Final Year Project 2013/2014

General Requirements

Recommended development platform for all projects is Linux. Any distribution is acceptable, but Slackware is recommended. I also recommend projects that involve source codes (e.g. HDL, C, C) to use source code management (SCM) or revision control software such as [[http://git-scm.com/ git]] or mercurial. I will be providing a wiki page for every project and I expect students under my supervision to keep a project journal within that wiki page. The template page will be given. To stress the importance of this journal, I will be making it part of your final evaluation marks. ===== General Comments ===== For each project title, I've included some keywords, objective(s) and scope. The keywords are there for you to do some background research before you jump into this - I don't want you to give-up on me (it's a waste of everybody's time) towards the end of the project. I put in objectives and scope to let you know what is expected out of this project. So, your results will be based on these expectations. I define an objective as the targeted final result. I usually set only ONE primary objective and optionally a secondary objective that will/should not affect your final results (though it usually gives you extra marks if completed) - too many objectives usually leads to unsatisfactory results. Meanwhile, scope visualizes how much work is expected - for example, one can say that the primary objective is to design a microprocessor. So, the scope should mention maybe something like you're expected to design a 4-bit microprocessor up to schematics level with instruction set that covers data transfer/processing and program control, complete with logic simulation results. ====== Final Year Project 2012/2013 ====== ===== General Requirements ===== Recommended development platform for all projects is Linux. Any distribution is acceptable, but Slackware is recommended. A good alternative would be Debian. I also recommend projects that involve source codes (e.g. HDL, C, C) to use source code management (SCM) or revision control software such as git or mercurial. I will be providing a wiki page for every project and I expect students under my supervision to keep a project journal within that wiki page. The template page will be given. To stress the importance of this journal, I will be making it part of your final evaluation marks.

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Project Titles

Development of an ARM-based Mobile Robot Controller Board

Comment:

This project is purely hardware development.

Keyword(s):

ARM, microcontrollers, mobile robots

Pre-requisite:

Digital Electronics, Microprocessor System

Objective:

1. to develop a mobile robot controller board with an ARM-based microcontroller

Scope:

1. produce a working prototype for mobile robot controller
2. include/enable basic mobile robot control interface (motor, servo, sensor, etc.)

Mapping and Localization for Mobile Robot Platform Using Player/Stage

Comment:

This project is purely software development but with embedded systems application.

Keyword(s):

mapping, localization, simultaneous-LAM (SLAM), mobile robot, player/stage software

Pre-requisite:

A in Computer Programming...? (This is NOT a “Hello, World!” programming project!), Good in Maths

Objective:

1. to develop a practical mapping and localization algorithm/application for mobile robot platform

Scope:

1. using this
2. something like this
3. test on simulator platform only...

Development of 8051 Development/Training Kit

REVOKED! 😕

Comment:

This project also involves a combination of hardware and software development.

Keyword(s):

8051 microcontroller, compilers & assemblers, software library, SDK, FPGA

Pre-requisite:

Microprocessor Systems, Embedded System Design...

Objective:

1. to develop an 8051 microcontroller development and training kit

Scope:

1. develop a basic 8051 soft-core to be implemented on FPGA
2. develop assembler/compiler for 8051 (optional: worst case scenario, use existing)
3. develop a software C library for various common devices (LCD, keypad, etc.)
4. design reliable testbench to verify the core operations/interface

VGA Controller Module for Custom FPGA-based Vision Systems Verification

NO TAKERS! 😕

Comment:

This project is about digital circuit design on FPGA platform.

Keyword(s):

VGA controller, FPGA, HDL

Pre-requisite:

Digital Electronics, Microprocessor System (and MAYBE programming for kernel interfacing)

Objective:

1. to develop VGA Controller module for use on FPGA-based vision systems

Scope:

1. produce a working VGA controller module (HDL entry)

2. refer to this... maybe do higher resolution like SVGA? more...
3. must produce working interface for either linux kernel OR custom imaging logic
4. test and verify module on FPGA development board

Development of Memristor Device Model for Spice Simulation

NO TAKERS! 😕

Comment:

This project is purely software development but requires good background in low-level electronics (semiconductor physics).

