

WEB-BASED TEACHING ON ASIC DESIGN

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ABSTRACT: This paper presents IMiOCAD System Guide on the Internet. Microelectronic Systems Design Group (Institute of Electronics University of Mining and Metallurgy) WWW pages on microsystems design proces have been presented. □ □

INTRODUCTION

From 1995 to 1997 Microelectronic Systems Design Group from the Institute of Electronics AGH participated in the European Project SJEP 9159-95 entitled "Postgraduate education in ASIC design" [1]. In 1996 Cracow branch of ADEC (ASIC Design Education Centre) have been established and the authors are members of this branch.

This branch is a part of ADEC consortium [2]. The main founder and head of this consortium is prof. Wiesław Kuźmich from Institute of Microelectronics and Optoelectronics Warsaw University of Technology. Consortium's mission is "Help and consulting for Polish enterprises (especialy for small and medium) in acces to advanced microelectronics technologies".

Thanks to cooperation in ADEC our software and hardware facilities provided us with oportunity indeveloping new teaching curricula. In our opinion, from all the software the IMiOCAD System deserves the most remark [3]. It is used in designing Integrated Circuits and now, the IMiOCAD is available from EUROPRACTICE [4].

Since academic year 1996/97, students from Department of Computer Science at our university have been provided with lectures and laboratory on ASICs and VLSI design. They are taught different aspects and new trends in the VLSI field, i.e.: technology, design rules, CAD tools, thermal problems, micromachines and microstructures. After few years of experience we have to admit that results of the work are very useful in research and education [5], [6], [7]. Some students' projects performed during project course are taken advantage of in teaching students of our Faculty. We have also developed some applications for teaching "at distance" on the Internet. Some of the results are shown in this paper. More details need checking the www pages where a list of addresses is presented after conclusions in this paper.

INTERNET PRESENTATIONS

OF IMiOCAD SYSTEM

The IMiOCAD System (Fig. 1.) consists of programmes for design, verification and simulation of Integrated Circuits. These programmes run on Macintosh computers. Using of PC (DOS, Windows) needs a Macintosh/MacOS emulator.

Public domain technology files are distributed together with IMiOCAD System. They are also available on IMiOCAD www home page [3]. Technology files for commercial technologies are distributed on the EUROPRACTICE CD ROM.

The IMiOCAD programmes has used in education in the Institute of Electronics at the University of Mining and Metallurgy.

In the next part of this paper an internet presentation of the IMiOCAD System is shown. All the „on-line manuals” are illustrated by many figures which show them in action.

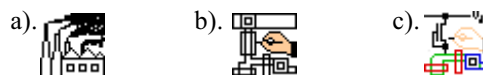


Fig. 1. The icons of presented programmes in article
a). SYPRUS, b). UNCLE, c). EXCESS

SYPRUS

SYPRUS is an Integrated Circuit Manufacturing Process and Device Simulator [8]. This programme is useful in simulation of NMOS and CMOS manufacturing processes modelling of NMOS and CMOS devices as well as in simulation of statistical process disturbances in a Monte-Carlo loop. Additionaly, the SYPRUS calculates physical parameters of simulated semiconductor structures and device model parameters for SPICE. The doping profiles are also shown.

On the www page
<http://scalak.elektro.agh.edu.pl/students/syprus/> (Fig.2.)

are described SYPRUS simulation types (in Polish). On this page a lot of dialog windows of SYPRUS are presented. The formal data in English can be found on the IMiOCAD official www pages:
<http://www.imio.pw.edu.pl/wwwvlsi/imiocad/>.

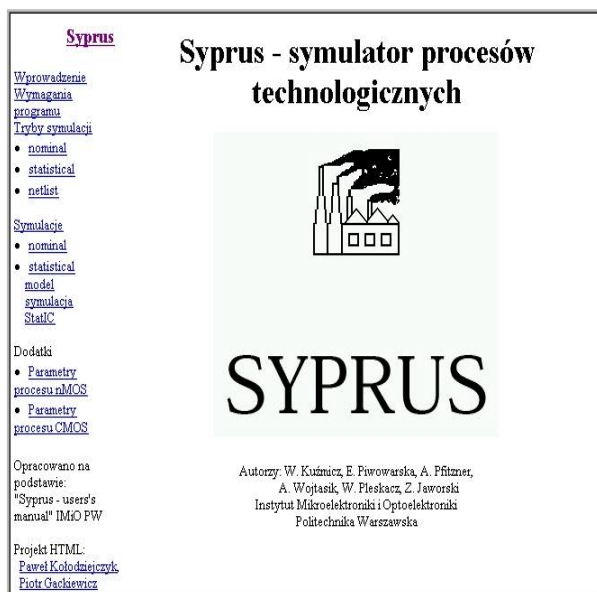


Fig. 2. Main window of SYPRUS www page

UNCLE

The UNCLE is an Universal Circuit Layout Editor [9]. There is an applet of UNCLE First Session at the internet address
<http://scalak.elektro.agh.edu.pl/students/uncle/>. This page is in Polish. Figure 3 presents one applet window of the Uncle First Session. The formal data in English can be found on the IMiOCAD official www pages.

