CENG 492
TEST
SPECIFICATION
REPORT

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1. INTRODUCTION

1.1 Objective

The objective of this document is to explain the methods used by the CMN Media group in order to test the KLOSTROFOBI project.

The main objectives of creating a test plan for the KLOSTROFOBI project can be summarized as follows:

- To define the test approaches used by CMN Media group
- To define the parts and features of the project which will be tested
- To explain the test scenarios
- To define the testing requirements

1.2 Scope

This document covers all the testing process for the KLOSTROFOBI project. This process includes testing the game modules separately and the project as a whole according to the determined use cases.

The document also defines the testing approach and testing criteria determined by CMN Media group for the KLOSTROFOBI project.

1.3 References

The following documents were used for the preparation of this report:

- CMN Media Detailed Design Report
- CMN Media Configuration Management Plan
- IEEE Standard for Software Test Documentation
2. TESTING PROCESS

2.1 Test Items

All the main modules of the KLOSTROFOBI project are tested separately during the testing process. So they are treated as different test items. The main modules of the KLOSTROFOBI project are as follows:

- Graphics Engine
- Model Exporter
- Physics Engine
- Script Engine
- Sound Manager

The game itself is also considered to be a test item since different tests are applied to it. The types of the tests applied to the test items and the test scenarios used are explained in the following sections.

2.2 Testing Approach

This section describes the types of tests that are applied to the KLOSTROFOBI project. There are four kinds of tests used for the KLOSTROFOBI project.

Functionality Tests: Functionality Tests are the tests which are done in order to verify if a feature is working according to its design specification. Functionality tests are used in KLOSTROFOBI project to examine the extent to which the main modules of the program meet expected functional requirements.

Performance Tests: Performance Tests are the tests conducted to evaluate the compliance of a system or component with specified performance requirements. Performance tests are used in KLOSTROFOBI project in order to determine if the project as a whole (when all its modules are working) satisfies the performance constraints defined in the Detailed Design Report of CMN Media group.

Stress Tests: Stress Tests are the tests used for determining the stability of a given system under extreme conditions. Stress tests are used in KLOSTROFOBI project to see the results of extreme use cases for some modules of the game. Also these cases are applied to the whole project in order to see the behaviour of the program.

Edge Tests: Edge Tests are the tests used for determining the weaknesses of a given system. Edge tests are used in KLOSTROFOBI project to detect the possible bugs in the game.
2.3 Pass/Fail Criteria for Test Items

The pass/fail criteria for the test items are stated separately below. These criteria are the minimum necessary requirements needed for a smooth gameplay. The criteria stated here are a summary of the requirements for these modules in the Detailed Design Report of CMN Media group for the KLOSTROFOBI project. If a test item cannot satisfy its required criteria then that item is useless for the project.

**Graphics Engine:**
Must be able to draw .lvl, .mdl and .smd files
Must be able to draw multiple transparent layers

**Model Exporter:**
Must be able to export the 3D Studio Max models into .lvl and .mdl formats

**Physics Engine:**
Must be able to support box and sphere shaped objects
Must be able to support friction and gravity

**Script Engine:**
Must be able to create a script instance for level items
Must be able to parse .bsc files

**Sound Manager:**
Must be able to play sound
Must be able to support multi channel sound

**KLOSTROFOBI:**
Must be able to run at least 30 frames per second all the time
Must be able to run under Windows 98 and XP

2.4 Test Scenarios

The test scenarios stated in this section are grouped by the test item they are applied to. Each test scenario will be defined with its:

- Test Item to be tested
- Creator of the scenario
- Feature(s) to be tested
- Type of tests applied
- Frequency of Tests
- Results of the Tests

**Graphics Engine:** The graphics engine is without any doubt the most important module of the project. The types of tests applied to the Graphics Engine are; Functionality Tests and Edge Tests. The test scenarios for the Graphics Engine are created and run by Eren Bali and Seçkin Sancı.
Functionality Tests are used to determine if the Graphics Engine could draw .lvl, .mdl and .smd files. Edge Tests are used in order to find out the possible bugs of the Graphics Engine.

The test scenario used for Functionality Tests has three parts. These parts are simply ordering the Graphics Engine to draw a .lvl file (a level of the game), a .mdl file (an item of the game) and a .smd file (a character of the game) separately. The Graphics Engine succeeded in these tests. This test scenario is repeated whenever a major change has been done to the Graphics Engine.

The test scenario used for Edge Tests consists of drawing a complete game level (with environment, items and characters), then moving the character in such a way (moving the character to the positions near to walls, near to objects and to the points in the map where the ceiling is low) that the testers could see the bugs of the Graphics Engine. At the end of such tests it was seen that main bug in the Graphics Engine was the unexpected moves of the camera (e.g. passing through walls) when the character is near the walls or corners of the rooms. Edge Tests are done for the Graphics Engine whenever a new level is created.

