

*For the purposes of SoPra 2017:*

# Mystery Biplane Inspector

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# Conception

## Abstract

Mystery Biplane Inspector is a 2D real time cooperation tower defence game in a fantasy setting. Two players have to team up and fulfill their duty which is to defend the Mystery against endless waves of enemy minions and terrifying bosses. For that each player has to master the coordination between his three hero units. Use your Inspector to fight minions directly with mighty magic, hold the enemy off with all kinds of different building prepared by your builder Bob and make your line of defence even stronger by using the helpful hands from your supporter Jazzy Harp. Distracted from an epic battle each player's ability in decision-making and odds weighting is tested.

## Unique Characteristics

Common tower defence often use predetermined paths and fix wave patterns. By using random generated Map obstacles, minion type and other components of the game, players should not be able to find "the best" strategy. Mystery Biplane Inspector is all about reacting in the best possible way and changing up your strategy when it's needed. This leads to a quicker and more interesting gameplay as well as stronger long-term motivation because there are numerous possibilities for the outcome of a game.

# User Interface

## Ingame mockup



Example screen for a running game

## Explanation of the elements on screen:

### Top border and bottom border

1. Smaller Bar with Game status Information
2. Current Wave ( Not in Image)
3. Current glowing goo
4. Time to next wave
5. Time played
6. number of waves to next boss wave
7. Main building health
8. Units Bar
9. Overview of Selected Units
10. Buttons to use skills
11. Portrait of Unit

12. Status Points Display
13. Current Element
14. Current Level

Building:

15. The Mystery
16. Tower (Are shooting on the minions, when they are in range)
17. [optional] Walls

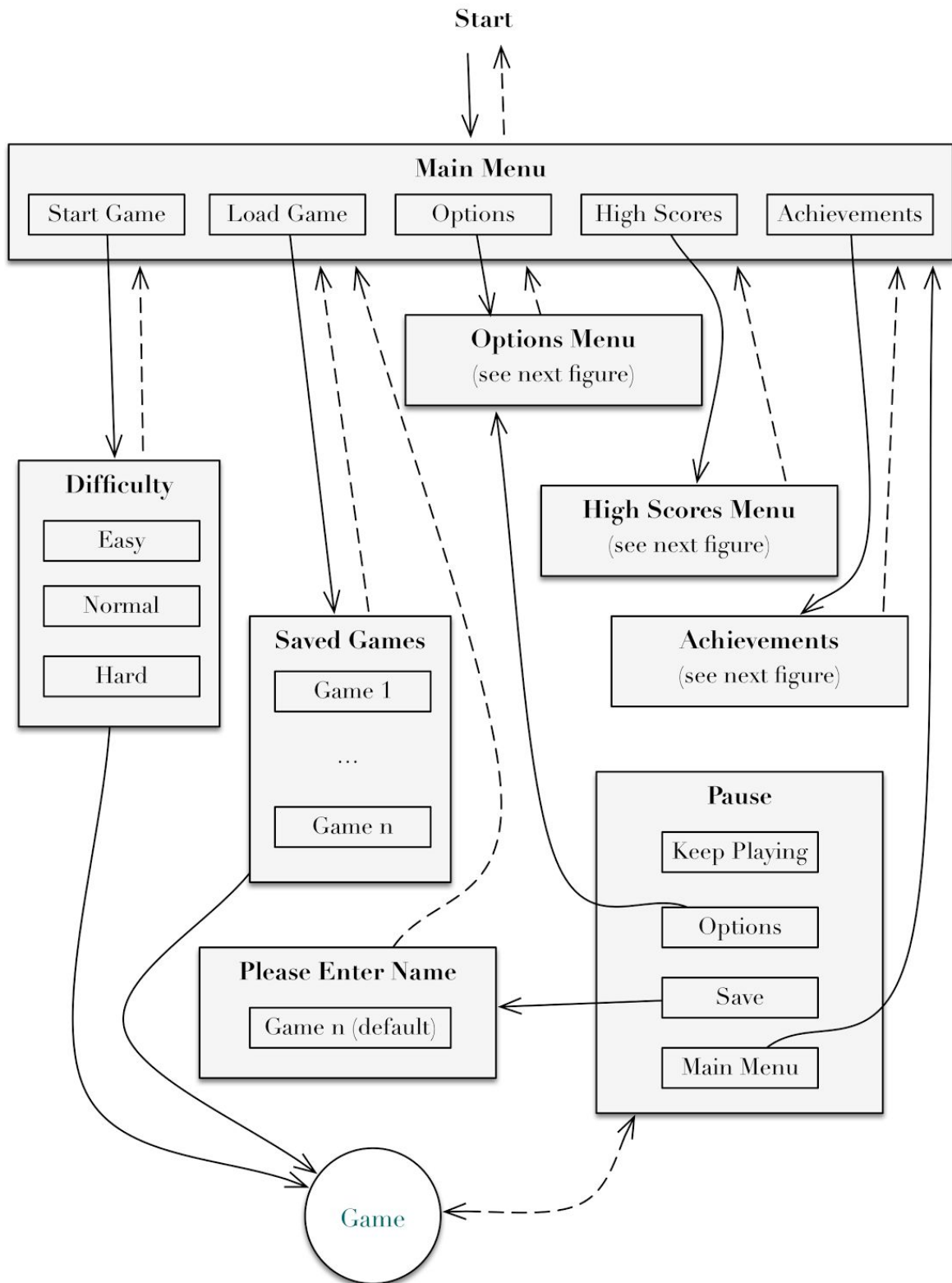
Units:

