G54GAM Coursework - Zlat's Tower Defense

Core Gameplay

Objects/Rules/Procedures/Resources/Gameplay Events

Game Controller - A game object containing 4 important scripts.

- Build Manager - Has a reference to the Node tile allowing it to keep track of which Node has been selected. As well as contains the reference to the currently selected turret. Does further work on the user interface by enabling and disabling the Turret information panel.
- PlayerInfo - Contains player resources such as :
    - Credits
    - Lives
    - Text References for the - UI. Updates as necessary.
- Management - A game management script for navigation or restarting between levels (e.g. If the user dies, or successfully completes a level.)
- Wave Spawning -
    - Contains 3 classes which are used to define Waves, Wave Enemies and Wave Spawning functionality.
    - All functions are editable in the inspector allowing for the user to set as many waves as necessary and as many enemies as he'd like.

Turret building block (Node) -

- A building tile prefab which contains a Node script.
- Used in order to allow the turret to be spawned on top of it.
- Contains a reference to a spawn location allowing the turret to be spawned there.
- Completes further functionality such as building the turret as well as dealing with turret upgrades and turret selling.

Environmental blocks-

- Environmental blocks which don't affect gameplay only aesthetics
- Used to reduce the total number of nodes on the map, allowing the developer to vary the difficulty of levels as needed.
- FBX Models.

Turret Prefabs -

- FBX models containing a turret script.
- Turret script used to deal with turret attributes as well as maintaining a reference to the closest target.
- Used to shoot at enemies within range.
- Must have its attributes filled in order to work properly.
- Bullets(set through the inspector) are fired from a Fire Point which sits on every turret prefab towards the closest target. The turret rotates towards its target and shoots at an interval of its determined fire rate. Damage is also set here.
- 5 functioning turrets:
    - Ballista Turret - A standard turret with medium long.
    - Blaster Turret - A fast shooting turret, which shoots twice instead of once. Short-Medium range.
    - Cannon Turret - A slow shooting turret with mediocre range but high damage that deals Area of Effect (AOE) damage

- - Fire Turret - A faster shooting turret with a larger range, however smaller damage. Also deals AOE damage.
    - Poison/Heavy-Hitting Turret - Heavy-hitting turret, initially supposed to apply debuffs to the enemy; however, due to lack of time is currently used as a heavy-hitting turret which boasts extreme attack damage at the expense of mediocre range and very slow attack speed.
  - 1 nonfunctioning turret:
    - Buff Turret: Initially supposed to apply buff's to nearby towers, currently not used due to time constraints.

Enemies -
- Enemies patrol around the scene along a predetermined route.
- Upon death either give credits to the player or take away lives depending on the method of death.

Bullets -
- Bullet Models shot out by turrets at enemies. Upon reaching the enemy the bullet deals damage to it. If the enemy is low enough it will die.
- The bullet chases the enemy each frame until close enough, at which case it deals damage to the enemy.
- If the bullet is specified as an AOE bullet, it will instead deal damage to all enemies within the AOE range through the use of a Physics. Overlap sphere which returns all colliders that have been hit within that range.
- 5 Bullet Types :
  - Ballista Bullet - An arrow FBX model with high speed and no AOE Effect.
  - Blaster Bullet - a sphere object with changed material properties to look like a real bullet. Medium Speed with no AOE effect.
  - Cannon Bullet - Missile FBX model. Medium Speed, high AOE range(5) effect.
  - Fire Turret - a red sphere object. High speed, low AOE range (2) effect.
  - Poison Bullet - A large sphere bullet, to signify that it hits for more damage than others. Slow movement speed to signify weight.

Bullet Impact Effects -
- Bullet particle effect systems.
- Created when the bullet hits the enemy to provide extra aesthetics to the game.
- Some effects contain lights to signify AOE attacks.

Waypoints -
- An empty game object containing a waypoint script.
- Enemies use these to set their paths.

Start and End Game Blocks-
- Start Object - A start game object used to signify a spawning location for enemies.
- End Game Object - A end game object used to signify an ending location for enemies. Kills enemies upon reaching it and reduces the player's lives.

Game Flow
Level 1
- During the first couple of levels, the game is not designed towards being difficult. It is instead treated as a learning curve to the user. This can be seen by the reduced

enemy attributes as well as the heightened user starting lives and credits. As the user progresses, these slowly whittle down.

