טקס הצגת פרויקטים
חוגי הנדסת מחשבים
需要用 הndמדים במכים
וולק פרסי
הمركזחלשנות הנדסה ו決めיה
המהנדס"ש פיטרבוייד
ויו תמי, 'ב חתמו תשים"ע, 17.6.10
מתכוננים להזמנך לטקס הצגת פרויקטים של תלמידי החוג להנדסת מחשבים.

ה⟦תקיימת ביום חמישי, ה' בתמוז 16:30-19:00 בין השעות 17.6.10, תשע ten.

בבית בלגיה, קריית אדמונד ספרא, גבעת רם, ירושלים.

סדר הטקס:
1. קבלת פנים וכיבוד קל
2. תצוגת פוסטרים ברחבת הלובי
3. ברכות:
   - פרופ' דרור פייטלסון
   - פרופ' רוני אגרנט
4.-Disposition לפרסים לפרויקטים נבחרים
5. הצגת שני פרויקטים מובילים

הטקס נערך בחסות יישום, החברה לפיתוח המחקר של האוניברסיטה העברית, חממת ואן ליר, קרן הפקולטה לחדשנות בהנדסה ומדעי HP, דוקור, אינטל המחשב ע"ש פיטר ברוידה

הפקולטה למתמטיקה ולאימוץ טכנולוגיה

ביה"ס להנדסה למדעי המחשב ע"ש רחל וסלים

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ד_mapping למשתמש

פרופ' דרור פייטלסון
הנדסת מחשבים

פרופ' רוני אגרנט
הנדסת מחשבים - התמחוש פיסיקת יישומיים

הולקה פרסים לפורקטים נבחרים

הצגת שני פרויקטים מובילים

מטוס עסוק בשיתוף עם החברה לタイトル המחבר
של האוניברסיטה העברית, מחמודgment, קרן דוקור, איינטל, והחברה לדגון בנהב וחבר
הمشاركة בשנית קריירה

סדד תקפים:

כabler פינס וצובא קל
تعاונה פוסטירם ברнстט חולבי

ברכות:

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הנדסת מחשבים - התמחוש פיסיקת יישומיים

הצגת שני פרויקטים מובילים

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Hitchhiking Coordination

Project Description
Hitchhiking has become an important means of transportation. However, having a safe, previously organized trip is much more reassuring and convenient than a casual and typical hitchhiking trip. Our project solves this problem by coordinating a trip between hitchhikers and drivers who are heading in the same destination.

The Hitchhiking Coordination system consists of three main components: the Android operated handsets of the users (hitchhikers and drivers), the server that receives the hitchhikers’ requests and searches for suitable drivers and a database. The system is user-friendly for both the hitchhiker and the driver. It provides a convenient means of navigation for the driver to reach the hitchhiker. As for the hitchhiker, the searching process is simple, with comfortable layouts. Few operations are needed in order to complete the process for both sides.

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Interface for the Blind and People with Severe Vision Loss

Project Description
The cellular phone has become an instrument that makes our life easier. With the introduction of the smart-phone, more options that were once only provided by a computer are now integrated into the cellular phone. What formerly was only a tool to communicate via a conversation or text messaging, has now become the place for the calendar, reminders and even surfing the web. All of those options which are embedded in the phone are not yet available for people with severe vision loss. Moreover, cellular phones had distinct buttons that people could identify by touch, however the trend today is touch screens that eliminate this possibility. Our project is a hardware interface combined with designated software that will make advanced options accessible for the blind population.

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Improvement and Comparison of Convex Hull Computation Methods

Project Description
The convex hull is the smallest convex polygon containing a given set of points. It can be visualized as the shape a stretched rubber band takes, upon being released around nails stuck in a board (see figure). Methods for computing the convex hull are often used in image processing and computer graphics. This project evaluates various algorithms for computing the convex hull of a finite set of points on a plane. Two algorithms might have the same theoretical running time, but in practice differ by a large factor. We implement a new algorithm and compare it with a number of known convex hull algorithms. We compare their actual speeds, and for the new algorithm, also the precision of its approximation of the hull within a limited amount of time. In addition, we develop and verify a method for preprocessing the input data, which, in most cases, drastically improves the speed of any convex hull algorithm.