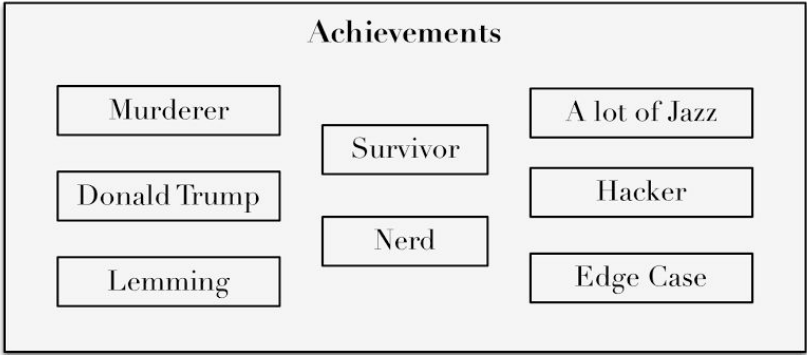
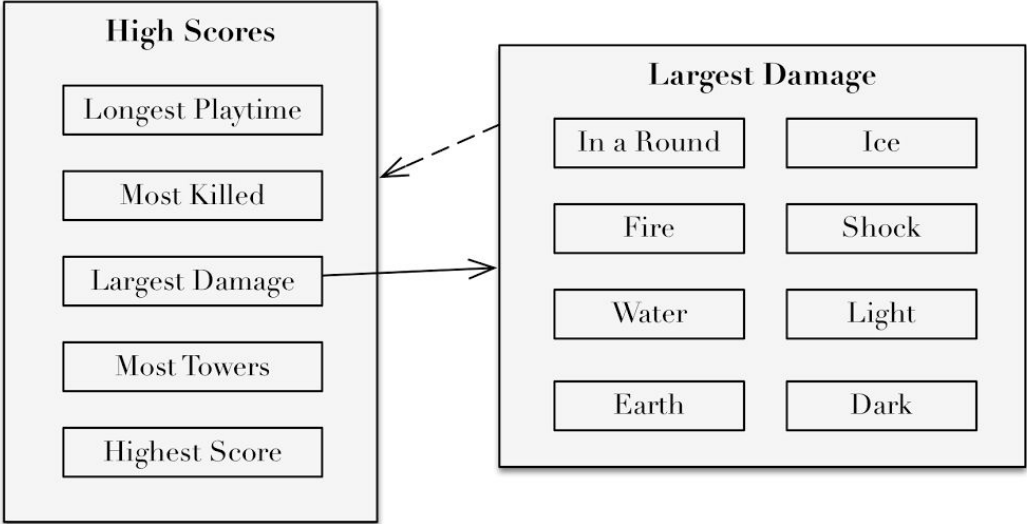
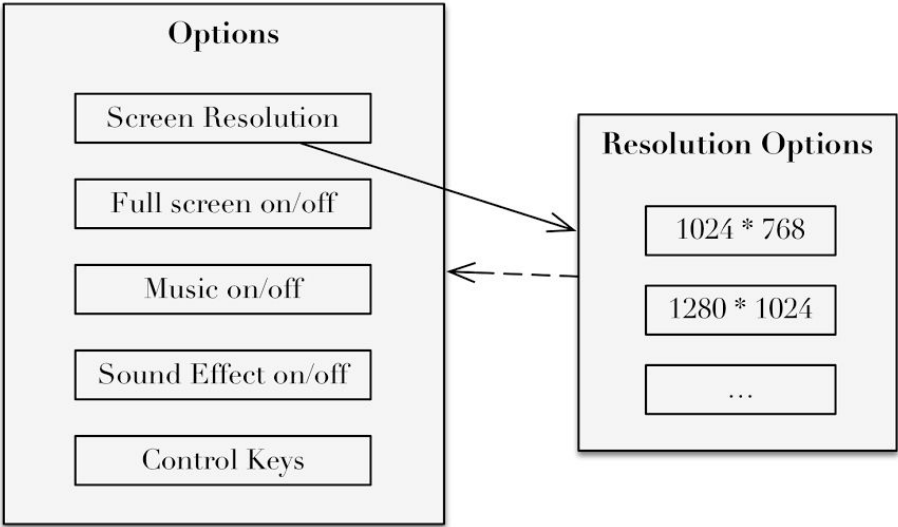
18. Inspector (player 1)
19. Bob (player 1)
20. Jazzy Harp (player 1)
21. Inspector (player 2)
22. Minions