- The first level allows the user to experiment with the shop as well as the upgrade and sell functions on the turrets.
  - The first level can be passed simply by using any combination of turrets without thinking about why and when to use them.
  - The first level has slow-moving enemies which provide a large number of credits on death(Cash Influx).
  - These credits allow the user to experiment with any turrets they seem fit.
  - Even though this level is easy and can be passed without much thought, it teaches the user about the general flow of the game as well as familiarise the player with enemy types that will be used in later levels.
- **Level 2** then continues building on this by first changing the map. The map is now larger and contains a variety of enemies each wave. Meaning the user is now less likely to create multiple copies of the same turret and pass. This allows the user to experiment with a mixture of AOE and single-target turrets. Whilst still not being too punishing if they make any mistakes.
  - Level 2 has slightly lower starting lives and starting credits.
  - Level 2 also allows the user to experiment more with Heavy Turrets which previously did not have much use as the enemies died too quickly. As the boss enemy types are now introduced properly into the wave system, the user can learn that a combination of heavy turrets can kill the bosses quickly. This is further supported by the cheap cost of these turrets.
  - The user is now also introduced to faster and stronger variations of the same enemies, teaching them that the same turret-spam tactic as the first round will not work.
  - These modifications to the level allow the user to further build up their knowledge of the way the game will function. And also keep the game interesting as the user can no longer pass the levels as easily.
  - Fewer Cash Influx rounds.
- **Level 3** is the final level of the game. This level incorporates all previously learned mechanics and also adds new ones.
  - This is the hardest level starting the user with only 400 credits and 10 lives. Meaning simple mistakes can cost the user his game.
  - Total of 10 waves this level
  - Whilst the map remains largely similar, previously used turret nodes have now been replaced with environment meaning the user has to carefully devise which turrets should go where. An example of this would be placing AOE turrets on loops, meaning multiple enemies will get hit by each turret consecutively.
  - Whilst the wave spawner starts off by spawning weaker enemies, it quickly transitions to tougher enemies. Meaning the user only has the first couple of rounds which they can take easy.
  - A variety of fast and slow enemies are spawned making it harder for AOE turrets to target packed enemies - more enemies are present per round meaning more need to be killed in order to survive.

- ○ Enemies have more health and movement speed, however, also reduced credits on kill.
  - ○ At the end of the game, there are fewer cash influx rounds, meaning if the user has made a mistake in their tactics it is harder to recover

- ● Each level provides the user with a different map and different enemies to deal with.
- ● As each level passes, the levels slowly become more complex both in terms of enemy attributes but as well as to level design. This can be seen clearly when transitioning from level 2 to level 3. Whilst the majority of the map is reused, certain turret nodes have been replaced with the environment, therefore, reducing the total number of turrets the user can place.

CHARACTERS
Enemies
- ● FBX models containing an "Enemy" script as well as a Nav Mesh Agent.
- ● Enemy script used to control enemy attributes such as
  - ○ Movement speed - Set this speed to the NavMeshAgent's as that's what's controlling the movement.
  - ○ Health - Enemy health, reduce to 0 to kill.
  - ○ Credits per kill - How much credits are provided to the user upon death.
  - ○ Armour (currently unused) - Plans to reduce damage by the percentage of armour.
  - ○ Contains a reference to a current waypoint.
  - ○ Reference updated upon reaching its destination.
  - ○ Follows this list of waypoints to guide itself through a patrol path.
  - ○ Look towards the next waypoint direction and move forward.

- ● 5 - 7 Enemy Types (based on Level:
  - ○ Basic Enemy -
    - ■ A basic enemy with mediocre movement speed and mediocre health.
    - ■ Can be killed by most turrets.
  - ○ Tough Enemy -
    - ■ A tougher enemy with more health than a basic enemy and initially less movement speed.
    - ■ Can be killed by some turrets.
  - ○ Fast Enemy -
    - ■ A fast-moving enemy with lower health than the previous enemies
    - ■ Can slip by defences if not enough AOE turrets are present.
  - ○ Extremely Fast Enemy -
    - ■ An extremely fast-moving enemy with even lower health than the previous enemies.
    - ■ Can slip by defences if not enough AOE turrets are present.
  - ○ Cash Influx Enemy -
    - ■ A cash influx enemy with low health and high movement speed used to help give balance to the game.

