

Time Break Documentation

[Overview](#)

[Gameplay Features](#)

[Characters](#)

[Knight](#)

[Ninja](#)

[Cowboy](#)

[Alien](#)

[Scientist](#)

[Weapons](#)

[Pistol](#)

[Revolver](#)

[Full Auto](#)

[Sniper Rifle](#)

[Shotgun](#)

[Sword](#)

[Bow & Arrow](#)

[Grenade Launcher](#)

[Rocket Launcher](#)

[Ghost Gun](#)

[Water Thrower](#)

[Air Strike](#)

[Items](#)

[Bouncy Grenade](#)

[Jump Grenade](#)

[Concussion Grenade](#)

[Glue Grenade](#)

[Bullet Grenade](#)

[Jetpack](#)

[Taser](#)

[Drone](#)

[Body Armour](#)

[Landmine](#)

[Map Theme](#)

[Ice Field](#)

[Lava Cave](#)

[Swamp](#)

[Crystal Cave](#)

[River Forest](#)

[Space](#)

[Player Status Effects](#)

[Confusion](#)

[Jump](#)

[Burn](#)

[Freeze](#)

[Slow](#)

[Haste](#)

[Requirements](#)

[1. General Mechanics](#)

[2. General Characters](#)

[3. Specific Characters](#)

[4. General Maps](#)

[5. Specific Maps](#)

[6. Weapon Types](#)

[7. Items](#)

[8. Status Effects](#)

[Acceptance Tests](#)

[Implementation Plan](#)

[Structure of Implementation](#)

[Milestones & Deliverables](#)

[Time Plan](#)

Overview

- The ideas for this project were inspired by a variety of sources:
 - [Hotline Miami](#), which we looked to for its aggressive and fast-paced gameplay.
 - The competitiveness of 1v1 bar sports inspired the competitive 1v1 PvP multiplayer experience.
 - [Invisigun Heroes](#), which inspired the dynamic environment and its grid structure.
- 1v1 battle arena.
- Map selection with 6 maps, each with a unique environmental gimmick.
- Character selection with 5 characters, each with a unique ability.
- Best of 5 rounds - a round is won by depleting your opponent's HP bar.
- Weapons and items that spawn into the game over the duration of the game.
- The narrative is simplistic by design, fitting with the typical arcade game experience.
 - Set in a post-apocalyptic universe, where humanity accidentally created a time fracture that destroyed the space-time continuum. Now, people from different time periods are randomly placed together in 'time pockets', where the only opportunity to escape is by eliminating your opponent.
 - Weapons and items appear throughout gameplay due to small ripples in time.
 - Shifts in the environment occur due to bigger ripples in time.
- Omni-directional movement - momentum is preserved in projectiles.

Gameplay Features

Characters

Each character has a unique ability, some are passive while others may be activated once per round/once per game.

Knight

- Has a higher HP than other characters.

Ninja

- Can trade their currently held weapon with their opponent's.

Cowboy

- Has a base weapon with increased DPS compared to other characters.

Alien

- Can remap their opponent's movement controls to random keys. Once the afflicted player stops movement input, the mapping reverts.

Scientist

- Uses a magnet ability to drag any items that are currently in the field of play close to the player.

Weapons

Pistol

- Default weapon (excl. Cowboy)

Revolver

- Cowboy's default weapon

Full Auto

Sniper Rifle

Shotgun

Sword

Bow & Arrow

- Interacts with grenade items.

Grenade Launcher

- Interacts with grenade items.

Rocket Launcher

- Interacts with grenade items.

Ghost Gun

- Projectiles ignore environmental obstructions.

Water Thrower

- Fast rate of fire.
- Very low damage per projectile.
- Large spread.

Air Strike

- Laser sighted detection.
- Detects player collision and places target at the player's location.
- Detonates after timed delay with massive damage in AoE.

Items

Items are a core component of the game. They are obtainable throughout a round as randomly generated pickup items on grid spaces.

Bouncy Grenade

- Bounces on collision

Jump Grenade

- Ignores collisions

Concussion Grenade

- Causes a large knockback effect

Glue Grenade

- Temporarily slows players

Bullet Grenade

- Fires 8 evenly spaced projectiles

Jetpack

- Applies the [Jump](#) status effect while active.

