

CENG 492

Computer Engineering

Design 2



Test Specification Report



Geeks In Action

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Contents

1 Introduction.....	3
1.1 Purpose of the Document.....	3
1.2 Scope of the Document.....	3
1.3 Major Constraints.....	3
1.4 Document References	4
2 Test Plan.....	4
2.1 Testing Strategy.....	4
2.1.1 Unit Testing.....	4
2.1.2 Integration Testing	4
2.1.3 Validation Testing.....	4
2.1.4 System Testing	5
2.2 Test Record Keeping	5
2.3 Testing Resources and Staffing.....	5
2.4 Testing tools and environment	6
2.5 Test Schedule	6
3 Testing Procedures	6
3.1 Overview of the System.....	6
3.2 Module Testing.....	7
3.2.1 Graphics Module.....	7
3.2.2 Physics Module	8
3.2.3 Network Module	9
3.2.4 Database Connection and Querying.....	10
3.2.5 Sound Module	10
3.2.6 Artificial Intelligence Module	10
3.2.7 User Interface Module	11

1 Introduction

This document is the test specification report of Football Game for Linux project, performed by the group Geeks In Action.

1.1 Purpose of the Document

The purpose of this document is to give information about the scope, resources, strategies and procedures of testing management as preparation for final release of this game. By extensive testing, it is intended to have a product free from defect and guarantee that project modules perform as expected. This document is also going to be a guideline for software reliability, quality and maintainability issues of this project.

1.2 Scope of the Document

This document presents the testing plan and different testing strategies for the project of Geeks in Action. The general information about this report is provided in the “Introduction” chapter. Next; in the “Test Plan” chapter, an overview of testing strategies, organization of testing staff, testing environment and testing schedule are presented. Third chapter explains the testing strategies and procedures in detail.

1.3 Major Constraints

This project is executed for senior project course in Middle East Technical University’s Computer Engineering Department and five senior students are working on it. Team members are subject to intense academic work that is not related with the project and this fact has a huge effect on the overall development performance of the group. The implementation of the project is still going on and since there is only a little more than a month left, time arises as an important constraint for testing.

In addition to time constraints; our group's size and our lack of access to different platforms and hardware, rigorously restricts the testing options for this project.

1.4 Document References

Standards and guidelines used in the preparation of this document are from the following references:

- “Software Testing”, The presentation prepared in METU Computer Engineering Department for the course CENG492
- Pressman, Roger S. Software Engineering: A Practitioner's Approach, Sixth edition. New York, NY: McGraw-Hill
- IEEE Standard for Software Test Documentation

2 Test Plan

2.1 Testing Strategy

2.1.1 Unit Testing

Game graphics, network, audio, ball physics, artificial intelligence, user interface and database modules are needed to be tested. Since each module can not be tested as individual parts for our project, other modules are going to be ignored during unit testing a module.

2.1.2 Integration Testing

Although each module might be working individually, integrating modules together might cause problems. Integration testing is going to check if modules can work together and if they are synchronized properly.

2.1.3 Validation Testing

Result of this test is going to show whether expectations in design is met or not.

2.1.4 System Testing

Various system tests are going to be held such as:

Stress Testing: This test is going to be held to check two conditions: to see behavior of the system to high input rate (by keyboard/game pad) and big database.

Security Testing: This test is going to be held to check network security.

Performance Testing: Performance of the game is tested on different hardware for different options in the game.

Alpha/Beta Testing: The game is going to be tested by the people in our department.

2.2 Test Record Keeping

As a result of the nature of our project, there is no test result data. However, after each test, the game is versioned and archived. Thus if bugs or errors are found in future tests, it would be possible to keep track of its place.

2.3 Testing Resources and Staffing

Main testing resource is the group members. Since group members are responsible for both developing and testing, there is a time constraint on testing. Thus, time spent on testing by group members has to be arranged in an efficient way.

Staff responsibilities for testing different modules are seen below:

Game Graphics	Talat, Oğuz
Network	Cuma, İshak
Audio	Cuma, Nur Muhammet
Ball Physics	Talat
Artificial Intelligence	Oğuz
User Interface	Cuma, İshak
Database	Nur Muhammet, İshak

2.4 Testing tools and environment

There are no additional testing tools other than the game itself. However, different testing environments are required.

First environment type is the operating system. Although, the game is supposed to work under Linux operating systems; there are many versions of Linux operating systems. Moreover, being 32 bit or 64 bit operating system matters too. Thus, the game is needed to be tested in different operating systems.

Second environment type is hardware. While old hardware would be causing low fps, new hardware would be providing high fps. Thus, the game has to be tested with different hardware to see that its functions are hardware independent.

2.5 Test Schedule

Incremental Testing	December 4 – June 15
Unit Testing	May 16 – May 20
Integration Testing	May 21 – May 28
Validation Testing	May 29 – June 2
System Testing	June 3 – June 15

3 Testing Procedures

In this chapter; strategies and procedures that are going to be followed in the test process are explained.

3.1 Overview of the System

In this testing procedure document, modules that have direct connection to the user are explained. Though there exist some low level modules without any outside interface, they are outside the scope of our testing procedure since the scope of this

testing report is high level black box testing. Testing a module consists of four basic testing strategies such as:

- **Functionality Testing:** It is performed to check whether the planned functionality exists in the game.
- **Performance Test:** It is explained above.
- **Stress Test:** It is explained above.
- **Edge Test:** It is performed to check if the system breaks down or behaves unexpectedly under extreme conditions or values which are unlikely to appear in normal game play.

3.2 Module Testing

3.2.1 Graphics Module

Game graphics is the main part of the project since the project is a football game with 3D graphics and its performance is related with the power of graphics hardware. Therefore; in game projects, the balance between graphics quality and performance should be set properly. If there are a lot of objects with high levels of detail in the game scene, the performance is subjected to reduce dramatically in the systems with poor graphics hardware.