## Menu Structure

The menu structure is showed in the following two figures. The outside boxes are the interfaces with the options that the player can choose from with a left mouse click. The options are presented in the inside boxes. After clicking, the next menu where the continuous lines lead to will be showed. There actually should be a "Back" option for each outside box and also for inside the game as the circle at the bottom of the first figure presents, but this is omitted due to a better overview. After clicking "Back", the previous menu where the dotted lines lead to will be shown. In addition, pressing "esc" button will have the same effect.

When the game is started first the start screen will be shown. By clicking the enter button the player can enter the main menu looking as shown in the first figure. If one chooses "Start Game" directly, a difficulty grade should be chosen before entering the game. If one chooses "Load Game", the previously saved games will be presented, so that the player can choose from them. From inside the game pressing "esc" button will lead to the "Pause" Screen. By clicking on the "menu" button in the upper right corner during game the ingame menu will open. One can save the current game with a preferred name by choosing "Save" option. Besides, as shown in the second figure, from the main menu one can go to "Options" menu in which the screen resolution, the full screen mode, the music, the sound effect and the control keys can be chosen, unchosen or changed. Moreover, there are "High Scores" menu and "Achievements" menu where the previous statistics can be seen. Like "Options" menu, these two are also submenus of the main menu.





# Technical Features

## Technologies

- Microsoft Visual Studio Enterprise 2015 (C#)
- Monogame 3.6
- JetBrains ReSharper
- TortoiseSVN
- Trac
- Slack
- Google Docs
- Gimp / Paint

## Minimum System Requirements

- Windows 7 (32- or 64-Bit)
- Intel Core i5 2500k (3,3 GHz)
- 4 GB RAM (DDR3 1,600 MHz)
- .Net Framework 4.5
- Soundcard
- Internet connection 16 MBit/s (Downstream)
- Internet connection 1 MBit/s (Upstream)



## Game logic

The following chapter will give an accurate insight in our game logic. First we explain our game objects, options & actions and how elements will affect the gameplay through tables. Afterwards we describe an exemplary game process in three parts. Early,- , mid,- and endgame. Last we give an overview of the statistic and achievements.