Keyword(s):

memristor, device model, spice

Pre-requisite:

A in Computer Programming...? (This is NOT a “Hello, World!” programming project!), Good in Device Physics

Objective:

1. to develop a spice simulation model for a memristor device

Scope:

1. obtain open-source spice simulator code
2. learn how a model is created in spice
3. learn characteristics of a memristor
4. write a device model for memristor
5. build a simple test circuit
6. verify simulation results

Extendable FPGA Development Board for Reconfigurable Computing Platform

NO TAKERS! 😕

Comment:

This project is purely hardware development.

Keyword(s):

FPGA, reconfigurable computing, development board

Pre-requisite:

Digital Electronics, Microprocessor System

Objective:

1. to develop an extendable FPGA development board to be used as platform for reconfigurable computing research/applications

Scope:

1. produce a working prototype for FPGA development board
2. design a working interface for future extensions
3. include/enable reconfigurable computing features in the design?

Final Year Project 2011/2012

General Requirements

Recommended development platform for all projects is Linux. Any distribution is acceptable, but Slackware Linux is recommended. A good alternative would be Salix OS. I also recommend projects that involve source codes (e.g. HDL, C, C) to use source code management (SCM) or revision control software such as [[http://git-scm.com/ git]] or mercurial. I will be providing a wiki page for every project and I expect students under my supervision to keep a project journal within that wiki page. The template page will be given. To stress the importance of this journal, I will be making it part of your final evaluation marks. ===== General Comments ===== For each project title, I've included some keywords, objective(s) and scope. The keywords are there for you to do some background research before you jump into this - I don't want you to give-up on me (it's a waste of everybody's time) towards the end of the project. I put in objectives and scope to let you know what is expected out of this project. So, your results will be based on these expectations. I define an objective as the targeted final result. I usually set only ONE primary objective and optionally a secondary objective that will/should not affect your final results (though it usually gives you extra marks if completed) - too many objectives usually leads to unsatisfactory results. Meanwhile, scope visualizes how much work is expected - for example, one can say that the primary objective is to design a microprocessor. So, the scope should mention maybe something like you're expected to design a 4-bit microprocessor up to schematics level with instruction set that covers data transfer/processing and program control, complete with logic simulation results. ===== Project Titles ===== ==== Development of an ARM-compatible Microprocessor Core for FPGA-based CPU/Controller ==== **Comment**: This is a multi-discipline project and requires knowledge in both hardware and software development. **RESERVED Keyword(s)**: Microprocessor Core, ARM, FPGA, HDL Coding for Synthesis, Linux Kernel **Pre-requisite**: Microprocessor Systems, Embedded System Design... **Objective**: *still reviewing this (just a general description - mainly revolves around the idea of building a microprocessor core)* - to develop an FPGA-based general purpose CPU or controller board - (optional) to develop a mobile robot control/navigation systems using customized FPGA-based controller board **Scope**: - develop a complete microprocessor core on an FPGA (development or customized) board - design interface between the microprocessor core and the peripherals available on the FPGA board - design reliable testbench to verify the microprocessor core operations/interface - compile an operating system (e.g. Linux-based) for the board to create a general purpose CPU/controller board - test results for analysis and discussion/upgrades ==== GIT Web Interface (with Access Control) Using PHP ==== **Comment**: This project is purely software development. This is a 'support' development - 'end product' is to be

