1. Podcasting: An Internet-Based Social Technology for Blended Learning

Prof. Dr. Hossam M Fahmy

Podcasting has the potential to enhance learning by giving students mobile access to course materials anytime, anywhere. In particular, integrating podcasting, electronic learning (e-learning), and traditional face-to-face teaching into a blended learning (b-learning) environment can help create a push-pull educational exchange that increases student learning satisfaction. The authors' empirical study reveals that students generally feel a higher level of social presence and achieve better academic results if they're involved in the development of course podcasts.

With the rapid advances in Internet technologies, an array of emerging educational support tools is now available to educational practitioners to augment traditional face-to-face teaching and learning methods. E-learning platforms give students access to instructional materials before and after normal class times. Mobile learning (m-learning) tools have further extended the reach of e-learning platforms by giving learners access to instructional materials via portable devices, such as smart phones, personal digital assistants (PDAs), and digital media players. As one such m-learning technology, podcasting offers distinct advantages by letting students engage in learning processes even when they're on the move.

Although podcasting derives its name from the Apple iPod media player (www.apple.com/pr/library/2007/04/09ipod.html), it has become one of the most popular information delivery platforms on the Internet. A podcast is simply a collection of digital audio or video files distributed over the Internet using RSS technology (http://validator.w3.org/feed/docs/rss2.html). After users subscribe to a podcast feed (or podcaster), podcasts are automatically pushed to the RSS reader or aggregator (such as iTunes) installed on their portable device or desktop computer. Even if a portable device is disconnected from the Internet, podcasts can still be pushed to the device automatically when it reconnects. Subscribers can then choose the most suitable time and venue to listen to or watch the podcasts.

Social technologies are any type of computing applications that serve as an "intermediary or a focus for a social relationship." Although these technologies, such as online chat rooms, blogs, wikis, podcasting, and online games, have been associated mostly with social interaction and entertainment, they now provide fundamental support for a variety of business and educational applications. In the educational setting, podcasting gives instructors a channel to the student's digital environment, where most young people are already comfortable. Apart from being a push-based information delivery technology, the main difference between podcasting and other social technologies commonly found on existing e-learning platforms is that podcasting (particularly audio podcasting) requires minimal cognitive attention from users. As a result, users can listen to or watch podcasts while conducting other activities, such as traveling or exercising. This unique feature makes podcasting an ideal technology to support ubiquitous m-learning. For instance, college students with portable devices, such as smart phones or media players, can utilize unexpected timeslots (such as spare time during a traffic jam or between classes) to review podcasts of course materials.

2. Building a Secure and Reliable Web Service for a Business-to-Business Application

Prof. Dr. Salma Ghoneim

Web services are open standard-based web applications that interact with other web applications for the purpose of exchanging data. Web services are considered distributed application components that are externally available to internet users. They can be used to integrate computer applications that are written in different languages and run on different platforms. Web services are language and platform independent because vendors have agreed on common web service standards.
Building a web service has recently become a straightforward task, and several technologies exist for this purpose.
Security and reliability are critical to web services especially when business partners in big enterprises use them on the internet. These features should be guaranteed to obtain the highest level of performance. Some of the existing technologies explicitly satisfy these requirements, some partly do, and some do not.

The aim of this project is threefold:

1) Learning the web service paradigm for distributed applications.
2) Using typical standard technologies to implement a web service for a certain business-to-business application with security and reliability.
3) Comparing and contrasting technologies with/ without security and reliability considerations in web service design.

3. CAD Tools for Automatic Behavioral Model Generation and Calibration

Prof. Dr. Hazem Abbas

Abstract

Analog and mixed-signal (analog and digital) systems are growing in significance and size as system-on-chip platforms continue to include more peripherals, chip-to-chip and inter-chip communication systems running at high bit rates. Meanwhile, the design process of analog and mixed signal systems is becoming more challenging as the manufacturing process advances. And so are the requirements for CAD systems.
Analog designs have a reputation of long design times. Rapid design (shorter time to market) is all about reducing the design cycle for these difficult circuits. Emphasis is on design discipline, reuse of analog intellectual property (IP), design automation, and increasing the likelihood that a mixed-signal design work on first silicon.
This project investigates a couple of real-life CAD solutions which enable IP reuse, design automation, and first silicon success; namely: automatic generation and calibration of behavioral models.
Project students are going to be divided into two groups. Each working on a separate CAD problem. Working on CAD tools is an excellent approach to exercise the computer programming and artificial intelligence knowledge you are learning at the department.