Taser

- Causes the opponent to drop their currently held weapon

Drone

- Locks the player in place and gives a controllable drone that can fire projectiles.

Body Armour

- Player can block a single instance of damage - unequipped on use

Landmine

- Detonates when player enters its grid space after activation

Map Theme

Ice Field

- Reduces player acceleration.
- A storm moves across the arena horizontally over time.
 - Obscures vision.
 - Applies [Burn](#).

Lava Cave

- Contains lava pools which apply [Burn](#).
- Contains geysers that apply [Jump](#).

Swamp

- Contains swamp water and destructible vines which both apply the [Slow](#).

Crystal Cave

- Contains destructible crystals that have different properties when destroyed.
 - Blue crystals apply [Freeze](#).
 - Red crystals explode.
 - Yellow crystals apply [Haste](#).
 - Green crystals apply [Burn](#).

River Forest

- Contains a waterfall leading to a river down the middle of the map.
- The river pushes players down the screen.

- The river widens over the duration of the game until the map is consumed by the river.

Space

- Prevents passive deceleration.

Player Status Effects

Confusion

- Movement controls are randomly remapped until the player stops moving.

Jump

- Cannot collide with environmental objects.

Burn

- HP continually decreases in small intervals.

Freeze

- Movement input is prevented.

Slow

- Movement speed decreases.

Haste

- Movement speed increases.

Requirements

1. General Mechanics

1.1. Game Rules

- 1.1.1. A player shall win a round upon reducing their opponent's HP to 0.
- 1.1.2. A new round shall begin if neither player has achieved 3 round wins in the game at the end of a given round.
- 1.1.3. The game shall end once a player achieves 3 round wins.

1.2. Player Movement

- 1.2.1. A player shall have a position that will change additively according to varying velocities.
- 1.2.2. A player shall accelerate in velocity in a given direction relative to their internal movement speed multiplier, multiplied by the base movement speed rate.
- 1.2.3. A player's sprite shall be applied onto the screen relative to its updated position after moving.

1.3. Weapon Equip

- 1.3.1. A player shall equip a weapon by positioning their character over the grid space containing a pickup location on the map, and interacting with the pickup.
- 1.3.2. The player's currently equipped weapon shall be manually swapped with the weapon pickup when the player interacts with the pickup.
- 1.3.3. The pickup shall be equipped without swapping if the player has their default weapon currently equipped at the time of interaction.

1.4. Default Weapon

- 1.4.1. A character shall have a default weapon equipped in instances where another weapon is not currently equipped.
- 1.4.2. A weapon shall be unequipped when the player has manually chosen to swap their weapon.
- 1.4.3. A weapon shall be unequipped when the ammunition for the weapon has been depleted.
- 1.4.4. Upon firing the default weapon after exhausting an equipped weapon's ammo pool, the default weapon should texture its next projectile to the sprite of the previous weapon.
- 1.4.5. The thrown weapon projectile should rotate by 10° each visual frame.

1.5. Weapon Spawn

- 1.5.1. Weapon pickups shall spawn in a pseudo-random grid space on the map by allocating it to an area without an obstruction (an "obstruction" shall consist of hazardous areas, cover obstacles, currently present pickups and character sprites).

1.6. Weapon Firing

- 1.6.1. An equipped weapon shall be fired upon manual input from the player.

1.7. Projectile Interaction

- 1.7.1. Weapon fire shall be able to destroy cover obstacles and remove them from the arena for that round.

- 1.7.2. Projectiles shall only interact with cover obstacles, drones, the edge of the arena and players.
- 1.7.3. Projectiles shall detect collisions with collidable objects, including walls, obstacles and destructibles.

2. General Characters

2.1. Speed

- 2.1.1. Players shall move at a base speed of 3 grid square lengths per second, unless an external event/the character choice affects this.
- 2.1.2. Movement shall be controllable in the x and y domains in the 4 main compass directions.
- 2.1.3. Movement should support 8-directional input.

2.2. HP

- 2.2.1. A player shall have an assigned base maximum HP of 100, that when depleted will result in the player losing the round.
- 2.2.2. Any damage inflicted from a weapon, status effect or environmental hazard shall reduce the player's total HP.

