First Report – Engineering Project

# Names

שלמה שנציס

משה סמסון

# List of Projects and Advisors that we checked

* We contacted PrimeSense regarding project offer that was in the moodle. It turned out to be void.
* We contacted INTEL on their website and asked if they have any projects for engineering students. They answered back and told us that they give projects only to employees.
* We sent mail to Roi Klipper – the contact from Elbit Systems, and asked them if they have any openings for projects. We never got a reply.
* We e-mailed with Avi Baum, the contact from Texas Istruments, regarding possible projects ideas. We did not came with specific ideas, but wanted to know if they have any on-going pojects that we can join to or new ready-to-start projects. They answered and said that their list of projects is not yet compiled, and they suggested to be in contact 3 weeks from then (04.03.2014). We told them that this almost exceeds our time-frame for the project-choosing-time. They answered and said that they would try to accelerate the process of compiling the projects list. Since they did not contact us after that, and since we both wanted to concentrate on graphics projects instead of communication projects (most of TI projects), we sent then an e-mail, thanked them, and told them that we already chose another project.
* We contact prof. Dani Lischinski from the Hebrew University’s staff, and asked him if he would like to be an advisor to a project, and if he has any ideas for projects, since we both took course in Computer Graphics in the past semester. He answered and said that he has no ideas for projects of this scale, and we can meet fo further discussion. Since we already met with our current advisor regarding our project, and since we chose to go with our project, we told him no thanks.
* We sent mail to prof. Amnon Sha’ashua and asked if he has any openings for projects. He told us that all of the projects that he advise to intended for MSc or PhD students, and therefore he couldn’t be our advisor.
* We sent mail to URECSYS and asked for details regarding the offered project in the moodle. Until they answered it was irrelevant.
* We sent mail to prof. Leo Joskowicz and Refael Vivanti regarding two projects that were in the moodle: the first is : ***”*** [***Brain surface tissue deformation tracking in open brain surgeries***](http://moodle.cs.huji.ac.il/cs13/file.php/67546/Suggested_Projects/brain-surgery%20tracking.pdf)*”* and the second one is: ***“***[***Robust medical images segmentation in the clinic: the meta-segmentation framework***](http://moodle.cs.huji.ac.il/cs13/file.php/67546/Suggested_Projects/robust-segmentation.pdf)***”.***  They told us that they would like to meet, and we set a meeting in Prof. Leo’s office in 03.03.2014. We were presented to his ongoing “Robust medical images segmentation” project and were proposed to implement the GUI and integration for the program (will be discussed in details later). Two weeks later we told them that we decided to go with this project.

# Our Project

## Introduction

Liver cancer is the third most common cancer worldwide. Measuring tumor volume is

important for the evaluation of treatment response. However, liver tumor segmentation

from computed tomography (CT) scans is a challenging task for radiologists.

Volumetric measurement of tumors is required for an accurate evaluation of treatment

response. However, the identification and characterization of liver tumors in CT scans is a

difficult and tedious task that requires an experienced radiologist. The difficulties of lesions

characterization stem from the various types, sizes and shapes of the lesions and from their

adjacency to other organs and their fuzzy borders. On top of that, different CT scans have

different properties depending on the scanning machine and protocols, and suffer from

artifacts and noise.

## The problem

The existing methods for liver tumor segmentation rely on manual or automatic segmentation.

If the segmentation method is manual a professional radiologist has to mark the tumor sector

by hand. This type of input is tedious, time consuming and non-efficient. Automatic methods on the other hand are prone to errors and have low accuracy. Nowadays radiologist use manual delineation of tumors, which is error prone, time consuming and suffers from inter/intra observer variability.

One additional proposed method of segmentation is semi-automatic segmentation. Semi-automatic methods require user interaction only for the initialization step, and enjoy the prior knowledge of the user with almost no harm to the user experience.

There already As the input should be prompt and simple for the radiologist to provide, we need a more accurate, more robust and natural GUI for user input.

LEAP

## Related Courses

* Computer graphics (67609)
* Image Processing (67829)
* Computer Vision (67542)

## Software, Software Packages and Devices

* Development Environment – since we suppose to work on windows, we chose to work on Visual Studio 2013. The main language would be C++.
* PTVS – Python Tools for Visual Studio. For simulations.
* VTK – Visualization Tool Kit. VTK is an open-source, freely available software system for 3D computer graphics, image processing and visualization.
* Leap Motion Developer Kit, and drivers.
* MatlabBridge - MatlabBridge is an extension of 3D Slicer to allow running Matlab functions directly in 3D Slicer.
* SVN – We chose to utilize version control system for our project online using SourceForge.
* Leap Motion Device – natural input controller.

## Related Reading Material

* The Leap Motion API , tutorials and documentation.