Introduction

Background

The semiconductor industry's growing ability to integrate functionality onto silicon requires that both the digital and analog circuits be increasingly integrated on the same chip [1]. It is predicted that by 2006, 70% of ASICs will contain analog content, up from 17% in 1998. Mixed signal plays a critical role in every high-value market served by the electronics industry. Communications systems (networking and wireless communications for example) must interface to the physical communications media, and those media are analog. In addition, mixed-signal design is key to overcoming the communication bottlenecks that exist in all high-performance computing systems.

What is a behavioral model?

A behavioral model is a software program which emulates the behavior of physical devices and processes. A mixed-signal behavioral model is usually implemented in a Hardware Description Language like VHDL-AMS, which is capable of describing digital, analog, and mixed-signal behavior.
The basic utility of a behavioral model of a mixed-signal circuit is:
To provide a faster substitute for the circuit in simulation environments. A behavioral model is by definition an abstract representation, which trades of accuracy for simulation speed.

To allow quick modifications to the design and analysis of the consequences of the change. It provides an environment in which experiments can be performed much more readily than with real hardware as well as opportunities to discover and exploit design trade-offs.
The following listing illustrates a simple behavioral model (a VHDL-AMS program) which represents an error amplifier. It has two analog inputs, one analog output, and one parameter (gain).

```
library IEEE;
use IEEE.math_real.all;
use IEEE.electrical_systems.all;

entity ErrorAmplifier is
    generic( Gain : REAL := 10.0);       -- amplifier gain
    port(terminal PveT,NveT: electrical; -- analog input pins
         quantity Vout : out voltage);   -- analog output
end entity ErrorAmplifier;

architecture Behavior of ErrorAmplifier is
    quantity DeltaV across PveT to NveT; -- differential input voltage
begin
       Vout == Gain * DeltaV;
end architecture Behavior;
```

What is behavioral model calibration?

For the behavioral model to give the same output as its circuit counterpart assuming the same input, the values of its parameters must take certain values. The process of determining those values is called behavioral model calibration. For example, designing a simulation experiment to inject a small-signal voltage between both inputs of the error amplifier illustrated above, and dividing the resulting output value by the differential input value to calculate the amplifier's gain is the calibration process for this error amplifier behavioral model.

Project Team A (4 Students)

Abstract

The current industrial practice for behavioral modeling calibration is manual; each behavioral model and circuit pair has their own specific method for extracting the values of the behavioral model parameters. This graduation project employs Genetic Algorithms (GA) to automate the process of behavioral model calibration.
Given model-circuit pairs, students are expected to apply single and multi-objective GA to find the right values for the behavioral model parameters so that the model output(s) match the circuit output given some input(s) values.

Matlab's GA library will be used to proof the concept, followed by an implementation in Java and Eclipse.

Deliverables

1. A working Matlab code demonstrating proof of concept.
2. A working calibration tool implemented in Java / Eclipse. Modules include a GUI, a parser, and calibration engine.

Why would you join this group?

- To learn about behavioral models calibration.
- To learn about genetic algorithms by applying it to a real-life problem.
- To learn Java & Eclipse by developing a CAD tool.
- To seize the opportunity of authoring a conference paper upon successful completion of the deliverables.

Qualifications

- Highly motivated and independent problem solver.
- Familiarity with Matlab and M-code.
- Previous Object-Oriented programming experience preferably in Java.

Project Team B (4-5 Students)

Abstract

The behavioral model development process is mostly manual. This project aims at developing an automatic model generation tool for mixed signal behavioral models in Java by re-using Eclipse libraries (Eclipse Modeling Framework and Graphical Modeling Framework). The tool architecture is adopted from [2] so this is mainly a software development effort. The tool includes the following modules:

- Specifications collection module (graphical forms).
- A relational database (MySQL).
- Control-flow diagram editor.
- Implementations of AI algorithms for model generation.

Deliverables

A working Java implementation of the CAD tool described in [2].

Why would you join this group?

To gain extensive experience in Java development and the Eclipse environment.

Qualifications

Highly motivated and independent problem solver.
Excellent knowledge of SQL.
Previous Object-Oriented programming experience preferably in Java.