Model Exporter: The model exporter is an external tool developed for the KLOSTROFOBI project which is used for exporting the models created in 3D Studio Max to .lvl and .mdl formats. Only Functionality Tests are applied to the Model Exporter. The test scenarios for the Model Exporter are created and run by Eren Bali.

The test scenario for the Model Exporter has two parts. The first part is modeling a room in 3D Studio Max and exporting it into a .lvl file. The second part is modeling an object in 3D Studio Max and exporting it into a .mdl file. The tests were run at the early stages of the process. An error discovered by the tests is that the coordinates of the borders of a level were not correct all the time. This bug was fixed and the tests on Model Exporter need not to be run anymore.

Physics Engine: The types of tests applied to the Physics Engine are; Functionality Tests and Edge Tests. The test scenarios for the Physics Engine are created and run by Seçkin Sancı.

The test scenario used for Functionality Tests is simply creating box and sphere objects in ODE, drawing them with their actual shapes and sizes using OpenGL, setting the environment's gravity and friction then running the simulation and determining if the objects move normally. Two errors are detected during these tests. The first one is that the movement of box objects were unrealistic and the second error was that the gravitational acceleration of the earth (9.81 m/s²) was very small for large areas. These problems were solved by small modifications to the Physics Engine and using a higher gravity (100*9.81 m/s²). The Functionality Tests for the Physics Engine are run whenever a new level is created.

The test scenario used for Edge Tests included using very high/low gravity/friction parameters and using larger simulation steps. These tests resulted some unexpected behaviour of the Physics Engine (e.g. sudden changes in objects'
positions) so the team decided to use trusted values for the mentioned variables. The Edge Tests were done and finished at early stages of the project.

Script Engine: Functionality Tests are applied to the Script Engine. The test scenario for the Script Engine are created and run by Cem Can.

The test scenario used for Functionality Tests included parsing a .bsc file which contains the script info for an object (e.g. what operations can be applied to the object) and assigning the information taken from the file to that object. Functionality Tests for the Script Engine were carried out successfully for different kinds of objects. These tests are repeated for any object which introduces a new operation that can be applied to it.

Sound Manager: Only Functionality Tests are applied to the Sound Manager. The test scenario for the Sound Manager are created and run by Samet Karadağ.

The test scenario used for Functionality Tests included playing more than one type of sound (e.g. in game music and effects) at the same time. Also sounds coming from different positions were tested. The tests became successful and they are over for the Sound Manager.

KLOSTROFOBI: Testing KLOSTROFOBI means testing all the modules of the game at the same time. Tests run for KLOSTROFOBI are the most important ones as they are a measure of the overall quality of the game. The types of tests applied to KLOSTROFOBI are; Functionality Tests, Performance Tests and Stress Tests. The test scenarios for the KLOSTROFOBI are created and run by all members of CMN Meida group.

The test scenario used for Functionality Tests includes just starting a new game and playing it. The main purpose of this test is to see whether the modules of the game work nicely together. Functionality Tests for KLOSTROFOBI are the most frequent tests and they are repeated intentionally or unintentionally everytime the game is run.

The test scenario used for Performance Tests includes calculating the fps (frames per second) value for the game and displaying on the screen. The fps value for the game is calculated accordng to the following formula:

$$fps = \frac{1}{(time \ to \ draw \ one \ frame)}$$

To obtain more information about the game’s performance Performance Tests were run on three different computers. Here are the results:

<table>
<thead>
<tr>
<th>Computer</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 Ghz Processor, 512 MB memory, 64 MB Graphics Card</td>
<td>120 fps</td>
</tr>
<tr>
<td>1.6 Ghz Processor, 256 MB memory, 16 MB Graphics Card</td>
<td>55 fps</td>
</tr>
<tr>
<td>2.0 Ghz Processor, 256 MB memory, Graphics Card using shared memory</td>
<td>45 fps</td>
</tr>
</tbody>
</table>
The results of the test indicate that the performance of the game is mostly dependent to the graphics card of the computer. Performance tests are applied whenever a new level added to the project for the newly added level.

The test scenario used for Stress Tests includes filling a game level with losts of textured, lighted and moving objects, making physics calculations for each of them and moving the character and mouse so fast that the graphics engine has to draw many objects at each frame. This scenario is applied in order to see the stability of the project under extreme conditions. According to the results the game is still stable under these conditions, however the frame rate falls significantly which makes the game very hard to play. Stress Tests are applied when a major change is done to the main loop of the project.

3. CONCLUSION

The testing process is an indispensable part of the KLOSTROFOBI project and it works continuously most of the time as the project is developed. However there are times that certain types of tests must be carried out for example Edge Tests and Performance Tests when a new level is added. The main aim of testing in KLOSTROFOBI project is improving the gameplay experience offered. The members of CMN Media group believe that testing will not only increase the quality of the project but also ease the development phase.