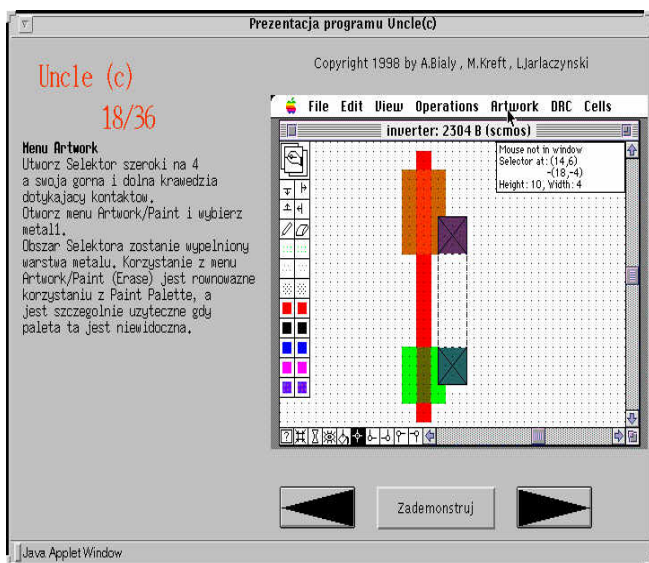


Fig. 3. Applet window of UNCLE

EXCESS

EXCESS extracts IC circuit diagram from its layout and transfer it into CIF format [10]. Internet EXCESS presentation shows first session with this software
(<http://scalak.elektro.agh.edu.pl/students/excess/>). These internet pages also present details of extraction types. Example of internet page is shown in Figure 4.

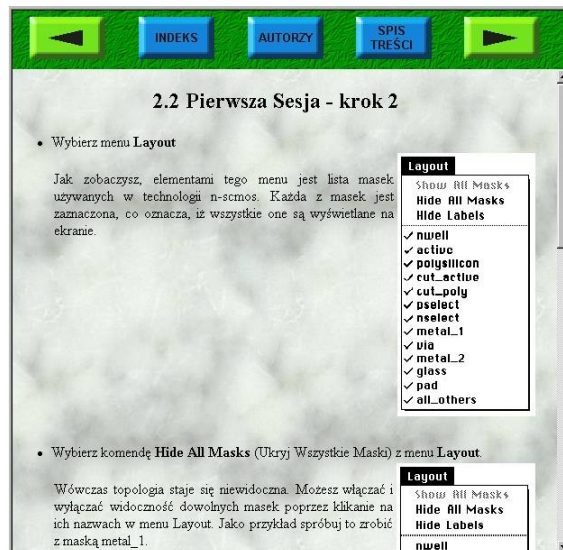


Fig. 4. Example

PROCESS OF INTEGRATED CIRCUITS DESIGN

The Cracow branch of ADEC fulfilling the mission of ASIC Design Education Centre, created the “on-line manuals” of the IMiOCAD System. The html pages present the way the Application-Specific Integrated Circuits are designed from an idea to fabricated microsystems. Two tutorials were designed. Short descriptions and internet addresses are presented below.

Tutorial 1

A description of typical design and fabrication of VLSI system is shown on
<http://scalak.elektro.agh.edu.pl/students/tutorial/>. This tutorial shows process of ASIC design by means of software owned by Institute of Electronics UMM. Tutorial shows ASIC design process from the beginning (an idea) through schematics, simulations, layout design, microcircuit elements extraction, postlayout simulation and the end verification before fabrication (Fig. 5.).



Fig. 5. Main window of ASIC design web pages

Tutorial 2

Another version of ASIC design tutorial (Fig. 6.) is on Microelectronic System Designs Group web pages and is intended for students and people who want to propagate ADEC motto "Make yourself your own IC". The Tutorial 2 presents the same topics as the previous one.

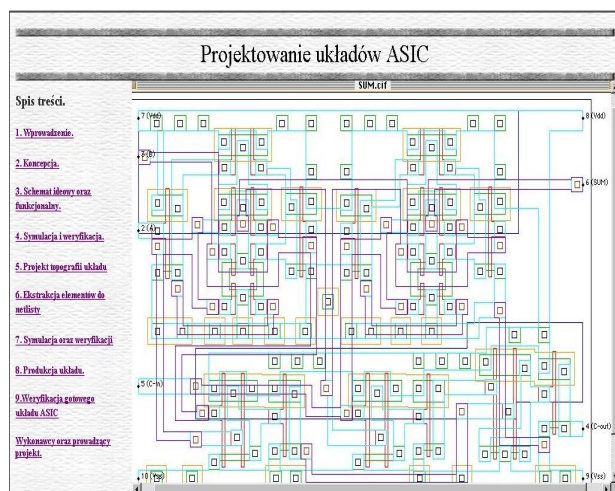


Fig. 6. Example web window of Tutorial 2

CONCLUSIONS

The paper presents some researchers' and students' projects for internet on-line IMiOCAD System Guide. WWW pages are designed for people who use the SYPRUS, UNCLE and EXCESS. This guide and ASIC Design Tutorials are created for polish designers from small and medium enterprises.

WWW addresses in the paper

ADEC Main Page:

<http://www.adec.elka.pw.edu.pl/>

IMiOCAD System:

<http://www.imio.pw.edu.pl/wwwvlsi/imiocad/>

SYPRUS:

<http://scalak.elektro.agh.edu.pl/students/syprus/>

UNCLE First Sesion Guide:

<http://scalak.elektro.agh.edu.pl/students/uncle/>

EXCESS:

<http://scalak.elektro.agh.edu.pl/students/excess/>

ASIC TUTORIAL 1:

<http://scalak.elektro.agh.edu.pl/students/tutorial/>

ASIC TUTORIAL 2

<http://scalak.elektro.agh.edu.pl/students/tutorial2/>

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