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**YAŞAR UNIVERSITY**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF COMPUTER ENGINEERING**

**COMP4910 Senior Design Project 1, Fall 2019**

**Supervisor: Dr. Gizem Kayar**

POF: Performance Optimized Fluid System

**Final Report**

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# PLAGIARISM STATEMENT

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# KEYWORDS

|  |  |
| --- | --- |
| **Term** | **Description** |
| Axis Aligned Bounding Box (AABB) | Bounding volume for a set of objects is a closed volume that completely contains the union of the objects in the set. |
| Cell | Axis aligned bounding box is divided into small identical cubes. |
| Colour field quantity | It is a functionthat calculates how each particle is affected by all of the other particles. |
| Gradient | The directional derivative of a scalar field gives a vector field directed towards where the increment is most, and its magnitude is equal to the greatest value of the change. |
| Grid | Series of vertical and horizontal lines that are used to subdivide AABB vertically and horizontally into cells in three-dimensional space. |
| Isosurface | An isosurface is a 3D surface representation of points with equal values in a 3D data distribution which is the 3D equivalent of a contour line. |
| Marching Cubes | Marching cubes is a computer graphics algorithm, published in the 1987 for extracting a polygonal mesh of an isosurface from a three-dimensional discrete scalar field. |
| NVIDIA Flex | NVIDIA Flex is a particle based simulation technique for real-time visual effects. |
| Polygonal Mesh | Polygon mesh is the collection of vertices, edges, and faces that make up a 3D object. |
| Unity 3D | Unity is a cross-platform game engine developed by Unity Technologies. Unity is used for developing video games and simulations for consoles and mobile devices. |
| Visual Studio | Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. |

# ABSTRACT

# ÖZET

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# LIST OF ACRONYMS/ABBREVIATIONS

|  |  |
| --- | --- |
| AABB | Bounding volume for a set of objects is a closed volume that completely contains the union of the objects in the set. |
| API | Acronym for Application Programming Interface. |
| CPU | Central Processing Unit. |
| GPU | Graphic Processing Unit. |
| OPENGL | Open Graphics Library is a cross-language, cross-platform application programming interface for rendering 2D and 3D vector graphics. |
| POF | An Acronym stands for performance optimized fluid system. |

# 1. INTRODUCTION

# 1.1. Description of the Problem

\*Değiştir ismail\*

Calculation problem due to the number of particles in fluid simulations.

Time and space complexity are vastly big problem to handle, because it is too much calculated particles. Hence, CPU and GPU usage are wasted.

# 1.2. Project Goal

\*Değiştir ismail 2\*

The algorithms used in the project are changed as a result of the researches and the calculation technique of the liquid particles is found to be more effective. Time complexity and space complexity are reduce for the system and making a more effective memory usage.

# 1.3. Project Output

\*İsmailde\*

# 1.4. Project Activities and Schedule

**\*\*Gant Chart eklenecek**

# 

# 2. DESIGN \*\* DSD den sonra bakılacak

# 2.1. High Level Design

# 2.2. Detailed Design

* This section will be completed in COMP 4920

# 2.3. Realistic Restrictions and Conditions in the Design

# 3. IMPLEMENTATION, TESTS and TEST DISCUSSIONS

# 3.1. Implementation of the Product

* This section will be completed in COMP 4920

# 3.2. Tests and Results of Tests

* This section will be completed in COMP 4920

# 4. CONCLUSIONS

# 4.1. Summary

\*\*

# 4.2. Cost Analysis Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Members** | **Daily/Hour** | **Weekly/Hours** | **Semester/Hours** | **Salary/Hour** | **Salary/Monthly** | **TOTAL** |
| Member1 | 8 | 8\*5=40 | 40\*14=560 | 20 TL | 11.200/3.5=3.200 TL | 11.200 |
| Member2 | 8 | 8\*5=40 | 40\*14=560 | 20 TL | 11.200/3.5=3.200 TL | 11.200 |
| Member3 | 8 | 8\*5=40 | 40\*14=560 | 20 TL | 11.200/3.5=3.200 TL | 11.200 |

As shown in the cost analysis table, three people works in the project. Every people works equally but have different tasks in the project.

**\*\* burada software i incele , hardware I required hardware kısmında madde madde yazdıktan sonar fiyat tablosunu koy.**

**Hardware and software price table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Software/Hardware | Minimum Price | Average Price | Fixed Price | Total |
| Software |  |  | $30=30\*6=180TL | 180\*3=540 Tl |
| Hardware | 6.500 TL | 12.000 TL |  |  |

1) Uflex

Unity uflex is an asset, software purchased for our project. We used uflex fluid simulation asset in order to study on particle based fluid simulation.

2) Obi Fluid

3) Screen space fluids pro

4) Tecnie collider creator Pro

**Required hardware:**

1. **Average components PC**

A D3D11 capable graphics card.

GPU: geforce GTX 730

CPU  
However, if GPU is better, we will get more efficient output so we have reserved minimum and average cost.

Total cost= Total employee budget + Software cost + Hardware cost (min/average)

If hardware cost will be minimum = 6.500 \* 3 Member=19.500

Total cost= 33.600 + 540 + 19.500 = 53.640 TL

If hardware cost will be average= 12000\* 3 Member =36.000

Total cost =33.600 + 540 + 36.000 = 70.140 TL

1. **Optimal comnponents PC**

Since our project is research based, income is not expected.

# 4.3. Benefits of the Project

Our project can benefit in all areas where liquid simulation is available.

Aspects to be examined:

1. Animation movies

**\*\* Bu maddeleri genişlet !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!**

1. Scientific work
2. Games
3. construction and Architecture

# 4.4. Future Work

Reduce time complexity and memory usage (space complexity).

Although the computer hardware used today is multi-core, only a small part of the software we use is programmed in parallel. For this reason, these series of software cannot use the hardware effectively and cause the user to waste time. Therefore, in order to be able to use hardware more efficiently, parallel codes will be written in the future.

# References

Rsd 1 -2 , DSD ve rsd deki referans kaynakları , varsa yeni kaynaklar yazılacak.