



BATTLE CITY REQ DOCUMENT

Stage: Pre-release

Abstract

Battle City is a classic arcade game. This document captures the requirements of the game which is reimplemented using VC++ and the SFML library

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Version History

Version	Date	Change Summary	Reviewed by
1.0	9 th June 2024	Prelim Document	Paarth Pugalia
1.1	29 th June 2024	Updated terrain size and square details Updated details about speeds and movements Updated enemy tank details table Updated details about Enemy AI Updated inter-bullet interaction	Paarth Pugalia

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Abbreviations used in the document

[illegible]

Overview

Introduction

Battle City is a multi-directional tank shooter game and is one among the most played 1980s classic arcade games. It was produced and published in 1985 by Namco. It is a successor to Namco's 1980 Tank Battalion and would be succeeded itself by the 1991 Tank Force.

Game Play

- Player controls a single tank.
- The objective is to destroy all enemy tanks on each level while protecting your base (represented by an eagle or phoenix symbol).
- Enemy tanks enter the battlefield from the top and attempt to destroy the player's base and tank.
- The player can fire bullets to destroy enemy tanks and obstacles on the map.
- Obstacles, made of bricks and steel, can be used strategically to create defensive positions and control enemy movement.
- Power-ups can be collected by destroying certain types of bricks. These power-ups may provide additional firepower, increased armour, or the ability to build walls.
- Levels are completed when all enemy tanks are destroyed.
- The game has a set number of lives, and the player loses if all lives are depleted, or the base is destroyed.

Additional Features

- Multiple difficulty levels.
- Two-player cooperative mode.
- Bonus points for destroying enemies in quick succession.
- Time limit on certain levels.

Target Audience

- Casual gamers and enthusiasts of action and strategy games.

Scope

This document covers all features and details of the game as per the original classic. It might add few new features to make the game more interesting. However, the MVP scope might be limited and is marked specifically in the document.

Game Aspects

1. Gameplay Elements

- **Lives:** A set number of player lives. The game ends when all lives are lost.
- **Base:** A phoenix (eagle) to be protected at all costs. The game ends when the base is lost.
- **Score:** Points awarded for destroying enemy tanks, obstacles and collecting power-ups.
- **Time:** May or may not be a factor depending on the level. Some levels might have time limits.
- **Terrain:** A backdrop representing a battlefield having various blocks placed strategically, base at bottom centre and tanks moving around.

2. Player Tank

- **Movement:** The player's tank can move freely in four directions (up, down, left, right).

- **Firing:** The tank fires bullets in the direction it's facing. Firing rate may be constant or affected by power-ups.
- **Health:** The tank can withstand a certain amount of damage (bullet hits) before being destroyed.

3. Enemy Tanks

- **Variety:** Different types of enemy tanks with varying movement patterns, speed, and health.
- **Behaviour:** Some enemies may move randomly, while others may target the player or player's base directly.

4. Terrain:

- **Background:** A simple backdrop representing a battlefield.
- **Obstacles:**
 - **Bricks:** Destroyable obstacles that can be used strategically for cover.
 - **Steel Walls:** Indestructible obstacles providing strong defensive positions.
 - **Water:** Impassable terrain that can trap both player and enemy tanks.
 - **Grass:** Terrain that can hide position of both player and enemy tanks and can be used by enemy tanks to camouflage.
 - **Ice:** Slippery terrain on which tanks go slower.
- **Bullets:**
 - **Normal:** Normal bullet that can destroy tanks, brick walls etc.
 - **Armor Piercing:** Bullets that can destroy steel walls as well.
- **Animation**
 - **Explosion:** Animation that shows a blown off tank
 - **Shield:** Whenever a player tank gets and shield, this animation is active on the tank
 - **Immobilize:** This animation is shown on immobilized tanks

5. Power-Ups:

- **Types:** Various power-ups with temporary effects that can be collected by destroying specific bricks. Examples include:
 - **Extra Life:** Grants an additional life.
 - **Faster Firing:** Increases the rate of fire for the player's tank.
 - **Double Shot:** Allows the player's tank to fire two bullets simultaneously.
 - **Bullet Penetration:** Enables bullets to pierce through multiple enemies or steel walls.
 - **Shield:** Grants temporary invincibility to the player's tank.
 - **Base Walls:** Creates temporary steel walls around the player's base.