4. Google TV

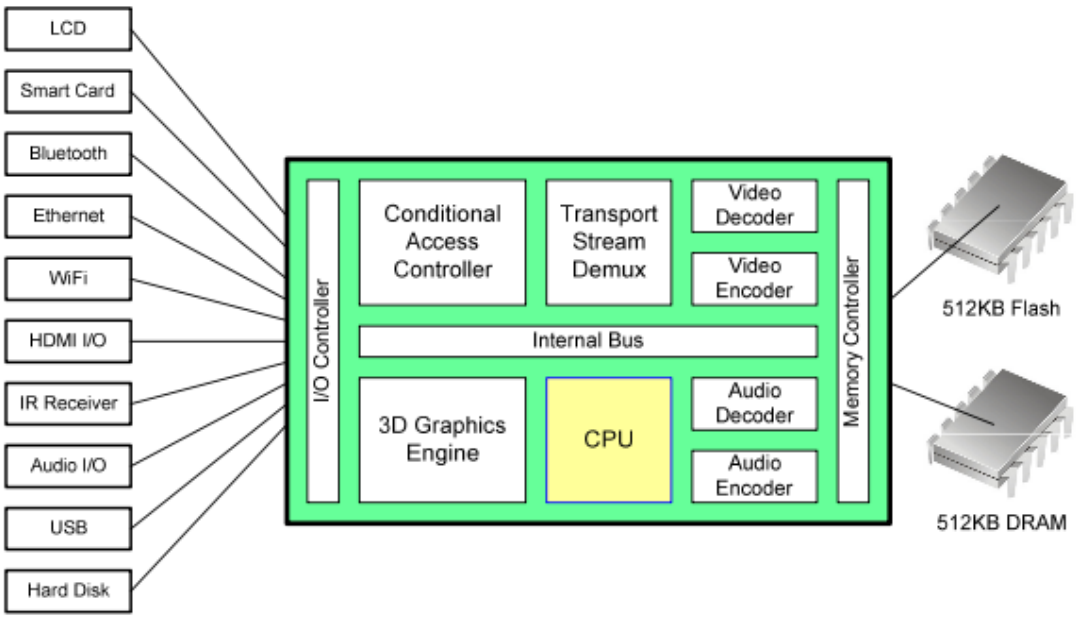
Prof. Dr. Ayman Wahba

Google recently announced Google TV—an open, architecture-neutral platform that will bring the full web experience to television viewing. The aim of the project is to develop a SOC that will support the Google TV operating system.

What is Google TV?
In May 2010, Google announced "Google TV", an open platform that adds the web to the television viewing experience. With Google TV, consumers can search and watch a large array of content available from a variety of sources including TV providers, the web, their personal content libraries and mobile applications.

Google TV is based on the Android operating system and runs the Google Chrome web browser. Users can access all of their usual TV channels as well as Internet and cloud-based information and applications, including video content available through the web and streaming videos.

Hardware Requirements
The differences between a traditional digital video based consumer electronics product and one that is prepared for "Google TV" are in the hardware and software to provide a similar web browsing experience on a TV as you would have on a PC. The following block diagram shows an example smart TV architecture.



5. Business Intelligence System for Charity Organizations

Prof. Dr. Hoda Korashy Mohamed

Throughout the past years the number of NGOs and charity organizations has been increasing rapidly and with this huge number the problems facing them have also been increasing.

From the main issues facing these organizations are the number of volunteers; also there is no integration between their efforts; many of them tackle the same charity projects while leaving other areas without any development.
We need to create a huge database that links all the databases of all the NGOs and charity organizations throughout Egypt so that all the information related to these organizations will be integrated together through a single interface which is a website.
The basic idea is to benefit from the business intelligence functionality in Microsoft dynamics. Microsoft SQL Server is a database platform for large-scale online transaction processing (OLTP), data warehousing, and e-commerce applications; it is also a business intelligence platform for data integration, analysis, and reporting solutions.

Tools needed:

- MS SQL Server (Integration, Analysis and Reporting Services).
- ASP.net.

6. Digital Photo Album

Prof. Dr. Mohamed El-Shafey
Dr. Hesham Farag

Problem: Nowadays a lot of people own Digital Cameras and It's required to have a Device which previews the Photos easily. Digital Photo Album is a Portable Device which previews and manages Digital Photos easily. And it can receive photos from any storage device directly including Digital Cameras, Flash Memory, Memory Card, Mobile devices and PC. Interfacing with the previous devices will be via USB cables, Memory Card Reader (optional) or Bluetooth (optional). This device will also be capable of storing and managing photos not only previewing it.