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Location-Based Social Games

Project Description
The mobile phone is an important part of our daily lives. Its abilities have vastly improved in the last few years and smartphone users are now carrying around a small but intelligent computer. The market shows a growing need for applications that use the abilities of the smart-phones, introducing new features like using the location of the user and his actual surroundings. We developed an engine for creating Location-Based Social Games. These games are a sort of role-playing games, where the reality is augmented and enhanced by the smart-phone’s abilities. This is the creation of a different and exciting game experience.

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**Smartvertising**

**Project Description**

Have you ever encountered a commercial for diapers while surfing the net, when in fact you don’t have children? How many women, do you think, met commercials for shaving gel? How many men, do you think, met commercials for beauty products?

In 2008 the budget for internet advertising was 140,000,000,000 dollars at the U.S. only!

Large companies like McDonald’s, Toyota, EL AL etc. destine large amount of their advertising budget for net commercials. Just imagine the payment for marketing specialists, psychologists, actors (sometimes famous ones), payment for website distributing… and eventually the diapers advertisement reaches a high school student (hopefully without children).

Smartvertising knows that you can learn something about the surfer that asks for a lot of sports pages and pictures of Bar Refaeli. It’s a system that studies the user’s consumption habits of web pages, builds a profile and routes advertisements accordingly. That way a girl that is interested in sports can get an advertisement for STUDIO C at an article on “Messi, the best soccer player”, a student who is also a father could get publicity for kindergarten in the campus, and the sky is the limit...

**Project Members**

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**Tracking Devices and Users in Enterprise Networks**

**Project Description**

Current firewalls rely on IP addresses as a main criterion for traffic filtering. However, since devices and users are becoming more and more mobile, IP addresses are no longer a sufficient criterion for filtering, and a demand for identity-based filtering is introduced. While Check Point’s current system can detect connection and login events of devices and users, it fails to detect logouts and disconnections. As a result, information about identities in the network is not reliable enough to be used for identity-based filtering.

The system designed and implemented in this project runs on a dedicated server, and tracks the connectivity, login and logout events of devices and users in real-time. The system implements various alternative tracking techniques, and thus automatically fits any network at any time. It minimizes the traffic overhead it generates by utilizing already available information in the network, and its tracking rules can easily be configured to utilize knowledge about specific network characteristics. The system is simple to deploy, and it manages to overcome various tracking difficulties.

**Project Members**

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**Supervisors**

Avi Shua, Check Point Software Technologies
An Enquiry into the Relation Between a BBO Melt’s Rayleigh Number and the Number of Spokes Appearing on the Melt’s Surface

Project Description

BβBaB2O4 plays an important role in optical frequency conversion in the visible and UV regions. It has a high damage threshold and a wide transparency range. The crystal yield is relatively low due to the thickness/diameter ratio being low in a crystal. It was found empirically that increasing the axial gradient results in a thicker grown crystal. Furthermore, the number of spokes on the surface of the flux during growth was found to give some indication as to the axial gradient change and growth stability. It was assumed that the patterns are governed by Raleigh convection (buoyancy), which depends on the axial gradient. The results of our experiment indicate that the number of spokes does not directly correspond to Raleigh convection. These results clearly demonstrate that pursuing larger axial gradients than those which occur naturally within the crucible is futile.

Project Members

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WebAccess - Web Browser for People with Disabilities

Project Description

Millions of people around the world suffer from quadriplegia (complete paralysis of the body from the neck down). Because the only muscles they can move are the facial muscles, they can’t use computers in standard ways. Current solutions either require complex hardware setup or are very expensive. My project’s aim is to give these people access to computers, by allowing them to surf the web using eyeblinks as they are captured by a simple webcam.

