

# **Fury Fighter**

## Design Document

### **About This Document**

This is the design document for Fury Fighter, a game based on Taxan's 1990 Nintendo Entertainment System game, Burai Fighter. This document describes gameplay specifics, but does not go into detail about content creation, level mapping, or boss design.

### **About Burai Fighter**

Burai Fighter was released in 1990 by Taxan for the Nintendo Entertainment System (NES). While the game is largely a derivative to other shoot-em-up titles of the era, it was notable for its difficulty, level design, and graphics. The story of the game is summarized as follows; seven super-brained organisms, known as the Burai, are creating huge armies of half robot, half organic, creatures. Their intention is to take over the universe, and it is your job to stop them. There were seven stages in the original game, one for each Burai.

### **General Design and Gameplay**

Burai Fighter is unique among other shooters of its time because of the careful attention paid to level design. In the game, players must navigate complex maps, outracing the ever present back edge to the auto scrolling levels, while in the mean time avoiding hoards of enemies and bullets. The level designers of Burai Fighter were careful to make avoidance as important as mechanics, especially evident in the swinging arms and other level hazards. Levels were also designed to pin the player against the auto scrolling; the player would be able to enter a cavern in the level, only to find that in a few seconds the entrance has scrolled off the screen, leaving them trapped. While at higher weapon levels there is a bullet frenzy aspect, most of the game's difficulty revolves around avoidance.

The concept of direction is also present in many aspects of the game. First, the player is able to move in eight directions and fire in eight directions. They are not limited to the direction of the scrolling or even the direction they are moving; the player may move and fire in opposite directions, which was novel for a game that proceeded the advent of dual-stick controllers by almost a decade. The player is not the only one with this advantage, as the enemies have a wide variety of movement patterns that, in certain combinations, can be very challenging for the player. The most stunning use of direction in the

game, however, is the change of scrolling direction. The levels wind their way either up, down, left, or right, and change directions completely unexpectedly. The change in scrolling direction forces the player to fight enemy movement patterns from different angles, adding challenge and interest to the game.

Another key element of the game design is the concept of risk and reward when gathering items and navigating the map. The player is able to choose if they should power up one weapon or spread the level increases around; the former allows the player to become very powerful, but at a very great risk, as dying resets the weapon power to zero, and the latter is a safer play but the player is less powerful. Players may spend the extremely powerful cobalt bomb at the slightest hint of danger, or they can save them for only the greatest threats to increase their chances of an extra life. Should the player risk going into a potentially dangerous cavern for the defense pod, or play it safe and take the main path?

## **Player**

### Basic

Unlike most shooter games of the era, the player character is depicted not as a spaceship, but as an individual in a space suit. The player begins with up to 5 lives, depending on difficulty level, and a default speed of 3.3 units per frame. Bomb fragments and weapon upgrades, discussed in later sections, also begin empty when beginning the game. The player also has a score, determined by the enemies killed and pickups obtained. For each 100,000 points, an extra life is earned.

#### Controls Summary

- Arrow Keys	Move player
- X Key	Fire
- Z Key	Cobalt Bomb
-Enter Key	Pause Game
-ESC Key	Quit

### Movement

The player is able to move in eight directions: up, down, left, right, and along both diagonals, and moves at the same speed for every direction. The arrow keys correspond to moving in their respective directions, and diagonal movement is achieved by holding down two arrow keys. Even if there are no barriers in the level preventing the player from doing so, it is impossible to leave the screen. Changing direction also changes the aim of the gun, unless the fire button is actively being held. Holding the keys results in constant player movement.

## Weapons

### *Basic cannon*

The basic cannon is the default weapon when starting the game. It fires rapidly but is fairly weak, dealing only 1 damage unit. Holding down the X key results in constantly firing the weapon. It has unlimited ammo and range. It cannot shoot through enemies or walls, nor can it destroy incoming enemy bullets. It appears as a black ball. Bullets for the basic cannon travel at 16.5 units per frame at a rate of 4 bullets per second..

### *Defense Pod*

The defense pod is obtained in a pickup. It is represented by a small star shaped image. When collected, it circles around the player and kills all enemies and bullets it contacts. Collecting multiple defense pod pickups increases the speed in which it rotates around the player. The defense pod can move through walls.

### *Cobalt Bomb*

The cobalt bomb is activated by pressing the Z key, and can be activated if the player possesses 4 bomb fragments. After firing the cobalt bomb, the player loses 4 bomb fragments. Holding down the Z key will not fire the cobalt bomb twice. It effectively eliminates all enemies and enemy bullets currently on the screen. It appears as an explosion of fireball animations surrounding the player.