6. Levels:

- **Design:** Each level presents a unique layout of obstacles, enemy spawn points, and power-up locations.
- **Progression:** Levels may increase in difficulty by introducing more enemies, faster enemy movement, or more complex level layouts.
- **Number:** The game has a set number of levels to complete.

7. User Interface (UI):

- **Enemy Counter:** Displays the remaining number of enemy tanks in the ongoing level.
- **Life Counter:** Displays the remaining number of player lives.
- **Score Counter:** Displays the current score.
- **Time Display (if applicable):** Shows the remaining time on timed levels.

- **Home Screen:** Contains the level selection, settings related to audio, player control etc.
- **Level Up Screen:** Screen showing the completed level summary before moving onto the next level.

8. Sound Effects and Music:

- **Sound effects:** Firing sounds, explosions, tank movement, and power-up collection sounds.
- **Music:** Background music to enhance the gameplay experience.

Gameplay Elements

Terrain

A terrain consists of a maze of 13x13 blocks or 26x26 squares. An example terrain image is shown below.



Squares

A square is the fundamental unit of the terrain.



A square can be 16x16 pixels for a screen resolution of 1024x768. In the original game, this resolution is maintained across different screen resolutions. However, to make the game look and feel better on higher resolution screens, the square resolution can be scaled appropriately.

It is important to note that all the everything else should be scaled appropriately by the same factor to ensure a seamless gaming experience across different resolutions.

Blocks

A block is a 2x2 collection of same type of squares. An obstacle on the terrain is typically a block. A block can be as a whole (2x2) or half (2x1 square + 2x1 space or 1x2 square + 1x2 space). A complete block looks like the one shown below.



A half block can be oriented in 4 possible ways and looks as below. The border is shown for the sake of clarity.



The base, tanks, power ups etc. are all size of a block. The different types of obstacles are defined later in the document.

Movement Speed

The real-world movement speed (distance/time) of game objects is controlled using two parameters in games.

- Pixels an object would move in a frame – PPF
- Frames being displayed per second – FPS

While the movement of objects could be triggered by user input (click, key press etc.), only one event of a given type is considered per frame even if the user holds the key or click. For this game, the FPS would be fixed so that the game can run even on low-end PCs.

- FPS = 60

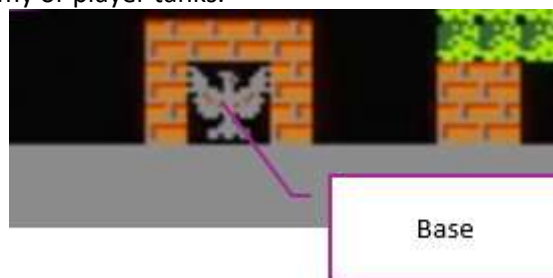
With the FPS fixed the speed of all objects can be defined in terms of PPF. The lowest speed would be thus 1 PPF where an object moves only 1 pixel in a frame. This we will refer as the base speed (BS). All moving objects move at a speed which is a multiple of BS based on its capability, type etc.

- BS = 1 PPF

IMPORTANT NOTE: It is important to note that if the square size is scaled based on the screen resolution, the base speed should be scaled by the same factor to maintain the game experience.

Base

The base represented by an eagle/phoenix is always at the bottom centre. It is normally protected by a half brick block in the beginning of each level. The base can get destroyed by any kind of bullets irrespective of whether they are shot by enemy or player tanks.



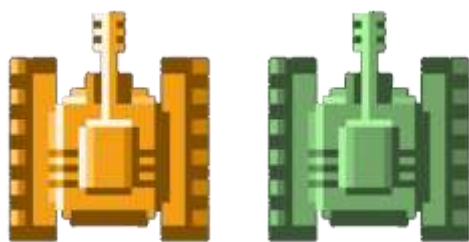
Lives

Each player gets 3 lives. The base has only 1 life. If the player is shot down, it respawns in the same level in the ongoing battle if it has lives left. If the base is lost, then the game is lost. In case the base extra life is available the entire level respawns.