Implementation includes:

- A well known Processor Architecture on FPGA
- Compiler Design
- Assembler Design
- Image Previewer and Manager Application Software

In addition a ready made RTOS, Memory, small LCD, Memory Card Reader (optional) , USB reader, Bluetooth reader (optional), VGA Card and Drivers will be used. The Processor will interface with the previous mentioned devices via the RTOS and Drivers.

7. Automotive Control Embedded Systems (ACES)

Prof. Dr. Sherif Hammad

Objective/Description

This project aims at implementing/testing different control algorithms for many automotive applications. Typical processes being controlled, injection, breaking, suspension, stability, lane-keeper, black-box … etc. Matlab/Simulink will be used for real time process simulation. Controllers are finally implemented in embedded-C and ported on specific target hardware boards. PC and controller boards will be networked together using standard automotive networking busses. Project ends by demonstrating simultaneous controllers execution interacting with real-time simulators.

Deliverables & Project Steps

Real time simulation of automotive applications/processes
Implementation and verification of control algorithms
Real time processes-controllers networking
Testing and verification

8. Intelligent Hybrid Control System for Hybrid Dynamical Systems

Dr. Mostafa M. GOMAA.

Hybrid dynamical systems (HDS) include two interacting sub-systems: a continuous one and a discrete event one. The continuous subsystem is characterized by a state that has a continuous evolution in time. The discrete event subsystem (DES) is characterized by a state that takes its value within a finite set and evolves in function of logical values "all or nothing". A continuous subsystem modeling can be achieved through: 1-directly writing the mathematical (differential or algebraic) equations via mass balance and/or energy balance; 2-applying identification methods, given the model structure and a set of input-output samples describing the real system behavior in its range of operation. Famous DES modeling tools are: Automata, Relay Ladder Logic (RLL), Grafcets, and the Petri nets (PNs). The continuous and discrete-event characteristics exist almost in all systems including production systems, manufacturing systems, batch processes, mobile robotics that contain changements of structure, commutations, on/off switching elements, non-linearities modeled by piece-wise linear form (e.g. thresholds, saturation, dead-band, etc.), etc. Batch processes are evident examples of hybrid systems that include activities and structures that change in time and in the space.

In this project, it is required to:

1. Study of hybrid dynamical systems (HDS).
2. Model a specific HDS (*batch process*), using a suitable continuous-discrete event tools.
3. Simulation of the HDS.
4. Hybrid control synthesis for the HDS, achieving both continuous variables control and discrete event recipe evolution, employing intelligent control techniques.
5. Implementing the simulation of the whole system through an attractive GUI based simulation, allowing full interaction with the system operator.

Required Skills:

- Programming with JAVA.
- Programming with MATLAB.
- Interfacing.

9. Building E-Learning system

Dr. Mona Fahmy Ismail

E-learning comprises all forms of electronically supported learning and teaching. E-learning includes Web-based learning, computer-based learning, virtual classroom opportunities and digital collaboration. Content is delivered via the Internet, intranet, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio. E-learning falls into four categories, from the very basic to the very advanced. These categories are:

- Knowledge databases, that are offering indexed explanations and guidance for software questions, along with step-by-step instructions for performing specific tasks.
- Online support that comes in the form of forums, chat rooms, online bulletin boards, e-mail, or live instant-messaging support.
- Asynchronous training may include access to instructors through online bulletin boards, discussion groups and e-mail or self-contained materials in place of a live instructor.
- Synchronous training is done in real-time with a live instructor facilitating the training. Everyone logs in at a set time and can communicate directly with the instructor and with each other.

E-learning system consists of two agents:

- Teacher-assistance agent, allows the teacher to cope with the knowledge base of the subject that will be taught.
- Student-assistance agent, that resides on the client site and communicates with teacher assistance agent on the server side.

Instructional designers can support the following learning strategies:

- Support the preferred learning strategies based on the target audience.
- Identify the type of prior experiences the target audience brings to the training to develop the relevant examples, questions, and definitions.
- Include historical information about the leaner progress.
- Include questions, and exams to evaluate the learner.
- Create a visual to show how all of the pieces of the content fit together to create a whole.

As much as the e-learning system is smart, user friendly, adaptable and reusable, it will be effective to the user.