### *Cannon Improvements*

There are three cannon improvements, or powerups, that the player can use. Each powerup is fired in addition to the basic cannon. There are three types of powerups, and each have different attributes.

Powerup Name	Strength	Special abilities
Missile	High (3 Damage)	None
Laser	Medium (2 Damage)	Fires through enemies
Ring	Low (1 damage)	Fires through walls

Each powerup has three levels, which increase the powerup's effectiveness. A player gets a powerup by picking them up from a dropped enemy. Every time a player picks up a powerup of a specific type, it increases a running total of powerups of that type; the total number of powerups of each type determines its level.

Powerup Level	Number of Pickups Required
1	1-4
2	5-9
3	10+

While more than 10 pickups can be obtained for each weapon type, doing so has no effect on the level.

Every powerup has unique features that are advantageous in certain circumstances and disadvantageous in others. The player cannot switch powerups at any time of their choosing. The only way to switch what powerup is being used is to collect another pickup of the desired powerup. Because powerup pickups cycle through the three powerups at constant time (described in detail below), one of the challenges for the player is to correctly time obtaining the desired powerup. Below is a description of each weapon upgrade.

Missile	
Level	Effect
1	Single missile, always fires to the right, regardless of direction player is facing.
2	Two missiles, one fired to the right, the other to the left, regardless of the direction the player is facing.
3	Four missiles, fired up, down, left, and right, regardless of the direction the player is facing.

Laser	
Level	Effect
1	Single laser, in the direction the player is currently facing.
2	Two lasers, one in the direction the player is facing, and one in the opposite direction.
3	Four lasers, one in the direction the player is facing, one in the opposite direction, and two more perpendicular to the first two, in opposite directions.

Ring	
Level	Effect
1	One ring, in the direction the player is shooting.
2	Two rings, one in the direction the player is shooting, and one in the opposite direction.
3	Four rings, one in the direction the player is shooting, one in the opposite direction, and two at 45 degree angles above and below the player direction.

## Death

### *Reasons for Death*

A player can die from the following reasons: trapped between an environment tile and the trailing scroll boundary, direct contact with an enemy, and contact with an enemy bullet. Death has numerous consequences. First, a player loses all weapon powerups for the current weapon used at the time of death. Second, a player loses all bomb fragments collected. Third, the player loses a life. Death is displayed as an explosion around the player.

### *Game Over*

When a player's last life is spent, they are presented with a game over screen, allowing to either start over or continue at the beginning of the current level. If the player chooses to continue, their score is reduced to 0, and they lose everything they normally would in a normal death.

## Pickups

### *Weapon Powerups*

Weapon powerups appear as circles on the screen with an M, L, or R inside corresponding to missile, laser, and ring cannon improvements, respectively. These powerups are dropped by killed enemies. They begin on a random letter, then cycle in one second intervals through the other options. The option that is showing on the point of contact is the improvement the player receives. These pickups are dropped by enemies.

### *Speed*

The speed pickup looks like a weapon powerup, but it contains the letter S. When collected, the player's movement speed increases by a rate of 1.65 units per frame. These pickups have pre-determined locations in the level.

### *1-up*

The 1-up pickup appears like a weapon pod, but with a 1 in it. When collected, it increases the player's life total by 1. These pickups have pre-determined locations in the level.

### *Bomb fragment*

A bomb fragment appears on the screen as a small fireball. Collecting four bomb fragments allows the player to use the Cobalt Bomb. After collecting 32 bomb fragments, the player gains an extra life and the bomb fragment total is reset to 0. This means that the player can have at most 7 cobalt bombs stored.

### *Defense Pod*

This pickup gives the player the defense pod weapon if they do not possess it already. When the player already has a defense pod, future pickups will increase the rotational speed.

## **Enemies**

### Basic Enemy Types

All enemies are spawned in a pre-determined fashion by the level. Contact with any of the enemies results in death.

### *Flyer*

The Flyer is the most common enemy type. It moves in a single direction across the screen in a shallow sinusoidal pattern, at a rate of 3.3 units per frame. Generally, Flyers only move left to right and right to left. They have a 5% chance every frame to fire a bullet. One shot from the basic cannon will destroy a Flyer. They have no defense mechanisms to block fire. They drop bomb fragments at a rate of 40%. They drop weapon pods at a rate of 20%.