Player Tank

UI

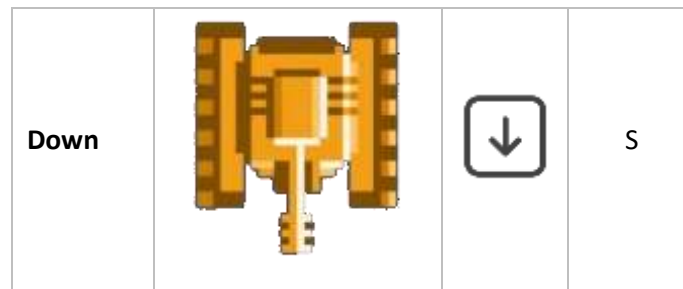
Player tanks are a bit bulky and heavy looking compared to normal enemy tanks. Player 1 tank is yellow in colour while the Player 2 tank is green in colour.



Movement

The tanks move in the direction of the cannon. The direction can be changed to 4 different ones.

Direction	Image	Player 1	Player 2
Left			A
Right			D
Up			W



Speed

Player tanks have a default speed of 1 BS. Depending on its power ups, it can double to 2 BS.

Fire Power

The tank fires in the direction of the cannon. The bullet has the following properties by default. Power-ups can change that.

- Bullet speed: 4 BS
- Rate: 1 bullet/s

Bullets are triggered by dedicated fire keys

- Player 1 Fire Key: M
- Player 2 Fire Key: F

Lives

The player tanks and the base have 3 lives each overall. The game is over when

- All base lives are over OR
- All player lives are over

In 2 player mode, if one player lives are over, it does not respawn. The other player continues the game till either all levels are complete, or game is over due to base lives or 2nd player lives getting over.

Health

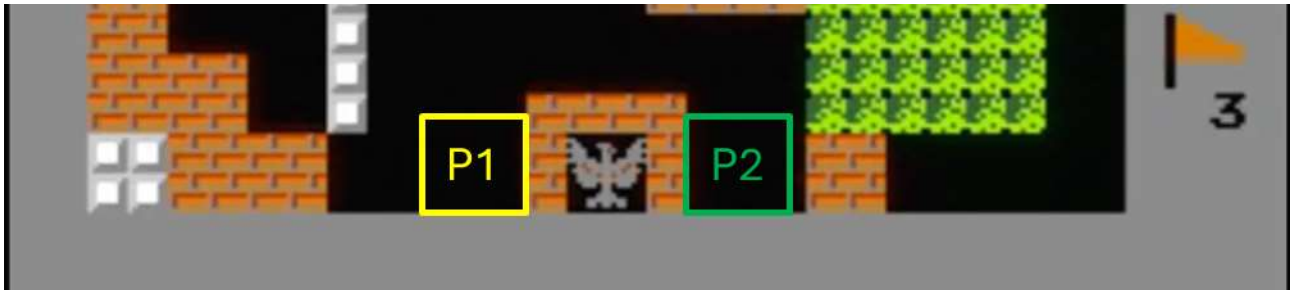
Either of player tanks or base can get destroyed by one (1) shot of enemy tank. This is the default health level. Power ups might change this.

In case the player tank is hit by another player's tank, it immobilizes for 5s.

Respawning

The player tanks once destroyed, respawn into the ongoing level beside the base.

- Player 1 respawns on the left and Player 2 on the right as shown in the image below.



- In case all lives are over for any given player, it won't respawn again.
- Whenever a player tank respawns, it comes with a default shield which stays on for three (3) seconds.
- Any powers that the tank had are lost on respawning.

Enemy Tanks

Enemy tanks are of 5 different varieties with varying speed, manoeuvring capability, fire power, armour/health etc. The number of tanks and their types vary in each level, in general increasing and becoming smarter with every level. Enemy tanks can be shot by player tanks only. Other enemy tank bullets pass through them.