2.3. Held Item

- 2.3.1. Each player shall be able to equip a single item to use at the player's discretion at any one time.
- 2.3.2. An item shall be consumed upon use and unequipped from the player.

2.4. Held Weapon

- 2.4.1. Each character shall have one weapon equipped at any given time.
- 2.4.2. Picking up a new weapon shall force the player to drop their previous weapon in place of the new one, with the exception of their default weapon.
- 2.4.3. Players shall start with a default weapon that will always be available to the player when they drop their current weapon.
- 2.4.4. When a weapon runs out of ammo, their next shot shall unequip the weapon.
- 2.4.5. When a weapon runs out of ammo, their next shot shall fire a bullet from the default weapon.
- 2.4.6. When a weapon runs out of ammo, their next shot fired should be textured with the sprite of the empty weapon to simulate firing.

2.5. Ability

- 2.5.1. Each character shall have their own unique ability or attribute.
- 2.5.2. If a character has an active ability, then they shall be able to activate it once per round.
- 2.5.3. If a character has an adjusted attribute (e.g. increased/decreased maximum HP), this should continue to be in effect for as long as the player is playing that character.

3. Specific Characters

3.1. Knight

- 3.1.1. Knight shall have a movement speed penalty of 20% less than the base speed.
- 3.1.2. Knight shall have a 50% HP increase over the base HP, so 150 HP total. This is also this character type's unique ability.

3.2. Ninja

- 3.2.1. Ninja shall have a movement speed increase of 20% over the base speed.

- 3.2.2. Ninja shall have an active ability that allows them to swap their weapon with the enemy player's weapon.

3.3. Cowboy

- 3.3.1. Cowboy has the Revolver as their default weapon, dealing +50% damage with -20% firing speed.

3.4. Alien

- 3.4.1. Alien shall have an active ability that allows them to randomly swap the other player's controls.

3.5. Scientist

- 3.5.1. Scientist shall have an active ability that lets them use a magnet that draws all items on the map towards them at 150% the character's base speed.
- 3.5.2. All items drawn to the Scientist shall ignore walls, environmental hazards and any other obstacles and travel in a straight line towards the character.
- 3.5.3. Scientist's ability shall only be usable once per game.

4. General Maps

- 4.1. The program shall generate a map with a theme selected by the user.
- 4.2. The themes selectable by the user shall be Lava Cave, Swamp, Crystal Cave, River Forest, Ice Field and Space.
- 4.3. The map shall load to the screen within 1 second at least 95% of the time.
- 4.4. The map shall have cover obstacles assigned to grid squares to block incoming weapon fire.
- 4.5. The map shall contain a maximum of 5 random weapons at any given time.
- 4.6. A random weapon or item pickup shall be spawned on a single grid space.
- 4.7. The map shall be composed of a grid of size 40 in the x-direction and 31 in the y-direction.
- 4.8. The players will spawn on horizontally opposite ends of the map, 4 tiles away from the edge of the arena and on the central row.

5. Specific Maps

5.1. Lava Cave

- 5.1.1. Lava Cave shall contain lava pools and steam vents.
- 5.1.2. Lava pools shall deal damage to the player equivalent to a pistol shot per second they contact the pool, starting with the instant they step into contact.
- 5.1.3. Steam vents shall launch the player to a predetermined floor tile when stepped upon.
- 5.1.4. While a player is being launched by a steam vent, all damage other than damage from explosions shall not affect them.
- 5.1.5. The map shall slowly replace random floor tiles with lava pool tiles.
- 5.1.6. Lava pools and steam vents shall provide no cover from weapon fire.

5.2. Swamp

- 5.2.1. Swamp shall contain swamp water and vines.
- 5.2.2. Swamp water shall occupy between 5 and 10 adjacent tiles.
- 5.2.3. Swamp water shall decrease player speed by 50% whilst stepped in.
- 5.2.4. Vines shall occupy 1 or 2 adjacent tiles.
- 5.2.5. Vines shall decrease player speed by 75%.
- 5.2.6. Vines shall block projectiles and explosions.

- 5.2.7. Vines shall be destroyed after taking 100 damage.
- 5.2.8. The Swamp shall slowly lose random floor tiles to fallen branches.
- 5.2.9. Fallen branches shall be indestructible and block weapon fire.