used by this group. **Keyword(s)**: git, source code management (scm), php, web-interface, access control **Pre-requisite**: A in Computer Programming...? (This is NOT a “Hello, World!” programming project!) **Objective**: - to develop a web interface with access control for GIT repositories using PHP **Scope**: - can be based on this, or write your own git backend engine - add access control, preferably using simple file DB - test on a live server ==== Development of Vision-based Driver Assistance System (DAS) ==== **DID NOT DELIVER!** **Comment**: This can be a full hardware implementation (i.e. FPGA-based) or partly software (i.e. codes running on PC/controller). In any case, it requires a good understanding in basic image processing and artificial intelligence. **Keyword(s)**: Vision systems, lane departure warning, obstacle and collision warning, traffic signs recognition, pedestrian monitoring, lane change assistance, blind spot monitoring **Pre-requisite**: Microprocessor Systems, Signal & Systems... **Objective**: - to develop a Driver Assistance System with at least 1 of the listed features **Scope**: - can be either software or hardware implementation (or even both) - a working prototype (at least 1 feature) at the end of the project - design reliable test (software simulations/in-the-lab execution) methods - test results for analysis and discussion/upgrades ==== Development of 8051 Development/Training Kit ==== **NO TAKERS!** **Comment**: This project also involves a combination of hardware and software development. **Keyword(s)**: 8051 microcontroller, compilers & assemblers, software library, SDK, FPGA **Pre-requisite**: Microprocessor Systems, Embedded System Design... **Objective**: - to develop an 8051 microcontroller development and training kit **Scope**: - develop a basic 8051 soft-core to be implemented on FPGA - develop assembler/compiler for 8051 (optional: worst case scenario, use existing) - develop a software C library for various common devices (LCD, keypad, etc.) - design reliable testbench to verify the core operations/interface ==== Mapping (and Localization, maybe) for Mobile Robot Platform Using Player/Stage ==== **NO TAKERS!** **Comment**: This project is purely software development but with embedded systems application. **Keyword(s)**: mapping, localization, simultaneous-LAM (SLAM), mobile robot, player/stage software **Pre-requisite**: A in Computer Programming...? (This is NOT a “Hello, World!” programming project!) **Objective**: - to develop a practical mapping and localization algorithm/application for mobile robot platform **Scope**: - using this - something like this - test on simulator platform only... ====== Final Year Project 2010/2011 ====== Recommended development platform for all projects is Linux. Any distribution is acceptable, but Slackware Linux is recommended. A good alternative would be Salix OS. I also recommend projects that involve source codes (e.g. HDL, C, C) to use source code management (SCM) or revision control software such as git or mercurial.

ANNOUNCEMENTS

201101211411 I've arranged for you guys to use MKR3 as a 'central' workplace. The official time that I've set is THU (1000-1500) and FRI (0800-1300). If you want, you can see En. Che Mohammad (Tech for that lab) to arrange for other times. I will be visiting you formally during that two days every week starting week 20110124-28. Please take note!

Project Titles

Implementation of an 8-bit/32-bit Microprocessor Core on FPGA

- can be RISC or CISC
- do analysis with picoblaze/microblaze as benchmark?

- implementation, testing, and improvise (if possible)
- should be expandable to micro-controller implementation

Random Number Generator (RNG) on digital hardware (i.e. FPGA)

- based on this page
- implementation, testing, and improvise (if possible)
- testing is essential - maybe design an alternative test-suite to the one used

Update This title may have been canceled by FYP Panel

Design and Implementation of an FPGA-based System

- board design based on selected FPGA (candidate: Spartan3E 500K gates)
- at least with RS232 interface, ethernet is nice to have
- obviously, need to be programmable
- external memory (e.g. SRAM) must be there
- for power requirements, this is a good reference
- it's nice to have this as well

CAD Tool Development: Circuit Simulator

- must be on linux
- use open source parser or write own (can be a project on its own?)
- start with logic simulator, must be capable of timing simulation (timing model)
- alternatively: write a VHDL version of the Icarus Verilog?
- another branch: start from spice3f5 - get it to compile on linux & improvise

CAD Tool Development: Automatic Place & Route

- must be on linux
- use open source parser or write own (can be a project on its own?)
- can be board-level or ic-level (select input netlist type and output format)

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