10. Programming on Multicore Processors & Graphics Processing Units (GPUs)

Dr. Watheq ElKharashi
Dr. Mohamed Taher

Graphics Processing Units (GPUs) are those fancy graphics cards for a PC to make video games vivid and realistic. The new GPU architectures from manufactures such as NVIDIA Corporation and ATI are capable of performing general-purpose computing in addition to making animated monsters look more life-like.

GPUs have emerged as a powerful platform for high-performance computation. They have been successfully used to accelerate many scientific workloads. GPUs have always been reported to outperform the conventional platforms in terms of throughput and processing power within the domain of cryptography, and image processing applications. Typically, the computationally intensive parts of the application are offloaded to the GPU, which serves as the CPU's parallel coprocessor.

The goal of the project is to improve the performance of a number of scientific applications by implementing them on GPUs.
Examples of applications:

- Cryptographic Applications
- High Performance RTL(Verilog/VHDL) Simulator
- Radar Image Processing

The applications will be implemented on NVIDIA GPUs using CUDA programming tools.

Required Skills:

- Programming with C or C++.

11. Face Gender and Ethnicity Classification

Dr. Mohamed Nabil Moustafa

Automatic analysis of human facial images has seen growing interest within the research community due to its vast area of applications in Human-Computer interactions and security industry. This analysis includes, face detection, face recognition, facial expression, etc…
Facial gender and ethnicity classifications are very interesting steps along those lines. For instance, it can be used as pre-processing steps to face recognition to lower the size of matching candidates. It has other usages as well, e.g., demographic data collection.
We propose a project to advance the gender and ethnicity classification research and development wheel. Expected input is a facial image and corresponding eyes position, e.g., human scan BioID database **(http://www.bioid.com/downloads/facedb/index.php).**
Expected outputs are gender and race labels. Possible gender labels are: “male” and “female”. Possible ethnicity labels can be: “African”, “Asian”, and “Caucasian”. Output classifications should be accompanied with scores or confidence levels in the labels in the range [0, 1].

12. Home Automation system using Web/Mobile Application

Dr. Sahar Haggag

Home automation simplifies the life by shifting the more mundane and tedious tasks from you to your home. With a ‘smarter’ home, you can focus more of your time and energy on the people and things that matter most

The system provides a complete home automation through computer based monitoring system (home server used as control unit) and a web interface that allows online follow up and management of all functionalities from any internet enabled PC or Smartphone anywhere.

As a browser-based platform of control, available by the client over Intranet or Internet connection, by using of a Personal Web Server and a Server software (Without the need for further software on the client PC, just a browser is required) system provides monitoring and controlling of all basic tasks of home like switching on/off lights, TV, sound systems, opening and closing windows’ curtains and taking control over mostly all home devices and appliances. Also provides controlling home's security system through security cameras, fire sensors, motion sensors, smoke detectors and other security modules that can be added to the system.

A website allows appliances to be controlled, activate different modes, and to monitor the security cameras for surveillance purposes from any computer connected to the internet. For obvious reasons, the site also has to be secured by using a security protocol like SSL.

Home Automation System also provides controlling for more luxury tasks such as selecting radio channel, dimming lights for comfortable ambience, adjusting air-conditions temperature according to external weather conditions, silencing phone ringer at night and selecting music. To control the music for example, the site merely hits the script on the music server, which controls a music player on the machine.

13. An offline handwriting Arabic Optical Character Recognition (OCR)

Dr. Mahmoud I. Khalil

Optical character recognition (OCR) is the translation of optically scanned bitmaps of printed or written text characters into character codes, such as ASCII. This is an efficient way to turn hard-copy materials into data files that can be edited and otherwise manipulated on a computer. Optical character recognition is one of the important applications in electronic documentation field. The computer should be able to recognize each character regardless of the font, size or style. The recognition process should be fast and accurate enough to be a reliable program. A list of features should be chosen to characterize each character.

The goal of the project to recognize Arabic handwriting words on the basis of the IFN/ENIT-database (http://www.ifnenit.com). That project can be considered as a participation of the Arabic Handwriting Recognition Competition held every two years. The details of the computation are given in http://www.ifn.ing.tu-bs.de/competition2007/.