5.3. Crystal Cave

- 5.3.1. Crystal Cave shall slowly lose random floor tiles to collapsed rocks which behave as cover obstacles.
- 5.3.2. The Crystal Cave shall contain four colours of crystal - red, blue, yellow, green.
- 5.3.3. Crystals shall be destroyed when hit, leaving an ordinary floor tile.
- 5.3.4. Red crystals shall explode when hit, dealing the same damage as a grenade.
- 5.3.5. Blue crystals shall freeze all players adjacent for 1 second when hit.
- 5.3.6. Yellow crystals shall increase the speed of all adjacent players by 50% for 3 seconds when hit.
- 5.3.7. Green crystals shall create poison clouds in adjacent tiles for 3 seconds when hit.
- 5.3.8. Poison clouds shall damage a player for the same amount as a pistol hit for each second the player is in the same tile as the cloud.
- 5.3.9. There shall be between 3 and 5 of each crystal type present on the map.
- 5.3.10. Crystals shall occupy one map tile.
- 5.3.11. Crystals of the same type shall not spawn within 5 tiles of each other.

5.4. River Forest

- 5.4.1. River Forest shall contain a river and long grass.
- 5.4.2. The river shall flow along a randomly generated path from the top of the map to the bottom.
- 5.4.3. A player in contact with the river shall be accelerated in the direction of the river's travel up to 500% of their base speed.
- 5.4.4. A player shall lose the round if they move off the waterfall at the bottom of the map.
- 5.4.5. Long grass shall obscure the view of a player that steps within it.
- 5.4.6. Long grass shall occupy between 5 and 15 adjacent floor tiles.
- 5.4.7. The river shall expand into adjacent tiles every 3 seconds until it occupies the map.
- 5.4.8. The river's expansion shall destroy obstacles when it comes into contact with them.

5.5. Ice Field

- 5.5.1. Ice shall contain ice patches and ice boulders.
- 5.5.2. Ice patches shall cause a player to decelerate at a 50% slower rate when in contact with the ice patch tile.
- 5.5.3. Ice boulders shall obstruct weapon fire
- 5.5.4. Ice boulders shall be destroyed after taking 200 damage.
- 5.5.5. Ice Field shall generate a blizzard on a random map edge after 10 seconds.
- 5.5.6. Blizzard shall occupy an entire row (top or bottom edge) or column (left or right edge), and should progress an additional row or column (accordingly) into the map every three seconds after it's generated.
- 5.5.7. Blizzard shall apply the burning effect to any element within its area of effect.
- 5.5.8. Blizzard shall overlay, not replace, the terrain in occupied tiles.

5.6. Space

- 5.6.1. Space shall contain asteroid map obstructions.

- 5.6.2. Any player who moves off the edge of the map shall immediately lose the round.
- 5.6.3. Player movement shall not passively decelerate.
- 5.6.4. A player who touches the black hole shall instantly lose all HP.

6. Weapon Types

6.1. Pistol (Default weapon)

- 6.1.1. The firing rate shall have a maximum fire rate of 5 projectiles fired per second.
- 6.1.2. A hit from this weapon shall remove 10 HP from the player hit.
- 6.1.3. The projectiles shall have a speed of 150% of the base speed.
- 6.1.4. This weapon shall have an unlimited ammunition count.

6.2. Full Auto

- 6.2.1. The firing rate shall be 10 projectiles fired per second.
- 6.2.2. A hit from this weapon shall remove 8 HP from the player hit.
- 6.2.3. The projectiles shall have a speed of 150% of the base speed.
- 6.2.4. The weapon shall be able to fire 20 projectiles before running out of ammunition.

6.3. Sniper Rifle

- 6.3.1. The firing rate shall have a maximum fire rate of 1 projectile per second
- 6.3.2. A hit from this weapon shall remove 50 HP from the player hit.
- 6.3.3. The projectiles shall have a speed of 200% of the base speed.
- 6.3.4. The weapon shall be able to fire 8 projectiles before running out of ammunition.

