Software Requirement Specifications for

BATTLE TANKS

Version 1

11th November 2010

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Introduction:

This Software Requirements Specification provides a complete description of all the functions and specifications of the Battle Tanks game developed by first year UG students of IIT-Bombay (2010 autumn semester) as a part of CS101 course project.

The name of the game dveloped is an interactive computer game Battle Tanks, a game similar to the well known game pocket tanks, but with some minor changes. In the game, players have to fire weapons at each other's tanks in the game's GUI till the health of one of the players is reduced to zero, when the game ends. The game is available in both single player and double player modes. The game was made in c++ using g++ compiler. EzWindows library was used throughout the program.

Functional Specifications:

Functions of the Computer:

The basic tasks performed by the system may be broadly classified as follows:

In this GUI interface responding to user events, the main task performed by the computer is registering the mouse click of user and responding accordingly, as per where the mouse is clicked.

Another important task is for the system to "play" with the user in Single Player mode, following (the artificial intelligence) criteria given. The system is supposed play like a person would, following the difficulty levels selected by the user. The harder the difficulty, the more accurate will be the system's shot.

The task of the system is also to generate a random terrain for the game, keeping it within some well defined boundaries. The terrian is also supposed to look rugged and rocky.

The system is also the high score keeper. It maintains a record of all high scores in Single Player and saves them in the harddrive. When the game is restarted, the computer retrieves the high scores from the file.

The various functions used throughout the program and a brief description:

`1. void ClearScreen();`

Clears the screen by erasing all bitmap images.

`2. void DoublePlayerScreen();`

This function allows both players to select different types of tanks.

Global variables used : ScreenID, Height, Width, PhotoPosition;

`3. void GameMenuScreen();`

This is the main menu of the game where user can select single player mode, double player mode,instructions, high scores or exit.

Global variables used : ScreenID, Height, Width;

`4. int MouseClickEvent(const Position &MousePosition);`

Whenever mouse is clicked this function is called. It handles all mouse click events.

Global variables used :MouseClick, NumberOfPlayers, Width, Height, Tank1Attack, Difficulty, TerrainHeight, Angle, Power,;

`5. void SinglePlayerScreen();`

Player selects type of tank and difficulty level after choosing the Single Player mode.

Global variables used :Width, Height, ScreenID;

`6. void TerrainGenerator();`

Generates random terrain.
Global variables used :TerrainHeight, Height, Width;

`7. void WeaponShop(int,int);`

Generates weapon shop where players can select weapons.
Global variables used :Count, Height, Width;

`8. void WeaponSelection();`

This function lets players to select weapons and stores the selected weapons in array.
Global variables used :Width, Height, ScreenID, Weapon1Chance[], Weapon2Chance[], Player1Weapons[],
Player2Weapons[], Count;

`9. void GamePlayScreen();`

This loads the screen where game is played.
Global variables used :Tank1Health, Tank2Health;

`10. void SelectWeapon();`

User can select which weapon to fire.
Global variables used :PlayerNumber,Width, Player1Weapons[], Player2Weapons[], SelectedWeapon, Height;

`11. void CpuSelectWeapon();`

This function randomly selects weapons for CPU.
This happens in Single Player mode where the player plays against CPU
Global variables used :CpuChance[], SelectedWeapon, CpuWeapons[];

`12. void CpuInput();`

This function randomly selects Angle and Power for generating artificial trajectory for CPU in Single Player mode.
Global variables used :Angle, Power, TerrainHeight[], Width, Difficulty;

```
13. void BmpMove(BitMap &Image,const Position &Start,const
Position &End);
```

This is used to move the buttons on game menu screen.

`14. void wait (float milliseconds);`

This function is used to wait for specified time before executing next command.

`15. void InstructionsScreen();`

This shows the instructions screen.
Global variables used :Height, Width, ScreenID;

`16. void GameLoad ();`

Loads the terrain, tanks, weapons etc.