### *Worm*

The Worm is identical to the Flyer, except it moves slightly faster 6.6 units per frame and flies in a

straight line. It also fires more frequently, at a rate of 10%.

### *Turret*

Turrets are another common enemy type. They do not move at all, except for rotating to aim at the player. They fire bullets at a rate of 10%. One shot of the basic cannon will destroy a turret. They have no defense mechanisms to block fire. They drop bomb fragments at a rate of 40% and weapon pods at a rate of 20%.

### *Torpedo*

The Torpedo moves in a straight line either left to right or right to left. They appear on the map moving slowly, at a rate of 1.65 units per frame, then after 1 second, accelerates to a moving rate of 19.8 units per frame. They do not shoot bullets. One shot from the basic cannon will destroy a torpedo, and they have no defense mechanisms to block bullets. They drop bomb fragments at a rate of 40% and weapon pods at a rate of 20%.

### *Bouncer*

The Bouncer is the only enemy that is affected by gravity, bouncing up and down on the level. They move at a horizontal speed of 3.3 units per frame. Bouncers have a shell on their back that is indestructible, making them impervious to shots from above.. Otherwise, they take two shots to destroy. They drop bomb fragments at a rate of 40% and weapon pods at a rate of 20%.

### *Eye*

The Eye is a slow moving enemy, but with extra defense. It follows the player using a steering movement pattern at a rate of 1.65 units per frame. The Eye does not shoot any bullets, but is much larger than the other enemies. The Eye is protected on three sides, the fourth exposed side is the only side that bullets can penetrate. They take 8 shots from the basic cannon to destroy. They drop weapon upgrades 100% of the time. They are the only enemy impervious to the cobalt bomb.

### *Bomb*

A Bomb is a slow moving circle, that flies in a straight line at a slow rate of 1.65 units per frame. They only move from left to right or right to left. After moving for a set amount of time, or being shot 4 times from the basic cannon, they explode into 20 copies of themselves, creating an expanding circle of deadly objects.

### *Scorpion*

The Scorpion is the only enemy that moves by a set of predetermined waypoints. They only appear that the hardest difficulty levels, because their movement makes them difficult to shoot. They tend to retreat off the screen if they are not destroyed. They move at a speed of 3.3 units per second and fire rapidly, at a speed of two times per second. They only take 1 bullet to kill. They drop bomb fragments at a rate of 50% and weapon pods at a rate of 50%.

### Sub Bosses

Levels may contain sub bosses that the player must destroy before moving on. Sub bosses stop the scrolling of the level and generally have more health than typical enemies.

### Bosses

Each level ends with a boss fight. Bosses are large enemies that have a high life total. There is no scrolling in the boss fights, so the player is constrained to a single screen of movement. There are no walls in a boss fight, but some bosses may affect their environment (falling rocks, lava floor, etc.)

## **GUI**

The GUI is 16 tile units wide and 2 tile units high, and is located at the bottom of the screen. It must contain information about player lives, bomb fragments, score, high score, and number of weapon pickups. Bomb fragments are represented as a segmented progress bar, the rest are icon and number pairs.

## **Environment**

### Scrolling

Scrolling is used as a design feature of the game. Levels should pin the player against the scrolling, forcing them to fit through tight crevices and escape caverns after a sudden scrolling direction change. Typically, the environment should scroll right to left, meaning the player seemingly moves left to right. The normal pace of scrolling is 1.65 units per frame but can change if necessary. The direction of the scrolling can change without warning, and is predetermined in the level design.

### Secret Areas

In addition to the normal path of the game, there are secret areas that generally contain items for the



player to pick up. Secret areas are just areas the environment scrolls to off the main path, but it does not do so unless the player is in a certain position at a certain time. For example, there may be a room above the main path, which contains a defense pod and four bomb fragments. This room is not visible during normal scrolling. In order for the player to access this room, they must wait at the top of the screen until the environment has scrolled a certain distance. Then, the map will divert from its normal scroll pattern, scroll up, allowing the player to collect the pickups, then back down to return to its normal path.

### Spinning Arms, hazards

The environments may have other obstacles besides walls and enemies. One such obstacle is a spinning arm, which is a long string of circles, with one end pivoted to a wall. It rotates similarly to hands on a clock, and results in instant death upon touching. It can move through other walls and can spin in any direction. They are indestructible. Multiple spinning arms are used together to create difficult passages.