Details

Tank Type	Image	Points	Speed	Directions	Health	Fire Power	Smartness
Basic Tank		100	1 BS	Left, Right, Up, Down	1 shot	1 shot/ 2s Speed: 4 BS	Basic movement
Light Battle Tank		200	2 BS	Left, Right, Up, Down	1 shot	1 shot/s Speed: 4 BS	Basic movement
Double Barrel Tank		400	2 BS	Left, Right, Up, Down	1 shot	2 shot/s Speed: 4 BS	AI to target players
Destroyer		400	1 BS	Left, Right, Up, Down	3 shots	1 shot/s Speed: 4 BS	AI to target players
Fighter Tank		600	2 BS	Left, Right, Up, Down	3 shots	2 shot/s Speed: 4 BS	AI to target players and base

Note: The Destroyer and the Fighter tanks change colour with their health dropping from Red (3) → Blue (2) → Silver (1)

Spawning

Enemy tanks spawn only from 3 locations in the top row of the terrain. Left most, Right most and Centre.



Tank AI

- Basic Movement

This is the simplest of the movements and doesn't involve any AI. Here the tank keeps on moving in its current direction till it hits any obstacle (blocks, other tanks etc.) through which it can't continue to move. In such case it randomly decides to turn into any of the other 3 directions. It then continues to move in the new direction. The change of direction has a rate limit depending on the tank.

1. Basic Tank: 1/s
2. Light Battle Tank: 2/s

The basic movement remains the same irrespective of the Enemy AI Level.

- AI to target players

This movement is similar to the basic movement with one key difference. Whenever the direction changes are done it happens always in the direction of the closest player and not random. Further, with the Enemy AI Level, the direction change decision making is done on different conditions.

1. Basic: Same as Basic Movement
2. Medium: Change direction whenever player tank is within 5 blocks and has changed direction
3. Advanced: Change direction whenever player tank is within 5 blocks and its distance is increasing






- AI to target players and base

This movement is similar to the AI to target players, with the key difference that in case there is no player tank in vicinity (within 5 blocks), then it starts moving toward the base. This movement is the most dangerous of all and if not stopped by destroying the tank, it would destroy the base.



Terrain



The terrain can have different kind of obstacles. The tanks can be moving around along with different bullet types inside the terrain. The obstacles and bullet types are defined here.

Obstacles


Obstacle Type	Image	Interaction with Tanks	Interaction with Normal Bullets	Interaction with Armor Bullets	Remarks
Brick Wall		Blocks – no pass through	50% destruction / bullet Bullet destroyed	100% destruction / bullet Bullet destroyed	Destroyable obstacles that can be used strategically for cover
Steel Wall		Blocks – no pass through	Indestructible Bullet destroyed	50% destruction / bullet Bullet destroyed	Indestructible obstacles providing strong defensive positions
Water		Blocks – no pass through	Pass through	Pass through	Impassable terrain that can trap both player and enemy tanks
Grass		Hides – pass through	Pass through	Pass through	Terrain that can hide position of both player and enemy tanks and can be used by enemy tanks to camouflage
Ice		Speed reduced to 50% – pass through	Pass through	Pass through	Slippery terrain on which tanks go slower

Bullets

Bullet Type	Image	Interaction with Tanks	Interaction with Bullets	Interaction with Obstacles
Player – Normal		Destroys / damages enemy tanks Immobilizes player tank	Destroys enemy bullets Passes player bullets	As detailed in table above
Player – Armor Piercing		Destroys / damages two enemy tanks in a row	Destroys enemy bullets	As detailed in table above

		Destroys player tank	Passes player bullets	
Enemy – Normal		Passes through enemy tanks Destroys player tank	Destroys player bullets Passes enemy bullets	As detailed in table above
Enemy – Armor Piercing		Passes through enemy tanks Destroys player tank	Destroys player bullets Passes enemy bullets	As detailed in table above

Animation

Animation Type	Image	When does it happen	Remarks
Explosion		On destruction of a tank	
Shield		On obtaining a shield	
Immobilize		When tank(s) becomes immobile	
Big Explosion		On destruction of base	

Power-Ups

The terrain can have power-ups that can spawn off at random time and place during the game play. They can appear anywhere in the terrain making them unreachable at times. They are available only for a certain duration after which they vanish. Only player tanks can get the power ups by moving over them.