Global variables used :Width, TerrainHeight[], Height, Wind, PlayerNumber, Player1Weapons[], Player2Weapons[],Player1Chance[],Player1Chance[],CpuChance[],CpuWeapons[];

`17. void FireWeapon();`

This function is called when weapon is fired. It calls other functions based on the selected weapon.
Global variables used :Tank1Damage, Tank2Damage, Player1Weapons[], Player2Weapons[], SelectedWeapon, PlayerNumber, Player1Chance[], Player2Chance[],

`18. void SingleShot();`

This function simulates trajectory and calculates damage for weapon Single Shot.
Global variables used :Angle, Power, PlayerNumber, Width, Height, TerrainHeight[], Wind, Tank1Damage, Tank2Damage;

`19. void ThreeShots();`

This function simulates trajectory and calculates damage for weapon Three Shots.
Global variables used :Angle, Power, PlayerNumber, Width, TerrainHeight[], Wind, Tank1Damage, Tank2Damage;

`20. void FiveShots();`

This function simulates trajectory and calculates damage for weapon Five Shots.
Global variables used :Angle, Power, PlayerNumber, Width, TerrainHeight[], Wind, Tank1Damage, Tank2Damage;

`21. void SpaceLaser();`

This function simulates trajectory and calculates damage for weapon Space Laser.
Global variables used : Angle, Power, PlayerNumber, Width, TerrainHeight[], Wind, Tank1Damage, Tank2Damage;

`22. void EarthMover();`

This function simulates trajectory and calculates damage for weapon EarthMover.
Global variables used :Angle, Power, PlayerNumber, Width, Height, TerrainHeight[], Wind, Tank1Damage, Tank2Damage;

`23. void Cruiser();`

This function simulates trajectory and calculates damage for weapon Cruiser.
Global variables used :Angle, Power, PlayerNumber, Width, Height, TerrainHeight[], Wind, Tank1Damage, Tank2Damage;

`24. void SuperBullet();`

This function simulates trajectory and calculates damage for weapon SuperBullet.
Global variables used :Difficulty,Angle, PlayerNumber, Width, TerrainHeight[], Wind, Tank1Damage, Tank2Damage;

`25. void PotShots();`

This function simulates trajectory and calculates damage for weapon PotShots.
Global variables used : :Angle, Power, PlayerNumber, Width, TerrainHeight[], Wind, Tank1Damage, Tank2Damage;

`26. void MagicHeal();`

This function increases health of player by 200units.
Global variables used :PlayerNumber, Tank1Damage, Tank2Damage;

`27. void Damage();`
Deducts damage done to the tanks.
Global variables used :Tank1Damage, Tank2Damage, Tank1Health, Tank2Health, Tank1Attack, Tank2Attack, NumberOfPlayers, PlayerNumber ;

`28. void HighScoresScreen();`
This function loads High Scores screen.
Global variables used :ScreenID, HighScore[],Width, Height;

`29. void CpuWeaponSelection();`
This functions selects the weapon to be fired by CPU.
Global variables used :CpuWeapons[];

30. `void GameOverScreen();`
This function will be called when the game comes to an end, i.e. When the health of a player reaches zero.
Global variables used :NumberOfPlayers, Tank1Health, Tank2Health, HighScore[], Width, Height;

`31.int SaveScore();`
This function takes care of the input to the files. Every time the game is over this function is called which writes the score to a file called “high.txt”

Description of Data:

Description of variables and bitmaps:
Most of the data used in the program is generated by the system in runtime. This is handled at using variables, and arrays among other data stuctures. The only other interaction with the harddrive is to read and write the highscores. Bitmaps are also extensively used in the game.

Both global and local variables are used in runtime. Global variables are used because some parameters which vary are used in many functions, for example, the terrain generated. Another example of global variable used is the screen ID, which uniquely identifies each screen, and takes appropriate action as per user click.

A striking feature of the game is the extensive use of bitmaps throughout the game. Instead of using EzWindows provided functions to draw rectangles, bitmaps were used to make the game look more elegant, pleasing to the eye and give it a professional appearance. Bitmaps were used to show buttons on the GUI, for tanks, weapons, terrain, sky, trajectory of the weapon, messages to be displayed to users, and many more. In other words the entire game is built on bitmaps.

The data is broadly classified into the following:-
SCREENS

- Game Menu Screen : Contains various options:-
  - Single Player

    - Double Player
    - Instructions
    - HighScores
    - Exit
- SinglePlayerScreen
    - Contains options for selecting tank type
        - Normal
        - Offensive
        - Defensive
    - Contains options for selecting difficulty level
        - Easy
        - Medium
        - Hard
    - Back and Continue options
- DoublePlayerScreen
    - Contains options for selecting tank type for both Player1 and Player2
        - Normal
        - Offensive
        - Defensive
    - Back and Continue options
- Instructions Screen
    - Contains instructions for Single Player and Double Player mode
- High Scores Screens
    - Contains high scores of human players
- WeaponShop
    - Contains 8 weapons from which user can choose any 5
    - Shows selected weapons
    - Separate screens for player 1 and player 2
- Game Play Screen
    - Contains the following
        - Night sky background
        - Randomly generated terrain
        - Input box containing the following :-
            - Angle Bar : To select angle of projection
            - Power Bar : To select power of projection
            - Different weapon icons to select from
            - Name of the selected weapon
            - Fire button to fire the projectile
        - Health of both players
        - Wind : direction and magnitude