Project Members

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3D Motion Tracking Using BSN (Body Sensors Network)

Project Description
Tracking the movement of an object in 3D space is essential for a wide range of applications. Existing motion tracking systems include video recording systems with markers attached to the object, and motion detectors based on accelerometers and gyroscopes. Our focus in this project was to integrate 3D accelerometer measurements with 3D gyroscope measurements. For this purpose, we used an existing BSN module with a built-in accelerometer, and attached it to a pair of 2D gyroscopes that enable us to acquire 3D orientation. The measurements from the motion detectors are sent periodically to a computer through the 802.15.4a (Zigbee) standard. We created a basic process that includes calibrating the measurements, filtering them to exclude noise and other disturbances, and aggregating the gyroscopes and accelerometer measurements to enable better motion tracking. As we demonstrate, we track the movement of a toy car traveling in a 3D trail. This project could be used as a platform for characterizing different types of motion, which could prove beneficial in games, medicine and sports.

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Management System for Security Systems

Project Description
Protrack Ltd. has developed an algorithm for Video Movement Detection (VMD) that enables the system to detect a suspicious movement and give a warning in real time. To manage these security systems, we have developed a service-client infrastructure which allows connection of the security systems to a central service that manages all movement detections, alerts and alert updates. Our system is based on the Windows Communication Foundation (WCF) communication infrastructure. In addition, we have developed a web site that allows the control of all security systems registered in the service, watches all video detections that have been saved in the data base, manages users’ permissions, etc.

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**SEBA Definer – Medical Event Generator**

**Project Description**
Current medical information-technology systems focus on integrating and increasing the availability of patients’ medical information stored in the databases of various medical organizations such as insurers, hospitals, laboratories etc. Due to the huge amount of information, it is difficult to keep track of the medical treatment processes and a lot of effort is spent on controlling and improving them.

We suggest a novel approach for processing the information stored in the organization’s databases and displaying it as a continuous process on a timeline. We have developed a system that allows the medical doctor to quickly understand a patient’s condition. It reduces the probability of medical errors and assists the medical doctor in making decisions.

Our system enables the organization to easily define and assimilate process-based quality indicators into the treatment sequences. These indicators reflect more accurately the quality of medical care that patients are receiving as a group. Thus, an application using this technology will permit a more trustworthy and inclusive measurement of the treatment.

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**SOA on KLTN Crystals – A New Approach for Optical Chips**

**Project Description**
As electronic components continue to grow smaller, the copper transmission lines between them will soon limit the chip performance. This limit motivates vast research on optical chips as optical chips can offer a solution which is not constrained by the standard board design rules.

The KLTN is an electro-optic crystal which can be formed into a 3D refractive index structures. These two qualities make the KLTN an excellent substrate for optical chips, since they supply solutions for the most required components in an optical chip, such as transmission lines (waveguides), modulators, filters, etc.

In this project we design and create an optical amplifier component which can be integrated with the optical circuit in KLTN. The device is made of a KLTN crystal that contains a slab waveguide for a wavelength of 808 nm. The waveguide is formed by ion implantation into the crystal, creating an area with a smaller refractive index. This structure allows the trapping of the wave between in proximity to the edge of the crystal. To the KLTN waveguide we couple a GaAs SOA (Semiconductor Optical Amplifier). This way, a beam of light which moves in the KLTN waveguide will pass into the SOA, be amplified and go back into the waveguide.

Implementing such a device will be a step forward into the vision of optical chip.

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**Supervisors**
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Wavefront Aberration Fixing Using a Polarization-Diverse Adaptive Feedback System

Project Description
Many optical fiber-coupled free-space systems suffer from wavefront aberrations. It’s not always possible to fix these aberrations using a wavefront measurement within the beam path.

We study an adaptive fixing system which compensates for the coupling loss caused by aberrations, using solely the coupled power metric.