## **Levels**

### Difficulty levels

There are four difficulty levels in the game, Eagle, Albatross, Ace, and Ultimate. The first three are available to the player at the start, but Ultimate must be unlocked by beating the game on Ace. The biggest difference between the levels is that the enemies have more health, move faster, and have a higher fire frequency. There are also more enemies and different types of enemies. Bosses especially get a health boost, making them quite difficult at higher levels. For each difficulty level, movement speed increases by 5% per difficulty level.. Health, for normal enemies, doesn't change, but for sub bosses and bosses, they gain a 10% increase in health per difficulty level. Firing frequency for all enemies increases by 5% per difficulty levels.

In addition to the enemies being more difficult, the player only starts with 4 lives on Albatross, and 3 lives on Ace and Ultimate. Also, the level scrolls 2% faster per difficulty level.

### Checkpoints

When a player dies in a level, they will respawn at the beginning of the level or one of several checkpoints, depending on their progress. Checkpoints are invisible to the player, and there are around 4 per level, including the level start.

## Password System

The original game did not have a save game mechanism and instead used a password system.

Passwords are common four letter words. Each level has four passwords, one for each difficulty. A password will take a player to the beginning of a level, with a score of 0. Players can enter a password when selecting “Password” from the main menu.

## Scoring

Below is a table for scoring:

Event	Points Awarded
Flyer, Turret, Worm, Bouncer, Torpedo, Bomb, Scorpion kill.	100
Eye	1000
Weapon Pod, Speed Pod, Defense Pod, 1-up	300
Bomb Fragment	30

Bosses each have unique scoring bonuses. In addition to the score achieved by picking up items and killing enemies, players receive a score bonus at the end of every level for completing the level, and points for every weapon powerup they've gotten. For Eagle, it is 500 points per weapon pickup, 1000 in Albatross, and 2000 in Ace and Ultimate. The level bonuses are 15,000, 30,000, and 60,000 for Eagle, Albatross, and Ace/Ultimeate, respectively. If a player has 10 of each weapon powerup at the end of a level, they will receive a reward of 3 extra lives. If a player beats the game, they will be allowed to retain their pickups and score when starting a new game at a higher difficulty level.

## Sound and Music

### Music

Each level has its own background music track, roughly 45 seconds in length, that loops infinitely. Boss fights have a separate music track.

### Sounds

The following sounds are needed.

- Splash screen fanfare
- Menu select

- Menu accept
- Basic cannon fire
- Missile fire
- Ring fire
- Laser fire
- Enemy destroyed
- Blocked bullet
- Pod pickup
- Bomb fragment pickup
- Pause game
- Cobalt bomb
- Death
- 1-up sound

### **Bugs in the Original Game**

There were several bugs in the original game that should be solved.

#### Sound restarting on pause

After resuming the game from the pause screen, the music restarts. The music should pick up from where it left off.

#### Enemies dead on checkpoint

After a player is revived at a checkpoint, all enemies at that checkpoint disappear. Turrets and enemies that do not cause the player immediate danger should appear on the screen.

#### Inconsistent hit detection

The original game implements questionable hit detection of bullets, both from the player and from enemies. Hit detection should be crisp and consistent.

### **Gamestate Flow Table**

State	Transition
Splash Screen	Title Screen
Title Screen	Password Screen, Play Screen
Play Screen	Game Over Screen
Password Screen	Play Screen
Game Over Screen	Play Screen, Title Screen

**Misc.**

The original game featured two levels that took a top down perspective of the player instead of a side view. These levels implemented completely different gameplay features than the rest of the game; an inconsistency that affected player immersion. These levels also exposed a game design flaw where the player could kill an infinite amount of enemies, maxing out all of their powerups and lives. For these reasons, the top down levels will not be present in Fury Fighter.

**Technical Details**

The game will be programmed in the Java programming language, using the AWT and Swing libraries for graphics. Levels content will be designed in Tiled, a program for creating 2D tilemaps. The game must work on Windows, Macintosh, and Linux computers.

The game should run at approximately 30 frames per second.

The resolution for the game will be 512 x 512 pixels. Tiles will be 32x32, meaning the screen can contain a 16x16 grid of tiles. The bottom two rows are reserved for the GUI, so 16x14 of the grid will be for the actual level.

Fury Fighter should run the same on all hardware, so long as the hardware meets these minimum requirements:

- 1 Gb Ram

- 512k Video Memory

- Dual Core at 1.60Ghz

Levels in Fury Fighter will be created in Tiled, an open source tile map editor. Maps should be read by the game using the JSON format.