Université de Bourgogne

Software Engineering

Mid Term Report

Mid Term Report for Software Engineering Project

Authors:
Tewodros W. AREGA
Vamshi Kodipaka
Hardik

Supervisor:
Prof. Yohan FOUGEROLLE

November 11, 2018

Contents

1 Introduction

With the growing number of 3D data and the tendency of capture devices to develop competitively priced multimedia data, the willingness to select appropriate information is becoming an fascinating field of research. In Digital models,the purpose is to monitor a few salient structures which can be used for applications like those for object registration, retrieval and mesh reorganization rather than the whole object.

An interest point simulator for 3D objects based on the Harris operator that were used in computer vision applications mostly with positive results. Just as intimated in the paper,an adaptive method for evaluating the neighbourhood of a vertex is being used to calculate the Harris riposte to that same vertex. The technique is rigorous with a very huge number of evolutions, that can be seen in the extremely high repeatability values acquired by using the SHREC function detection and description reference.

From paper we comprehended that the calculation of interest points with the level of projection of remarkable local structures. So, vertices on smooth or almost planar segments of a surface will have low interest, as opposite to vertices in places with remarkable local structure.3D mesh topology is randomly given as input. That is, an arbitrary number of directly adjacent vertices will have a vertex. It makes it difficult to select a local neighbourhood around a vertex. Furthermore, this downside causes completely different tessellations to represent the same coordinates

The magnitude of a remote location in which a vertex is an interest point is totally unknown or hard to compute without a well - clearly defined topological structure for meshes. Finally, no further information exists except for the position of the whole vertices and the connectivity information.

First always, the adjustment is not direct only because the structure of 3D meshes is quite different from the images. Furthermore, the transformations needed to be rigorous in 3D domains (isometry, topology, sampling, etc.) are also distinct. We chose primarily the Harris operator to calculate which is easy. From Loog and Lauze experiments, the authors concluded that Harris method has the low probability in other locations of the same image.

2 Methodology

2.1 Tools Used

We are using the following tools to implement the project. The programming language is C++, the IDE (Integrated Development Environment) is QT creator and the operating system is Windows 10.

2.2 Modules

We have divided the project into modules. The modules are evenly distributed between the team members. Here are the modules of the project:

- Creating Internal data structure of the 3D mesh using STL (Standard Template Library)
- 3D rending of the mesh using Opengl
- Determining the local neighborhood of each vertex
- Fitting Quadratic surface to neighborhood
- Calculating the Derivatives of the surface and smoothing the derivative using Gaussian function
- Calculating Harris response
- Selecting Interest Points using both methods
- Developing GUI (graphical user interface) for the system
- Testing the system (unit testing and integration testing)
- Documentation (Report writing)

3 Progress

3.1 Works done

We have started the project one month ago. In one month, we have completed the following tasks:

- Installed important libraries like Opengl(to render the 3D mesh), Cmake(to compile the project), GSL (to solve eigen value problem)
- Read and understood the Paper
- Studied how to use Github and Trello
- Created Trello and Github team account for project management and code sharing
- Studied some important topics in C++ like STL
- Started implementing the internal data structure of 3D mesh

3.2 Works to be done

As for the rest of the tasks, we will implement them according to the following project schedule:

Project Schedule		
Milestone	**Description**	**Time Allotted**
Creating Internal data structure of the 3D mesh	Face, Vertices, Mesh using STL	1 Week
Rending the 3D mesh	Using Opengl	2 Days
Determining the local neighborhood of each vertex	Using ring neighborhood	3 Days
Fitting Quadratic surface to neighborhood	After normalizing the neighborhood	4 Days
Calculating the derivatives of the surface and smoothing the derivative		2 Days
Calculating Harris response of each vertex		5 Days
Selecting Interest Points using both methods	Using highest Harris response and Clustering method	4 Days
Developing GUI (graphical user interface) for the system	To adjust internal parameters and move the object	3 Days
Testing the system	Using different testing methods	2 Days
Documentation (Report writing)	Using latex	5 Days

Table 1: Project Schedule

References

[1] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The LaTeX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.

[2] Albert Einstein. *Zur Elektrodynamik bewegter Körper*. (German) [*On the electrodynamics of moving bodies*]. Annalen der Physik, 322(10):891–921, 1905.

[3] Knuth: Computers and Typesetting,
`http://www-cs-faculty.stanford.edu/~uno/abcde.html`