The hardware of the system is based on a Spatial Light Modulator (SLM) and a controller. Since the SLM uses Liquid Crystal, it works only on one polarization of the incident beam. In order to correct the entire beam, it’s imperative to treat both polarizations by way of polarization diversity. In our system, the incoming beam is split by a polarizing beam splitter (PBS) into two single-polarized beams and the correction is made separately on each beam. The corrected beams are joined in a reversed way at the output fiber. The SLM can then apply a different wavefront correction for every point of each polarization in the deformed beam.

The controller uses an algorithm based on the first 15 Zernike polynomials and takes into account the coupling between them. We’re trying to achieve maximal output intensity by applying the most suitable superposition of the polynomials. The choice of the most suitable superposition is made solely by an intensity measurement.

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Double Layered Gate Structures for Excitonic Fluid Control Devices

Project Description
An exciton is a quasi-particle consisting of a bound state of an electron and an a hole in semiconductor structures. As such, it is a Coulomb-correlated electron-hole pair with no net charge. The bound electron - hole pairs provide a means to transport energy without transporting net charge. Exciton formation may occur when a photon enters a semiconductor, exciting an electron from the valence band into the conduction band, leaving a hole of opposite electric charge behind, to which the electron is attracted by the Coulomb force.

Dipolar excitons are a special kind of two-dimensional excitons in bilayer nanostructures: These excitons are confined in a double quantum well, where the electron and hole of each bound pair are reside in two different layers separated by a tunnelling barrier.

The interest in such excitonic systems ranges from the fundamental understanding of their collective quantum state to developing new concepts of manipulation devices for such quantum fluids “in a chip”.

In order to increase the control and manipulation flexibility we are developing, fabricating and characterizing the next-generation devices, which will employ a new double gating scheme.

During development we simulated the electrostatic field in order to obtain optimal trapping and manipulation capabilities. In the fabrication process the GaAs devices underwent photolithographic processing. Afterwards we used different types of etching methods in order to get the desired nanometric geometries. Finally we characterized the devices using an electron microscope and measuring IV curves.

One of the expected results is that in the new devices, trapped excitons will be able to be cooled to lower temperatures leading to further progress in the research of excitonic quantum fluids.

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Effect of Turbulent Medium on Radial Polarization

Project Description
Turbulent environments have optical properties which change randomly in time and space. These changes adversely affect any optical signal that we attempt to transmit through them. This can be readily shown by observing light through air rising from a hot road. An effect which is not visible to the eye is the change in the degree of polarization of a transmitted beam.

Radially polarized lasers have been shown to have unique capabilities in the fields of laser cutting and optical trapping. This type of polarization always points in the radial direction causing the beam to have a special ‘donut’ shape.

It has been theorized that radially polarized lasers have better transmission through turbulent mediums. If this theory is proven, radially polarized lasers could be used in the future to improve wireless optical communications. Utilizing its special properties it may also enhance the capabilities of laser-based weapons systems.

After characterizing different levels of turbulence in a heated water medium, our goal is to determine the effect of the different levels of turbulence on a radially polarized laser that is transmitted through them.

Project Members
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Supervisors
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Prof. Nissim Ben-Yosef
Gilad Lerman

How to Use Current Design Constructs in order to Improve the Post Silicon Verification

Project Description
The complexity of chip design is increasing and requires better design and verification methods. We focused on the verification side. The verification methods used for pre-silicon had been improved significantly in the last decade, while the verification methods of post-silicon are similar to the ones used in the last decade.

The main reason for this is that post-silicon verification requires hardware hooks that are part of the silicon design. This means higher costs and higher risk when introducing new techniques.

This project suggests improvement to the state-of-the-art post-silicon verification environment. The focus is to enable pre-silicon technique at the silicon and to offer an innovation way to reuse the hardware resources. In addition to that, we will explore techniques for optimizing the pre-silicon elements for the post-silicon environment.

The main verification technique that we implemented is Assertions/Checkers. These checkers are checking important functionality aspects in the design. For example: checker that checks the synchronization between 2 clock domains or between clocks with different frequencies.