6.4. Shotgun

- 6.4.1. The weapon shall have a maximum fire rate of 2 discharges per second, with 5 projectiles fired from each discharge.
- 6.4.2. A hit from this weapon shall remove 20 HP from the player hit.
- 6.4.3. The projectiles in a discharge shall fire divergently. A projectile shall fire in the direction the player is facing without offset, and there shall be projectiles fired at $\pm 6^\circ$ and $\pm 12^\circ$ from the point of origin, relative to that offset.
- 6.4.4. The projectiles shall have a speed of 150% of the base speed.
- 6.4.5. The weapon shall be able to discharge 4 projectiles before running out of ammunition.

6.5. Sword

- 6.5.1. The weapon shall have a maximum fire rate of 1 swing per second.
- 6.5.2. A hit from this weapon shall remove 70 HP from the player hit.
- 6.5.3. The sword's collision zone shall be 1.5 times the size of a grid space in height.
- 6.5.4. The sword's collision zone shall be 0.5 times the size of a grid space in width.
- 6.5.5. The weapon shall have an unlimited ammo count.

6.6. Bow and Arrow

- 6.6.1. The projectiles shall have a speed of 150% of the base speed.
- 6.6.2. The weapon shall have a fire rate of 2 projectiles per second.
- 6.6.3. A hit from this weapon shall remove 25 HP from the player hit. (if the weapon's behaviour is not modified by grenade items).
- 6.6.4. The weapon shall have its behaviour modified when used in conjunction with grenade items.
- 6.6.5. The weapon shall be able to fire 15 projectiles before running out of ammunition.

6.7. Grenade Launcher

- 6.7.1. The projectiles shall have a speed of 150% of the base speed.
- 6.7.2. The weapon shall have a fire rate of 1 projectile per second.

- 6.7.3. Upon projectile collision, the grenades shall have a timed delay of 1 second between collision and detonation.
- 6.7.4. A hit from this weapon shall remove 60 HP from the player hit. (If the weapon's behaviour is not modified by grenade items).
- 6.7.5. The weapon shall have its behaviour modified when used in conjunction with grenade items.
- 6.7.6. The explosion shall have an area of effect of 2 grid square radius.
- 6.7.7. The weapon shall have a range of 6 grid squares.

6.8. Rocket Launcher

- 6.8.1. The weapon's firing type shall be semi-automatic. The projectiles shall have a speed of 75% of the base speed.
- 6.8.2. The weapon shall have a fire rate of 0.4 projectiles per second.
- 6.8.3. The explosion shall have an area of effect of 3 grid square radius.
- 6.8.4. A hit from this weapon shall remove 90 HP from the player hit. (If the weapon's behaviour is not modified by grenade items).
- 6.8.5. The weapon shall be able to fire 2 projectiles before running out of ammunition.
- 6.8.6. The weapon shall have its behaviour modified when used in conjunction with grenade items.

6.9. Ghost Gun

- 6.9.1. The firing rate shall have a maximum fire rate of 5 projectiles fired per second irrespective of whether the input mechanism is activated at a faster rate.
- 6.9.2. A hit from this weapon shall remove 10 HP from the player hit.
- 6.9.3. The projectiles shall have a speed of 150% of the base speed.
- 6.9.4. The projectiles shall not interact with cover objects, the projectiles shall pass through the objects and are only removed upon collision with the edge of the arena or with another player.
- 6.9.5. The weapon shall be able to fire 15 projectiles before running out of ammunition.

6.10. Water Thrower

- 6.10.1. The weapon shall have a maximum fire rate of 20 projectiles per second
- 6.10.2. A hit from this weapon shall remove 1 HP from the player hit.
- 6.10.3. The projectiles in a discharge shall fire divergently. A projectile shall fire in the direction the player is facing with a random angle manipulation of +/-45°.
- 6.10.4. The projectiles shall have a speed of 150% of the base speed.
- 6.10.5. The weapon shall be able to fire 100 projectiles before running out of ammunition.
- 6.10.6. An enemy shall receive pushback when hit with a projectile, the speed of this enemy shall be the base speed of the player in the bearing that the projectile was travelling in.
- 6.10.7. The range that a projectile of the water thrower may travel before being consumed shall be 3 grid squares.

6.11. Air Strike

- 6.11.1. The weapon shall be able to discharge 1 time before running out of ammunition.
- 6.11.2. The weapon shall visually display an aiming laser beam projected in the direction that the player is facing from the player to the first obstacle obstruction as soon as the weapon is equipped.