### Explanation of Terms:

HP	Health Points: if hp is 0 the Unit dies
Damage	Attack Damage
Range	Attack Range between 1 and 800 where 800 is maximum range
Attack Rate	Rate of attack : 50 = 0.5 Attacks/Second 100 = 1 Attacks/Second
Lvl Up	Level Up
AOE	Area of Effect
Glowing Goo (GG)	Main Resource. Can be spent to build towers, Lvl Up your characters. Obtained every wave.
<b>[Optional]</b> (Element) Buff	Change neutral tower damage to one of the six element damage types and changes ability
Space Needed	1 = 1 Square $n = n^2$ Squares
Unit	Controllable character and Minions together

Explanation of general term which are used often

## Game Objects

### Playable Characters:

Name	Health Points	Damage	Range	Moves peed	Abilities	Description
BOB	Immortal	Can't attack	100	250	Move, built tower	Character to build towers
Inspector	1000	30	50	250	Move, Attack, Lvl Up,	Character to fight minions
Jazzy Harp	500	Can't attack	350	250	Move, Heal, Buff, Regenerate Hp	Character to heal other and buff towers

Listing of controllable characters, their stats and abilities

### Buildings:

Typ	HP	Damage	Range	Attack Rate	Used Space	Cost	Special Ability
Stone	200	10	500	70	1	50	
Multi Shot	150	6	300	70	2	100	Attacks multiple Minions in range
Poison	150	2	500	40	2	80	Poisons Minion( 400% of of poison tower damage per second)
AOE	150	20	400	40	3	150	AOE Damage
Snipe	100	5	800	70	2	70	Longer Range
[optional] Wall	300	Can't attack	Can't attack	Can't attack	1	20	Block minions
Mystery	1500	Can't attack	Can't attack	Can't attack	4	0	Gets more HP over time
[optional] Gate	500	Can't attack	Can't attack	Can't attack	2	300	Hero, Jazzy Harp and BOB can walk through this. Minions can't.

Listing of building, their stats and abilities

## Minions:

Typ	HP	Damage	Range	Move speed	Attack Rate	Used space	Special Behavior	Special Ability
Tank	120	15	50	100	50	2		More HP
Speedy	60	15	50	250	100	1		Move faster
Dump Flying	60	15	100	150	75	1	Ignores everything except Mystery	Unblockable by buildings and map obstacles
Hater	45	30	400	200	50	1	Attack Inspector in a bigger attack radius	Range attack
Destroyer	90	20	200	150	40	1		AOE against building
Boss	300%	200%	150%	100%	150%	3		Stronger version of a random minion. Is not affected by Stuns. Resist Slows and Dots by 50%.