BITMAPS

Following bitmaps are used in the game:-

- SinglePlayer – Single Player Button
- DoublePlayer – Double Player Button
- Instructions – Instructions Buttons
- InstructionsWindow – Instructions Screen Backround and instructions
- Exit – Exit button
- HighScores – High scores button
- Back – Back button, different back buttons for different screens

- Continue – Back button, different back buttons for different screens
- Background – Game Menu Background
- Sky – Game Play Screen background
- TankTypeScreen - Background for Tank Type Screen
- TerrainTexture - Terrain texture for displaying randomly geberated terrain
- WeaponShopBmp
- Player1 - Player1 image
- Player2 - Player 2 image
- WeaponName[MAX_WEAPONS] – Weapon Name images
- WeaponIcon[MAX_WEAPONS] – Weapon Icon Images
- InputBackground - Background for input section
- TankBMP1 - Tank1 Image
- TankBMP2 - Tank2 Image
- PowerBMP - Power Image
- AngleBMP - Angle Image
- Fire - Fire button
- Projectile – Projectile Image
- ProjectileErase - Black image for erasingProjectile
- Player1Wins - Caption
- Player2Wins - Caption
- CpuWins - Caption
- GameOver - contains “Do you want to stop playing?”
- Yes - Yes button in above box
- No - No nutton in above box
- HighScoresBackground – High Scores Screen background
- TankNameOffensive
- TankNameDefensive
- TankNameNormal
- TankImageOffensive
- TankImageDefensive
- TankImageNormal
- SelectDifficulty - Caption
- DifficultyEasy
- DifficultyMedium
- DifficultyHard

WEAPONS

- SingleShot : Simple default weapon
- ThreeShots :Three shots weapon shoots three bullets at the same time
- FiveShots :Five Shots weapong fires Five bullets at the same time
- SpaceLaser :This weapon produces a beam of yellow laser which flashes on the screen and causes damage to the tank.
- EarthMover :The Earthmover destroys the terrain quite badly and takes the tank to a lower physical level if it hits at the right spot
- Cruiser :The weapon Criuser is an along the ground weapon. It goes along the terrain for a distance and then explodes.
- SuperBullet:Super bullet is a weapon which defies gravity and also can go through the terrain
- PotShots :Fires 5 shots seperately at places just around the intended place
- MagicHeal :Increases the health of the tank by 200 points

Description of libraries used:

Many libraries were used for library functions and for use of pre-defined classes.
Souce-defined:
cstdio:for IO functions
cmath:for mathematical functions used in the game
cstring:to handle strings, especially for bitmap names
cstdlib:for file handling
sstream:to convert datatypes
cassert:for checking assertion
ctime:for random number generation and more importantly, time delay functions

User-defined:
rect.h:to deal with rectangles
ezwin.h: to use the entire EzWindows library
bitmap.h: to make use of bitmaps, without which the game would never quite look the same.

User Interface Requirements:

- It is strongly advised that a colour monitor be used.
- The game runs only in Ubuntu OS. It is highly recommended that versions after 9.04 be used for compatibility issues. Ubuntu may be downloaded for free from www.ubuntu.com.
- The program also makes use of EzWindows library. This may be obtained from *www.cse.iitb.ac.in/ ~cs101/Demos/**EzWindows**/instructions.html*
- The game makes use of GUI, so the computer must support graphics.
- The RAM of the computer must be at least 1GB for the game to function smoothly.
- 10 MB of free hard disk space must be availbale for storing run time data.

Interface to other systems, if any:

None.

Acceptance Criteria:

The criteria of acceptance is that described in project outline which includes

- basic gameplay – trajectory generation and animation of projectile
- terrain damage
- health and damage
- end game criteria
- tank type: Normal, Offensive, Defensive
- AI for single player
- different difficulty levels: Easy, Medium, Hard
- weapon shop : containing atleast 6 weapons
- game menu
- high scores : file input/output
- instructions screen

Appendices:

Credits

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The game Pocket Tanks for the idea, tank image, terrain image

cplusplus.com, cppreference.com

Various websites for free images