- 6.11.3. The weapon shall be activated upon the laser beam coming into contact with the other player.
- 6.11.4. Once the weapon has been activated, the laser beam shall not be visible.
- 6.11.5. After a delay of 1 second, an explosion shall occur at the position where the opposing player is in contact with the laser beam.
- 6.11.6. The damage radius shall be 2 grid square lengths centred on the position where the player was detected.
- 6.11.7. A player in the explosion area of this weapon shall have 90 HP removed from the player hit.

7. Items

7.1. Body Armour

- 7.1.1. This item shall make a player's HP remain unaffected for a single event where the player would otherwise lose HP.
- 7.1.2. The effect shall still take damage in events where the damage is caused by environmental hazards.

7.2. Landmine

- 7.2.1. This item shall allow a single mine to be placed in the nearest available grid square to the player upon activation.
- 7.2.2. Once placed, there shall be a period of 1 second before the mine becomes armed (i.e. in a state where it shall cause an explosion).
- 7.2.3. An explosion event shall occur upon either player entering the grid square of an armed mine.
- 7.2.4. Once placed, the item shall be unequipped from the player.
- 7.2.5. The player that detonates the mine shall have 50 HP deducted.

7.3. Jetpack

- 7.3.1. This item shall allow the player to have the jump and haste status effects applied for 5 seconds.
- 7.3.2. After the 5 seconds have passed, the item is unequipped.
- 7.3.3. The player shall be moved to the nearest adjacent grid square without obstruction and have 10 HP deducted, if the player is over a cover obstacle or the other player when the effect ends.

7.4. Drone

- 7.4.1. This item shall allow the player to control an aerial drone for 5 seconds.
- 7.4.2. The drone shall spawn in a random immediately adjacent grid square to the player, that's not obstructed.
- 7.4.3. The drone shall have the jump status effect applied, and can therefore fly over obstacles.
- 7.4.4. The drone shall have the characteristics of the pistol projectiles (projectile speed, damage, fire rate).
- 7.4.5. The drone shall fire continuously until it is destroyed or the 5 second timer has expired.
- 7.4.6. The drone shall have an initial HP of 50.
- 7.4.7. The drone shall have the base movement speed.
- 7.4.8. The drone shall be unequipped upon destruction or the 5 second timer running out.

7.5. Taser

- 7.5.1. This item shall allow the player to force the other player to drop the weapon that they are currently holding upon activation.
- 7.5.2. If the grid square closest to the player has a pickup currently in that location, the dropped weapon shall be placed in a random available adjacent grid space.

7.6. General Grenade

- 7.6.1. This item shall be a throwable projectile that can be fired in any of the four compass main compass points once equipped.
- 7.6.2. The grenade projectiles shall have projectile direction that is calculated based on the characters direction and momentum.
- 7.6.3. This item shall be unequipped once the item has been consumed.
- 7.6.4. This item shall explode after a timed delay of 1 second from the attack initiating.
- 7.6.5. This item shall explode instantly if the grenade comes into direct contact with a player.
- 7.6.6. This item shall travel 6 grid squares before explosion.

7.7. Jump Grenade

- 7.7.1. This item shall have the jump status effect applied and can be thrown over floor obstacles.
- 7.7.2. A player in the impact zone of this weapon shall remove 40 HP from the player hit.
- 7.7.3. This item shall have an impact zone of radius two grid squares upon detonation.

7.8. Bullet Grenade

- 7.8.1. This item shall fire 8 projectiles from the site of explosion.
- 7.8.2. This item shall emit all projectiles at once.
- 7.8.3. This item shall fire the projectiles at bearings of 0, 45, 90, 135, 180, 225, 270, 315, 360.
- 7.8.4. A hit from this weapon shall remove 10 HP from the player hit.

7.9. Concussion Grenade

- 7.9.1. This item shall knock a player in the impact zone in the vector that follows the angle between the player and the explosion.
- 7.9.2. A hit from this weapon shall remove 10 HP from the player hit.
- 7.9.3. This item shall have a knockback distance of 3 grid square lengths.
- 7.9.4. The knockback effect shall not be affected by an afflicted player's movement input during the course of the effect.
- 7.9.5. Cover obstacles shall be broken through by a player that hits the obstacle during the effect.
- 7.9.6. The explosion shall have an impact zone of radius two grid squares.
- 7.9.7. A player hit shall be afflicted with haste status effect for the duration of the knockback.