14. Web-based Multimedia Steganography System

Dr. Gamal A. Ebrahim

Steganography is the set of techniques used for writing hidden messages in such a way that no one apart from the sender and the intended recipient realizes that there is a hidden message, a form of security through obscurity. It is different from encryption, because the goal of steganography is to make a message invisible. A steganographic message may also be encrypted as an extra barrier to interception, but it doesn't have to be encrypted. The number of ways in which a steganographic message might be sent is limited only by human ingenuity. A photograph of a large group of people, for example, might contain a Morse-code message in the expressions of the people in the photograph (e.g., smiling for dot, blank for dash) or in the directions they are looking (e.g., slightly to the right for dot, straight at the camera for dash). The common technique among different forms of steganography involves embedding of messages in apparently innocent medium (text, image, sound track, video clip … etc.). One of the most common applications of steganography is digital watermarking, which is the hiding of information indicating ownership or origin inside a digital medium. Digital watermarking can be used for digital authentication (i.e., to prove that certain party was indeed the source of a medium) or to check whether a digital medium was obtained in violation of copyright. In this project, a web-based multimedia steganography system will be designed and implemented. In this system, several steganography techniques will be implemented for different media and then typical steganography applications will be tested using this system.

Project Pre-Requisites

- Java programming skills.
- Basic background of multimedia encoding/decoding.
- Basic background of web-programming (HTML, JSP, JavaScript, Servlets … etc.).

15. System Security Suite (Virus Detection through Program Analysis techniques)

Dr. Mohamed Sobh

A computer virus is a computer program that can copy itself and infect a computer without permission or knowledge of the user. A virus might corrupt or delete data on your computer, disclose user privacy, use your e-mail program to spread itself to other computers, or even erase everything on your hard disk.

In order to avoid detection by users, some viruses employ different kinds of deception such as Overwriting, Companion Infection, Appending, Space Filling, Compressing, Encryption, Boot Sectors Hiding and Using Metamorphic Code.

Antivirus is software that embraces a set of actions for the sake of protecting user privacy and user data. Those actions are: preventing, detecting and removing. Each action can be accomplished through different techniques. Normally virus detection techniques uses either Static or Dynamic code analysis techniques.

Static Code Analysis: With static analysis, a virus is detected by examining the files or records for the occurrences of virus patterns without actually running any code. Most used methods are: String Scanning method, Skeleton Detection, Heuristics Analysis.

Dynamic Program Analysis: Dynamic detection method decides whether or not code is infected by running the code and observing its behavior. Some actions commonly followed by viruses - such as: attempts to write to boot sectors, modify interrupt vectors, write to system files, etc. - can be detected using this technique.

In this project you will build an incremental system protection suite, as start this suit will support several virus detection techniques including both static and dynamic techniques.

Project development include following activities:

1. Preparation Phase
    a. Establish a test environment using virtual machine technology
    b. Review and study the required programming concepts
2. Development Phase
    a. Develop simple offline virus detection tool – software application
    b. Develop simple online virus detection service – system driver
3. Research and Development
    a. Study common researches in the field of virus detection, static and dynamic code analysis
    b. Implement and Integrate the selected techniques
4. Documentation
    a. Write the final Documentation
    b. Prepare the final Presentation

In this project you will learn:

1. Advanced engineering programming using C/C++ and (Assembly if Required)
2. Desktop application programming
3. Low level system drivers programming
4. Code optimization techniques, to support fast scanning and minimum overhead
5. Static code analysis techniques, theory and implementation
6. Dynamic code analysis techniques, theory and implementation

16. Design and implementation of a type-safe domain specific language

Dr. Cherif Salama

Experts (of almost every conceivable domain) either use computers extensively or can benefit tremendously from using them. This is not always easy because in many cases, domain experts are required to learn one or more programming languages in order to do so. Interestingly, domain experts already have their own terminology (depending on their domain of expertise) and should not have to learn a new language to use computers. Ideally, they should be able to express their ideas to computers directly using the same terminology they are familiar with. This is exactly what a domain specific language (DSL) strives to be: A language that is understood by computers and natural for domain experts. Examples of DSLs include Verilog and VHDL for hardware description, SQL for relational database querying, and Csound for music synthesis.

In this project, students will choose a domain they are interested in and design a domain specific language for it. They will subsequently implement the language from scratch. This will involve writing a parser, pretty-printer, interpreter, and a type checker. The latter is needed to ensure the type-safety of the implemented language. Other components such as a preprocessor might be added if need arises. Please note that some domains are better described graphically in which case the DSL itself should be graphical which would require unconventional (but still relatively simple) parser and pretty-printer implementations.

This project involves a lot of code writing but students will be allowed to choose between an object-oriented language such as Java or C# or a functional language such as OCaml or Haskell.