Functionality tests for the graphics module are as follows.

1. Static 3D models should be correct and precise enough for representing its purpose. In this project; .obj and .3ds files are used, so in testing phase these model files should be checked if they are problematic.
2. Animated 3D models should be tested in the same manner. In addition, the assignment of correct frame intervals (correct animations) to correct moves needs to be tested.
3. Since textures actually form the model, they should be mapped correctly. In testing, correctness of this mapping is going to be checked.

4. Accuracy of the coordinates in 3D space is also going to be tested, since it effects directly on the game play. If an object settles on wrong coordinates, proper translations are going to be executed.

Performance tests for the graphics module are as follows.

1. Loading and rendering process execution of the graphics engine needs to be tested. For real time graphics, frame rate must be kept higher than 30 fps otherwise the game can be totally unplayable in multiplayer modes.
2. Models with high polygon numbers affect the performance of the game directly, so quality limits for reasonable game play needs to be tested.

Stress tests for the graphics module are as follows.

1. Does the upper limit for the number of objects that can be loaded suffice enough for a proper game play?
2. Does the upper limit for the number of objects that can be rendered in each frame suffice enough for a proper game play?
3. Does the maximum quality for the textures suffice enough for a proper game play?

Edge tests for the graphics module are as follows.

1. The behavior of the game needs to be tested when the limits found in stress test are exceeded.
2. The behavior of the game needs to be tested when minimum hardware requirement is not found on the system.

3.2.2 Physics Module

Ball motion in 3D space is simulated with physics module. In order to present a nice game play, physics module must properly handle the ball motion in 3D space.

Functionality tests for the physics module are as follows.

1. Correctness of the ball motion needs to be tested. The ball must have an oblique motion, when it is supposed to have. (e.g. in a wide shooting moment)

2. Collision detection of the models (i.e. footballers) needs to be tested. Little errors are going to be ignored since our team is not capable of dealing with that much detail. (we don't have a 3D modeler or animation artist in our team)

Performance tests for the physics module are as follows.

1. The change in performance while altering between box collision and mesh collision needs to be tested.
2. The effect of physics calculations to the frame rate performance needs to be tested. (and vice versa)
3. The effect of increase in the precise calculation for collision detection to the performance needs to be tested.

Stress test for the physics module is as follows.

1. Does the maximum number of collidable objects in the environment are suffice enough for a proper game play?

Edge tests for the physics module are as follows.

1. The behavior of physics module with a frame rate less than 30 fps needs to be tested.
2. The behavior of ball motion needs to be tested, when the ball is out of the environment.
3. The behavior of ball motion with small acceleration values needs to be tested.

3.2.3 Network Module

For the testing of network module, functionality and stress testing procedures are going to be performed.

Functionality tests for the network module are as follows.

1. Correctness of the transported data needs to be tested.
2. Process control of these transported data needs to be tested.
3. Correct preparation of the game data to be sent needs to be tested.
4. Joining and hosting a LAN game conditions needs to be tested.

The only stress test for this module is such that whether the game is going to run properly with 8 players (7 clients plus 1 host) connecting via LAN or not. The players must not be subject to any spikes or delay in the connection.

3.2.4 Database Connection and Querying

Information about players, footballers and teams are stored in the project database. Since additional database server is not going to be used, connection to database tests is not going to be performed. Instead of this, black box functionality tests are going to be performed such as insertion, deletion and update operations.

Stress test is going to be performed by applying these operations to a huge game database. Therefore, the maximum game database is going to be determined via this test.

3.2.5 Sound Module

Sound module is supposed to deal with operations such as loading and playing sound files, equalization of audio according to the graphical environment. In order to test this module, the following functionality tests are going to be performed.

1. Loading of the audio file needs to be tested. It should be loaded correctly from its specific path and in this process no delay should occur.
2. Acoustic quality of the sound needs to be tested. Since sound quality is important for a game, it should be determined that acoustic quality of an audio file is acceptable.
3. Since the volume level of sound can be adjustable by the player, it needs to be tested that sound manager must adjust the volume properly upon user request.

3.2.6 Artificial Intelligence Module

Artificial intelligence properties tests of this game can be explained as:

Functionality: These tests are going to depend much on intuition since the definitions of intelligent behavior can not be stated well.

1. Do the AI agents pass the ball among each other?

2. Are the goalkeepers (controlled by AI agents) able to catch the ball on defensive positions?
3. Do the AI agents shoot the ball properly on offensive positions?
4. Do the AI agents run after the ball?
5. Do the AI agents try to tackle or harass the footballer to gain ball possession?
6. Do the AI agents line up properly with respect to some specific formation or tactic?

Performance:

1. Do the AI agents react rapidly?
2. Do the AI agents consume too much system resource?

Stress: There are going to be at most 23 AI agents on a game play screen, so the behavior of the AI algorithm is going to be tested regarding this condition.

Edge: After the match is over, do the AI agents behave as expected?

3.2.7 User Interface Module

In this project, static and dynamic graphical user interfaces are used. Start and in game menus are static GUI elements and game play screen components such as scoreboard, clock, radar and ball possession indicator are dynamic GUI elements.

Functionality test of this module is as follows:

1. Does the correct sub menu open when proper button is pressed or clicked?
2. Is the expected sounds completely synchronized with user actions such as clicking or pressing?
3. Is the menu hierarchy complete and does it work correctly?
4. Does the radar appear/disappear when its setting is adjusted?

For the performance test; it needs to be tested that whether the performance is decreasing or not, while high quality textures and sound are loaded in the menu screen.