Listing of Minions, their stats and abilities

## Options & Actions

ID / Name	Parties	Event flow	Precondition	Postcondition
ID01: Unit Selection	Player	<ol style="list-style-type: none"> <li>1. Click with cursor on unit to select it</li> <li>2. Add Unit to current selection by left mouse click</li> <li>3. Selected Unit(s) are Displayed at Bottom Interface</li> </ol>	<ol style="list-style-type: none"> <li>1. No Unit is selected</li> </ol>	<ol style="list-style-type: none"> <li>1. A Unit is selected</li> </ol>
ID02: Move characters	Player	<ol style="list-style-type: none"> <li>1. Player clicks with the right mouse button on a location of the map</li> <li>2. Character start to move to the location</li> <li>3. Behavior after starting the action:</li> <li>4. The character always try to take the shortest Way</li> <li>5. If there is an obstacle or building the character try to get as close as possible to the location</li> <li>6. If there are no obstacle the character moves to his destination</li> </ol>	<ol style="list-style-type: none"> <li>1. The player has selected a character</li> </ol>	<ol style="list-style-type: none"> <li>1. Character reaches his destination</li> </ol>
ID03: Use Inspector to attack Minions	Player	<ol style="list-style-type: none"> <li>1. Player selects Minions to attack by right click</li> <li>2. Inspector starts to move to the Minion</li> <li>3. Inspector reaches Minion</li> <li>4. Inspector attacks Minion until the Minion is dead</li> <li>5. Inspector starts attacking other Minions in range</li> </ol>	<ol style="list-style-type: none"> <li>1. The player has selected the Inspector</li> </ol>	<ol style="list-style-type: none"> <li>1. Three possible outcomes:</li> <li>2. Minion dies</li> <li>3. Inspector dies</li> <li>4. Player uses different actions with the Inspector</li> </ol>
ID04: Use Jazzy Harp to heal the Inspector	Player	<ol style="list-style-type: none"> <li>1. Use left mouse click to select skill "heal"</li> <li>2. Target Inspector with right mouse click</li> </ol>	<ol style="list-style-type: none"> <li>1. The player has selected the Jazzy Harp</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspector moves out of Range of the ability "heal"</li> </ol>

		<ol style="list-style-type: none"> <li>3. Behavior after using heal</li> <li>4. Inspector heals 1% HP every second</li> <li>5. Jazzy Harp can't move until "heal" is cancelled</li> </ol>	<ol style="list-style-type: none"> <li>2. Inspector is in range of the Jazzy Harp</li> </ol>	<ol style="list-style-type: none"> <li>2. Jazzy Harp starts moving</li> <li>3. Player uses ability "heal" again</li> </ol>
ID05: Use Jazzy Harp to buff towers	Player	<ol style="list-style-type: none"> <li>1. Use left mouse click to select a element buff</li> <li>2. Select a tower to use the element buff with left click</li> </ol>	<ol style="list-style-type: none"> <li>1. The player has selected the Jazzy Harp</li> <li>2. A tower is in range of the Jazzy Harp</li> </ol>	<ol style="list-style-type: none"> <li>1. Jazzy Harp used a buff</li> <li>2.</li> </ol>
ID06: Tower gets buffed	Player	<ol style="list-style-type: none"> <li>1. Tower changes stats</li> </ol>	<ol style="list-style-type: none"> <li>1. ID05:</li> </ol>	<ol style="list-style-type: none"> <li>1. Tower is buffed</li> </ol>
ID07: Use BOB to build towers	Player	<ol style="list-style-type: none"> <li>1. Use left mouse click to select a tower</li> <li>2. Select a position on the map a the tower</li> <li>3. Behavior after selecting position</li> <li>4. BOB is in range of the building position and can built the tower</li> <li>5. BOB is out of range of the building position. The BOB uses action "Move" to get in range of the position.</li> <li>6. BOB build a tower</li> </ol>	<ol style="list-style-type: none"> <li>1. The player has selected the BOB</li> </ol>	<ol style="list-style-type: none"> <li>1. BOB finished building a tower</li> </ol>
ID08: Minion destroys building	AI	<ol style="list-style-type: none"> <li>1. Minion attacks buildings</li> <li>2. Building HP reaches 0</li> <li>3. Building is destroyed</li> </ol>	<ol style="list-style-type: none"> <li>1. Minion attacks buildings</li> </ol>	<ol style="list-style-type: none"> <li>1. Building is destroyed</li> <li>2. Minion dies</li> <li>3. Minion changes attack target</li> </ol>
ID09: Minion kills Inspector	AI	<ol style="list-style-type: none"> <li>1. Minion attacks Inspector</li> <li>2. Inspector HP reach 0</li> <li>3. Inspector dies</li> </ol>	<ol style="list-style-type: none"> <li>1. Minion attacks Inspector</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspector dies</li> <li>2. Minion changes attack target</li> <li>3. Minion dies</li> </ol>
ID10: Send Minions	AI	<ol style="list-style-type: none"> <li>1. AI decides which Way each minion Walks to the Mystery</li> <li>2. AI sends Minions</li> </ol>	<ol style="list-style-type: none"> <li>1. Wave x starts</li> </ol>	<ol style="list-style-type: none"> <li>1. Wave x has started</li> </ol>