7.10. Bouncy Grenades

- 7.10.1. A hit from this weapon shall remove 40 HP from the player hit.
- 7.10.2. This item shall bounce off arena walls and cover obstacles, the angle of incidence shall be equal to the angle of reflection.
- 7.10.3. This item shall have an impact zone of radius two grid squares upon detonation.

7.11. Glue Grenade

- 7.11.1. This item shall apply the slow effect to a player in the impact zone for 3 seconds.
- 7.11.2. A hit from this weapon shall remove 20 HP from the player hit.

7.11.3. This item shall have an impact zone of radius two grid squares upon detonation.

8. Status Effects

8.1. Confusion

8.1.1. Affected elements shall have their movement controls remapped until they stop inputting movement.

8.2. Jump

8.2.1. Affected elements shall be immune to map collisions.

8.3. Burning

8.3.1. Affected elements shall have their HP reduced by 10 every second for the duration of the effect.

8.4. Frozen

8.4.1. Affected elements shall be unaffected by user-inputted movement.

8.5. Slow

8.5.1. Affected elements shall have their velocity reduced by 50% during reposition calculations.

8.6. Haste

8.6.1. Affected elements shall have their velocity increased by 50% during reposition calculations.

Acceptance Tests

1. Mechanics tests
2. Character tests
3. Map tests
4. Weapon and item tests
5. Status effect tests

Test Reference	Given	When	Then
1.1	A round of gameplay is currently underway.	A player's health has been fully depleted.	The player without health shall die, the other player wins the round.
1.2	A round of gameplay is underway.	A directional key is pressed.	The corresponding player is moved.
1.3	A player does not have a non-default weapon equipped or no item equipped.	The player interacts with a weapon pickup or the item pickup.	The pickup shall be picked up and equipped by the player and the pickup is removed.
1.4	A player has an item equipped	The player interacts with an item pickup or the weapon	The pickup on the map shall be equipped, with the

	or a non-default weapon equipped.	pickup.	previously equipped element dropped in its place.
2.1	An available active ability and the parameters for usage are met.	The corresponding ability key is pressed.	The corresponding ability is activated with respect to the character.
2.2	A player is playing a character that has a passive ability.	The round starts.	The passive ability is applied with respect to the character.
3.1	A game has started or a previous round has ended.	The new map is to be generated.	There shall be a path in the terrain that shall lead to the opponent.
3.2	The map has areas that cause damage to a player when entered.	A player enters the hazardous area.	The player shall have HP reduced while they remain in the area.
3.3	The map loaded has transportation elements.	The player interacts with the movement element.	The player shall move to the in the manner specified in the requirements.
3.4	The map loaded has elements that cause status effects.	An element has all the states met to instantiate a status effect.	The effect shall be replied to the element as per the requirements.
3.5	A map is loaded with an expanding hazardous area.	A non-hazardous tile space is adjacent to a newly placed hazardous tile space.	In the specified time in the requirements, the non hazardous tile shall become a hazardous area.
3.6	The river forest theme is loaded in the current round.	A player enters a long grass area.	The player's sprite shall not be visible until the player leaves the long grass.
3.7	The loaded map has areas where the player can fall through the map.	The player enters an area where they can fall off the map.	The player will lose all HP and lose the round.