Type	Image	What it does?	Duration of existence	Count in entire game	Persistence through levels	Persistence with respawn
Extra Life		Gives an extra life to the player	10s	2	Yes	Yes
Extra Base Life		Gives an extra life to the base	10s	1	Yes	Yes
Faster Firing		Increase bullet speed to 2x the default	10s	Levels / 2	Yes	No
Double Shot		Increase firing rate to 2x the default	10s	Levels / 3	Yes	No
Armor Piercing Bullet		Makes the bullets armour piercing	10s	Levels / 4	Yes	No
Shield		Puts a temporary shield around player tank for 10s	10s	Levels / 2	No	No
Base Walls		Puts a temporary steel wall around base for 10s	10s	Levels / 5	No	Yes
Freeze		Freezes all enemy tanks for 5s	10s	Levels / 2	No	Yes
Dynamite		Destroys all active enemy tanks	10s	Levels / 2	NA	NA

Levels

Each level comes with a pre-loaded map, enemy tanks, power-ups etc. Below table summarize the details of each level. The level maps are given as images below.

Details

Level	Tanks	Power Ups	Time Limit	Base Shield	Enemy AI Level
1	Basic Tank – 10 Light Battle Tank – 10 Fighter Tank – 0 Double Barrel Tank – 0 Destroyer – 0	Shield Freeze	NA	Half Brick Wall	Basic
2	Basic Tank – 15 Light Battle Tank – 10 Fighter Tank – 5 Double Barrel Tank – 0 Destroyer – 0	Shield Freeze	NA	Half Brick Wall	Basic
3	Basic Tank – 10 Light Battle Tank – 10 Fighter Tank – 10 Double Barrel Tank – 0 Destroyer – 0	Shield Freeze Dynamite	NA	Half Brick Wall	Basic
4	Basic Tank – 10 Light Battle Tank – 10 Fighter Tank – 10 Double Barrel Tank – 5 Destroyer – 0	Shield Freeze Dynamite Faster Firing Double Shot	NA	Half Brick Wall	Basic

Level	Tanks	Power Ups	Time Limit	Base Shield	Enemy AI Level
5	Basic Tank – 0	Shield	NA	Half Brick Wall	Basic
	Light Battle Tank – 10	Freeze			
	Fighter Tank – 10	Dynamite			
	Double Barrel Tank – 10	Faster Firing			
	Destroyer – 5	Double Shot			
6	Basic Tank – 0	Shield	NA	Half Brick Wall	Medium
	Light Battle Tank – 10	Freeze			
	Fighter Tank – 10	Dynamite			
	Double Barrel Tank – 10	Faster Firing			
	Destroyer – 5	Double Shot			
7	Basic Tank – 5	Shield	NA	Half Brick Wall	Medium
	Light Battle Tank – 5	Freeze			
	Fighter Tank – 5	Dynamite			
	Double Barrel Tank – 10	Faster Firing			
	Destroyer – 10	Double Shot			
8	Basic Tank – 0	Shield	NA	Half Brick Wall	Medium
	Light Battle Tank – 10	Freeze			
	Fighter Tank – 10	Dynamite			
	Double Barrel Tank – 5	Faster Firing			
	Destroyer – 10	Double Shot			
		Base Walls			
9	Basic Tank – 10	Shield	NA	Half Brick Wall	Advanced
	Light Battle Tank – 0	Freeze			
	Fighter Tank – 5	Dynamite			
	Double Barrel Tank – 10	Faster Firing			
	Destroyer – 10	Double Shot			
		Base Walls			

Level	Tanks	Power Ups	Time Limit	Base Shield	Enemy AI Level
10	Basic Tank – 10 Light Battle Tank – 10 Fighter Tank – 10 Double Barrel Tank – 10 Destroyer – 10	Shield Freeze Dynamite Faster Firing Double Shot Base Walls	NA	Half Brick Wall	Advanced

Level Maps

- Original Maps: <https://gamefaqs.gamespot.com/nes/562966-battle-city/faqs>
- Nintendo Maps: <http://selmiak.bplaced.net/games/nes/index.php?lang=eng&game=Battle-City>

User Interface

Home Screen

This screen is the game start screen containing game settings and related aspects.



- Allows for selection of 1 or 2 player game
- Allows to create new maps

Level Screen

Each level screen contains various elements and the map. The elements are described here.



Level Up Screen

On completion of a level this screen summarizes the level achievements.



Sound Effects & Music

Sound Effects (TBD)

- Explosion
- Power Up Taken
- Dynamite
- Immobilize
- Enemy tank health reduction

Music (TBD)

- Level starting music
- Background music

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