- - - Similar to other Tower Defenses, where there are rounds specifically dedicated to giving the player an influx of cash in preparation for stronger rounds. Used in the same way.
    - Boss Enemy -
      - Extremely high health but medium speed enemy which provides more credits when killed. However, if spawned concurrently with other enemies or simply not enough single-target turrets presents won't be killed in time.
    - Big Boss enemy -
      - A stronger variant of the Boss Enemy used as a test for the player on the final wave of the final level. Faster movement speed than other boss enemies.
- All of these enemies are reused on each level, however with a changed prefab. Whilst the colour or mesh of the prefabs aren't changed, the individual stats within the Enemy Script are:
    - E.g. Level 1 Basic Enemy = 3 Movement Speed, 150 Health, 8 Credits
    - E.g Level 2 Basic Enemy = 5 Movement Speed, 400 Health, 10 Credits
    - E.g Level 3 basic Enemy = 8 Movement Speed, 600 Health, 12 Credits

Physics and Parameters

Turrets -
- Turrets rotate in place to face towards the closest enemies direction.
- If within range turret fires a bullet.

Bullets -
- Bullets trace the enemy they've been assigned to.
- Using the enemies location and setting their destination towards it
- Bullet movement speed is set by itself either through the code or programmatically.
- Upon getting close enough to the enemy the bullet will self-destruct and deal damage to the enemy.
- If the bullet has an AOE Range, it will instead do a physics.OverlapSphere which returns all colliders within the AOE Range and instead apply the damage to all of them.

Enemies -
- Movement speed is set by each enemy on start.
- Enemies navigate through a predefined set of waypoints.
- NavMeshAgent is in control of enemy movement, therefore movement speed variable is set there.
- The Nav Mesh Agent has an in-built obstacle avoidance which stops it from colliding with near-by objects.
- It also reacts accordingly to this with its attributes set in the inspector. These allow you to modify
    - Radius - This is the agent's "personal space" within which obstacles and other agents should not pass.
    - Height - The height of the agent for purposes of passing under obstacles
    - Quality - This property lets you trade off the precision of obstacle avoidance against processor load required to achieve it.

○ Priority - When the agent is performing avoidance, agents of lower priority are ignored

End Point Collider
● Collision collider trigger, which detects any objects that it comes in contact with.
● Destroys said objects

AI
Enemy AI -
● Continuously moves between waypoints until destroyed.
● Damages the player if destroyed by the endpoint.
● Has different variables for speed and health which can be set in the inspector.
● Loses health when shot.

Level Requirements
● Overall there is no story told by this game other than that the user is told to survive the waves which are coming to attack him.
● There are a total of 3 levels, each of which is locked until the user has completed its predecessor.
● Upon completion, the user is given the option to continue to the next level through the press of a button which appears on his screen.
● If the user fails to meet the level requirements to continue (Finish the level with >0 health) he is instead shown a restart screen where he can restart the level at his convenience.
● Whilst the levels are not directly labelled Easy/Medium/Hard, they can be interpreted this way with levels 1-3 ranging from Easy to Hard.
● As the user progresses, he gains access to more powerful enemies and a variation of maps which change the way they have to play.
● The user has access to an upgrade and sell menu at all times of the game simply by clicking on a placed turret.

Prototype Instructions
Level 1:
1) Choose and place 3 cannon turrets anywhere on the map
2) Upgrade 2 of the cannon turrets to level two when possible.
3) Place a Heavy Turret elsewhere on the map to help kill boss enemies.

Level 2:
1. Place 2 cannon turrets at the bottom loop.
2. Fill both sides with cannon turrets when possible.
3. Place 2 heavy turrets on the nodes above the cannons next to the environment.
4. Fill the top loop with ballista turrets when possible
5. Upgrade 2 cannon turrets to level 2.
6. Place more Heavy Turrets next to the current one as many as you'd like.

Level 3:
1. Place 2 cannon turrets on the bottom loop.
2. Place 2 ballista turrets on the top left side of the map.
3. Place a fire turret above the left side cannon.
4. Upgrade fire turret to Level 2.
5. Place 2 heavy turrets, one above the fire turret, and one above to the right.
6. Place 2 cannon turrets on the top right loop.

7. Upgrade cannon turrets to level 2.
8. Upgrade heavy turrets to level 2.
9. Upgrade Ballista turrets to level 2.
10. Fill top loop open spots with Blaster turrets.
11. Upgrade Blaster Turrets to level 2.
12. Fill the rest of the turret slots with Heavy Turrets.
13. Upgrade turrets as you deem necessary preferring AOE turrets where possible.
14. You have completed the game!

Credited Assets:
Used FBX models were gathered from https://kenney.nl/assets/tower-defense-kit
Brackeys bullet seeking + target updating tutorial :
https://www.youtube.com/watch?v=oqidgRQAMB8&