4.1	A player is holding a weapon that is not a default weapon.	A weapon attack has been initiated by said player.	The player shall consume ammunition and launch an attack that shall cause damage to things on collision.
4.2	A player has a non-default weapon equipped and is running out of ammunition.	The player fires after the ammunition count is 0.	The weapon is unequipped and thrown from the player as a default weapon projectile. The default weapon is equipped.
4.3	A player has either a grenade-interactive weapon equipped but no grenades, or vice versa.	The player equips grenades if previously the grenades weren't equipped, or a grenade-interactive weapon when they weren't equipped.	The weapon shall apply the effect of the grenade, additive to its original effect, but consumes the grenade.
4.4	A player has a bouncy grenade/bouncy grenade weapon equipped.	A bouncy grenade is activated and it comes into contact with a cover obstacle.	The grenade shall reflect off the surface such that the angle of incidence = the angle of reflection.
4.5	The player has a grenade item equipped.	The grenade item is thrown.	The momentum of the player shall affect the grenade projectile's movement.
4.6	The player has a taser item equipped.	The taser item is activated.	The other player shall drop their weapon and it shall be positioned in the nearest available grid tile.
4.7	The player has a body armour item equipped.	The player is hit by an incoming projectile.	The damage is negated - the player's HP shall not be affected and then the item is consumed.
4.8	The player is using the jetpack item and is hovering over cover obstacles.	The jump effect has finished executing.	The player shall take damage and is positioned in the nearest adjacent grid square.
4.9	The player has a jetpack item equipped and	The landmine is deployed.	There shall be a one second grace period after deployment before a player

	the player is over a free grid tile.		can trip the mine.
4.10	The water thrower weapon is equipped by a player.	The player launches an attack using this equipped weapon.	The enemy player shall be pushed back in the bearing of the projectiles that hit the player.
4.11	A player has the drone equipped.	The drone item is activated.	Movement controls shall be mapped to the flight of the drone until the drone is deactivated.
4.12	A player has the landmine equipped.	The item is deployed.	The item shall be positioned in the nearest available grid square and it will not be able to detonate for one second
4.13	A landmine has been activated.	A player enters the detection radius for the landmine.	The landmine shall detonate.
4.14	An item or weapon that causes a side effect is ready to take action.	The item or weapon is activated.	The side effect shall be applied to the target element.
4.15	A player equips the air strike weapon.	The weapon's laser sight aim comes into contact with the opposing player or their drone.	The air strike attack shall occur after a one second delay at the location where the player was at time of contact.
4.16	The knockback effect from a concussion grenade is applied to a player.	The player attempts to control their character's movement against the effect's direction.	Movement in that direction is ignored for the duration of the effect.
5.1	A player is currently under the confusion effect.	The player isn't pressing any directional keys.	The confusion effect is removed.
5.2	The element does not have a given status effect applied to it.	The given effect is applied.	The element shall have their effect applied and the state of the element shall change as per the requirements.

5.3	A round of gameplay is underway.	The player moves into a hazardous area on the map.	A status effect is applied to the player until the player moves away from the hazardous area.
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Implementation Plan

Structure of Implementation

The general structure we intend to take with our implementation will hold to the principles of agile development. The project should use a spiral methodology to allow us to review and correct any balance issues, flaws in the enjoyment of gameplay and unpredicted issues in the implementation.

Milestones & Deliverables

Deliverables

- Concept art for weapons, characters, maps and items.
- Finalised digital art for weapons, characters, maps and items that shall be used in the finished article of the game.
- Original sound design files for music and sound effects that shall be used in the game
- Shooting mechanic prototype that will demonstrate simple projectiles being fired from a weapon.
- Grenade mechanic prototype that will demonstrate how the grenade items will impact the bow, rocket launcher and grenade launcher weapons and the throwing mechanics of grenades.
- Movement prototype that will show more complex movement, including acceleration and deceleration with momentum and direction being taken into account.
- Control manager prototype.

Milestones

- Create a framework for menus
- Create a system for detecting control inputs
- Create a basic controllable game scene
- Create a set of working mechanics and game rules
- Create an algorithm for the generation of map obstacles
- Create a system for generating map hazards based on theme
- Create a randomiser for maps that also ensures the map is playable
- Create status effects that impact players in the required ways
- Create unique characters with their abilities
- Create a character select screen
- Create unique weapons with unique statistics
- Create unique items with working effects
- Create a system to randomly generate items and weapons on the map
- Draw graphics and sample sounds

- O. Apply graphics and audio where relevant
- P. Test system

Time Plan

Critical Path Analysis

The critical path identified carries through milestones B, C, D, H, L, M, O and P. The project's minimum completion time as it stands (i.e. This starting iteration of spiral development) should take 38 days, given that no interruptions to workflow occur.

The activity network below demonstrates this. The Gantt chart further below also indicates how we intend to take the project forward, attempting to finish tasks outside of the critical path early to allow for leniency in case any tasks take longer than expected.