When inserting debugging elements to the silicon, one of the challenges is to use minimal silicon resources. Therefore, we will provide proof-of-concept of using assertions in the FPGA, when we will focus on the (1) area and power consumptions of that logic and (2) the reuse of other elements like scan chains, probe mode and memories.

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Logic Simulation Accelerator

Project Description
Logic simulation is the use of a computer program to simulate the operation of a digital circuit and is the primary tool used for verifying the logical correctness of a hardware design. In many cases logic simulation is the first activity performed in the process of taking a hardware design from concept to realization.

The glaring drawback of logic simulation is that simulation can take an inordinately large amount of time and computing resources, since typically it uses a single processor to reproduce the behavior of many (perhaps millions of) parallel hardware processes. Thus, simulation is always orders of magnitude slower than the system being simulated. The slowdown is from $10^6$ to $10^8$, depending on the size of the system being simulated. In many cases, a simulation of today’s large and sophisticated digital designs lasts for unreasonable amount of time of weeks or even months!

In order to accelerate the simulation and yet maintain its debugging capabilities, we researched the way that software based simulators operate and their performances, and designed a hardware chip that simulates the operation of a digital circuit using the algorithm that the software simulator does. Hardware implementation of the simulator allows parallelism and pipelining and accelerates the simulation by 100 to 1000.

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Time-correlated asynchronous counter (TCAC) for monitoring phenomena as a function of tip sample separation in scanned probe microscopy

**Project Description**
Time-correlated counting is a technique to record signal-pulses with high time resolution. When a pulse is detected, the time of the corresponding detector pulse is measured. The events are collected in memory by adding a ‘1’ in memory location with an address proportional to the detection time. TCAC was implemented on Xilinx Spartan-3a-DSP-1800 low cost FPGA. Time resolution of this implementation of TCAC limited by FPGA clock and equal to 9.345 ns (107 MHz) for the current chip being used. Easy to use software was written to control the TCAC from a standard PC. The goal is to integrate the TCAC into scanned probe microscopy software. TCAC was written using the VHDL language. The guidelines used during implementation were easy reconfigurability and FPGA-vendor independent VHDL code.
An example of an important application of the TCAC is the online measurement of a near field optical signal as a function of a tip-sample distance.

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**Supervisors**
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Dual Band UV/IR Nanodetectors
A Lateral Sensitive Multi Spectral Detector

**Project Description**
Semiconductor detectors are used today in a wide range of applications. The demand for newer, more sophisticated, and smaller sensors increases at a rapid pace. In recent years multi-spectral detectors (detectors which response to different wavelength), are highly demanded. In order to create multi spectral devices, different semiconductor materials must be grown together.
An important two color detector is the combination of detection of ultra violet (UV) light together with infrared light (IR). However for these wavelengths the different crystals cannot be grown using conventional methodologies. In our project we study the possibility to grow IR nano-dots on top of an existing UV sensor in order to realize dual band UV/IR sensor.

**Project Members**
Eldad Reinman
Yoni Levitt

**Supervisors**
Dr. Yossi Paltiel
Dr. Shira Yocheles

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A Paperless Helicopter Cockpit

**Project Description**
The system offers a smart solution tuned to pilot needs during a flight that is simple to execute. Running on a small touchscreen PC, the system generates a mission using information from a base station. As a flight mission is executed, a moving map and textual information, according to pilot commands and GPS location, are presented. For example, the pilot can change flight details in real time, declare an emergency or recalculate the wind or the needed amount of fuel. The map is tailored to the mission needs. For example, an ambulance helicopter would need a map layer of power grid lines in its proximity to avoid them. Lastly, the system logs a record of the relevant information of the flight to be downloaded and used by the base station system after the flight.

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Final Projects presentation

Computer Engineering Program

and awards of the Peter Brojde Center for Innovative Engineering and computer science

June 17 2010