

C.Eng 491 – C.Eng 492 2009- 2010 Project Topics

A Secure Processing Element for Crypto Protocols

Alias: ASPEC

Sponsor: Invicta R&D Ltd.

Aspects: Crypto, Security, Embedded Systems, Hardware Design

Description: Cryptographic protocols are widely used in most of the computing platforms (eg., banking and other corporate servers, etc.). However, due to high computational performance requirements and the confidentiality of the cryptographic processing, these cryptographic functions should be both secure (and trusted) and fast.

In the context of this project, a separate (and self-contained), secure/trusted processing element to provide secure and fast crypto processing for server applications' requests will be designed and developed.

Development Environment: Embedded Linux, Microcontroller and/or FPGA Development Kit (to be provided by Invicta)

Expected Outputs: An embedded design, and a prototype implementation of a protocol- and performance-rich scalable ASPEC hardware.

Secure Channel over VoIP

Alias: SECVOIP

Aspects: Crypto, Security, Embedded Systems, Hardware Design, Voice over IP

Description: Voice over IP (VoIP) is becoming more and more dominant technology for voice communication. There are possibly many implementations available today. However, end-to-end secure voice communication is still a major requirement for some applications.

In the context of this project, an embedded handset to additionally provide secure voice communication over VoIP will be designed and developed.

Development Environment: Embedded Linux, Microcontroller and/or FPGA Development Kit (to be provided by Invicta)

Expected Outputs: An embedded design, and a prototype implementation of a VoIP hardware with crypto functionality.

High Performance Computing

Alias: HPC

Sponsor: Department

Aspects: Clusters, parallel programming, scientific computing,

Description: Parallel programming and cluster computing provide solutions for many complex engineering problems. Our department has a 340 core cluster consisting of blade servers. In this project, our aim is to parallelize existing environments or provide HPC solutions for engineering problems such as transportation planning.

Mobile Solutions for Improving Efficiency in SME's

Alias: MOS-SME

Sponsor: Turkcell

Aspects: Mobile software, web services, peer-to-peer network programming

Description: SME's are small scale enterprises with limited budget and human resource. Therefore it is important to use the resources in the most effective way. Mobile solutions present promising environment for dynamic workload and access to the personnel.

Mobile Solutions Enhanced by Multimedia for Improving Health Care

Alias: MOS-Health

Sponsor: Turkcell

Aspects: Mobile software, web services, peer-to-peer network programming

Description: There has been important problems in health care especially for rural areas. Access to the doctors may be very hard or the number of patients per doctor could be very high that a time allocated for patient examination becomes very limited. Mobile solutions enhanced with web and multimedia can provide an environment for access to the doctor or access to the specialist.

Kiosk solutions for Supermarkets

Alias: SuperMarketGuide

Sponsor: Department

Aspects: Graphical User Interface, path planning, 3D visualization, search and optimization

Description: With a long shopping list, it may be very easy to get lost or to pass along the same aisles repeatedly in a supermarket or a mall. In this project title, the aim is to provide a software framework for mall or supermarket kiosks to guide the customers for searching for places of items, guide to the the correct direction or even provide a path to complete the shopping list. Visualisation is an important part of the interaction with the user.

Business Intelligence Solutions at Small and Medium Scale

Alias: BIS

Sponsor: Department

Aspects: Graphical User Interface, data mining, visualisation, web services

Description: Business Intelligence is an active area for both industry and academia. There has been research for machine learning and artificial intelligence for a long time, however their applications for the business sector is comperatively new. Starting from customer relationship management, there is a trend going on to analyze business data and obtain results for improving the business model. There has been solutions for large scale business, currently there is more need for smaller scale business environement. Under the title of business intelligence, the concrete project definition alternatives are quite rich. One basic topic may be providing an environment for analyzing business data and visualize discovered patterns as a graphically rich reports on desktop or mobile phone.

