▶ Myanmar workshop with no Internet, no electricity

▶ Photograph taken when electricity returned
Pedagogy: Side-by-side Method

Video

Software
Pedagogy: Side-by-side Method

Reduces cognitive overload
Massive faculty training workshops

- Coordinator workshop on 27 July 2019
- Main workshop on 21 Sept. 2019 for 3,200 teachers
Coordinator Workshop Movie

Video
Main Workshop
Through 119 Remote Centres

- 118 in India
- 1 in Myanmar, at MIIT, Mandalay
Astable multivibrator circuit

The actual implementation is shown next.
3 Tasks of the Workshop

1. Understand the importance of simulation
   - Measure frequency with a stop watch
   - Repeat in simulation
   - Check by hand calculation

2. Create Gerber files

3. (Optional) Make PCB+Circuit and validate
Training in the past 7-8 years

- 75,000 trained on Oscad
- 10,000 on eSim
- 7 million on all FOSS
Postal campaign

20,000 Heads of Departments were sent printed envelopes
Circuit Simulation Project

Build and Simulate Circuits
Design PCBs
Upload
Earn money
Win attractive prizes
Get certificates
Get internships
Improve job potential

For more details, please visit:
www.esim.fossee.in

Contact us:
contact-esim@fossee.in

For eSim video tutorials, visit:
http://spoken-tutorial.org

eSim
http://fossee.in

IIT BOMBAY
- 150 eSim circuits created by students
- 150 circuits migrated from PSpice and LTSpice
FOSSEE Fellowship

Performance based selection
Opportunities for everyone!
All college students (bachelors, masters, PhD. etc.) from all streams (engineering, science, arts, commerce, management, fine and applied arts, mass media etc.) are welcome to participate.

FOSSEE Summer Fellowship
Selection
Review
Screening Task
Registration

This fellowship will help you in
Jobs, Internships, Higher Studies

https://fossee.in
For more details, visit
https://fossee.in/fellowship/2020

The FOSSEE project is funded by the National Mission on Education through ICT, MHRD, Government of India.

Last date of registration:
10 January 2020

Indian Intitute of Technology Bombay
Powai, Mumbai - 400 076
Fellowship statistics

- 50,000 envelopes sent
- 9,000 registered
- 500 completed the screening tasks
- 250 found suitable
- We took 100 as Fellows for all topics
FOSSEE Fellows Created eSim on Cloud
Subscription model for training

Will people pay to get the full benefit of Spoken Tutorials?
Paid model for certification introduced in August 2018

Cost as low as 30¢ per certificate
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- Collecting high performers in the Spoken Tutorial online tests

Example:

Organised one with NASSCOM

10 companies participated

30 students out of 40 received 2 jobs each
Job Fairs

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Testimonial: Mayur
Job Fair Helps Students

- Tier-3, Tier-4 colleges have no campus placements
Job Fair Helps Students

- Tier-3, Tier-4 colleges have no campus placements
- Their students, especially toppers, suffer
Job Fair Helps Small Companies

- Small companies have difficulty in recruiting
Job Fair Helps Small Companies

- Small companies have difficulty in recruiting
- In both high and low ranked colleges
What next?

Ajit Processor
Funding

Supported by

- National Mission on Education through ICT
- Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching

Ministry of Education (MHRD), Government of India
Thank you