Massively Multiplayer Online Role Playing Game

Alias: MMORPG

Sponsor: ODTÜ-TSK MODSİMMER

Aspects: 3D Game Characters and Environments Modeling, Artificial Intelligence & Algorithms, Computer Animation, Computer Graphics, Database Management, Distributed Computing, Game Physics, Large Scale Software Design, Massively Multiplayer Online Role Playing Game, Network Communication, Path Finding, Server & Client Architecture, User Computer Interaction

Description: The MMORPG (Massive Multiplayer Online Role Playing Game) project mainly serves a purpose that is introducing the worth seeing monuments all around Turkey. The player will be travelling the country in order to collect coins and gold scattered over some secret places. While visiting and learning about the invaluable historical places of Turkey to carry out the quests, the player will have more chance to gain treasure, however, the treasure has to be hidden due to being non-transportable, which makes the game more mysterious and more riveting. The game already supports these attributes by being persistent. Each player was planned to have several attribute to make the game-play more realistic. Player needs these attributes in order to use quest system, player-class system and trade system. For instance a player might need an item in order to complete a quest, or gold to trade.

Some topics are here, that are expected to be optimized or completely developed by the teams,

- The quest architecture will be designed and implemented.
- Game Physics(Terrain, Models and Environment interaction) Optimization
- Data transfer between client and server will be optimized to fasten the communication.
- Real time communication between database and multi-clients.
- Secure client-server communication and system security.
- Animation and bounding box attributes will be implemented for certain models and also the boundaries of the terrain will be determined in order to prevent objects from getting lost outside of the terrain.
- Game user interface improvement.
- Client to other client's communication, interaction and positioning.
- Game character and environment modeling.

HLA (High Level Architecture) based Warfare Simulator

Alias: HLA-SIM

Sponsor: ASELSAN

Aspect: HLA(High Level Architecture), 3D visualisation, simulation

Description: This project is on the HLA-based warfare simulation. In such a simulation environment, warfare elements like units, guns, targets etc. are modelled as a federate object and another federate object is modelled to run the elements according to a predefined scenario. The simulation environment should support simulation of a fight between friend and enemy elements and provide comparison of friend-enemy forces. It is possible to include firing and elements eliminating each other into the scenario. This project involves the 3D modelling of the terrain and the elements, as well.

Within the scope of HLA-based warfare simulation, another subject involves preparation of simulation scenarios on the basis of radar locations and tracks provided by the user. On the basis of the capabilities of the radars, air targets are defined and scenario is simulated in a 3D graphical environment. This topic can be extended with inclusion of land units and engagement, orientation abilities.

Developing Tracking System using Mobile Devices with GPS

Alias: HLA-SIM

Sponsor: ASELSAN

Aspect: Tracking, PGS, mobile devices

Description: This project topic involves developing a mobile, ad-hoc network among the mobile entities having GPS so that they can send and receive position (and preferably any other) information to each other. On a GPS-supported console, positions of the elements in the network should be visualized. The system should support dynamic entry and exit of elements and other elements should be informed about such dynamic changes on the network. GSM-based communication can be considered.

Digitizing old Books/Radio programs based on Human Computation.

Alias: I-Digit

Aspects: Human Computation, OCR (Optical Character Recognition), Web Services

Description:

"Computerized tests. A computer generates a problem and presents it to evaluate a user. For example CAPTCHA tells human users from computer programs by presenting a problem that is supposedly easy for a human and difficult for a computer. While CAPTCHAs are effective security measures for preventing automated abuse of online services, the human effort spent solving them is otherwise wasted. The reCAPTCHA system makes use of these human cycles to help digitize books by presenting words from scanned old books that optical character recognition cannot decipher.", ((von Ahn et al., 2008) Wikipedia).

Project groups may have different application ideas that uses "Captcha" models to digitize words. For example, digitizing courses' hand-notes in department, old radio news' scripts, old books on the library etc.

Sources:

<http://recaptcha.net>

http://en.wikipedia.org/wiki/Human-based_computation

Sport Simulation Game

Alias: Football4Linux

Sponsor: Department

Aspects: Computer Graphics, AI, Network, Sound, Database, Character Animation (3D or 2D), Game Physics

Description: Although there are games like Tux football or Bygfoot, Linux environment lack a good football game. In this project, our aim is to develop a football game like Sensible Soccer or Pro Evolution Soccer, or a football management simulation game like Football Manager or Championship Manager. We expect a multiplayer game, and AI should be good enough for the game to be fun. Fast database queries are needed in football management simulation game, while searching for players all over the world. You can propose a game including both of these game styles or about a different sport (NBA, Formula 1, Paintball...). (For artistic quality of the graphics, you may get help from Industrial Design Department)

Expectation: A fun game to play.