ID11: Lvl Up	Player	<ol style="list-style-type: none"> <li>1. Player clicks on LVL up Button</li> <li>2. Glowing Goo is decreased (If Enough is on Account)</li> <li>3. Inspector Reaches New Level</li> </ol>	<ol style="list-style-type: none"> <li>1. Player has Enough Glowing goo and clicks on LVL up button</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspector has Reached next LVL</li> </ol>
ID12: Inspector dies	Player	<ol style="list-style-type: none"> <li>1. Minion attacks the Inspector</li> <li>2. Inspector Hp reach 0</li> <li>3. Player is Game over</li> <li>4. Game over Screen appears</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspector HP drop low</li> </ol>	<ol style="list-style-type: none"> <li>2. Inspector HP reach 0</li> </ol>
ID13: Boss wave spawns	AI	<ol style="list-style-type: none"> <li>1. Next wave timer has reached 0</li> <li>2. Timer is reset</li> <li>3. Boss spawns random in a spawn area around the map</li> <li>4. Boss walks towards Mystery</li> </ol>	<ol style="list-style-type: none"> <li>1. Next wave is a boss wave</li> </ol>	<ol style="list-style-type: none"> <li>1. Boss wave has spawned</li> </ol>
ID14: Mystery get destroyed	AI	<ol style="list-style-type: none"> <li>1. Mystery is attacked by Minions</li> <li>2. Mystery HP reach 0</li> <li>3. Mystery disappears</li> </ol>	<ol style="list-style-type: none"> <li>1. Mystery HP drop low</li> </ol>	<ol style="list-style-type: none"> <li>1. Mystery HP reach 0</li> </ol>
ID15: Minion die	AI	<ol style="list-style-type: none"> <li>1. Minion gets damaged by towers or Inspector</li> <li>2. Minion Hp reach 0</li> <li>3. Minion disappears</li> </ol>	<ol style="list-style-type: none"> <li>1. Minion HP drop low</li> </ol>	<ol style="list-style-type: none"> <li>1. Minion HP reach 0</li> <li>2. Minion disappears</li> </ol>
ID16: Upgrade towers	Player	<ol style="list-style-type: none"> <li>1. Left click on icon "Upgrade tower"</li> <li>2. Check if player has enough glowing goo</li> </ol>	<ol style="list-style-type: none"> <li>1. Player selected a tower</li> </ol>	<ol style="list-style-type: none"> <li>1. Tower is upgraded immediately</li> </ol>
ID17: Minion wave Spawns	AI	<ol style="list-style-type: none"> <li>1. Next wave counter has reached 0</li> <li>2. Timer is reset</li> <li>3. Minions spawn random in a spawn area around the map</li> <li>4. Minions walks towards Mystery</li> </ol>	<ol style="list-style-type: none"> <li>1. Next wave counter is 0</li> </ol>	<ol style="list-style-type: none"> <li>1. Minions have spawned</li> </ol>
ID18: Use ultimate ability with Inspector	Player	<ol style="list-style-type: none"> <li>1. Click with left mouse click on ultimate skill</li> <li>2. Select AOE</li> <li>3. Hero Walks in Range</li> <li>4. Inspector uses ultimate skill to deal 100% of his current damage to every minion in the AOE.</li> <li>5. Ultimate skill has now 4</li> </ol>	<ol style="list-style-type: none"> <li>1. Hero is selected</li> </ol>	<ol style="list-style-type: none"> <li>1. Ultimate ends after 3 Seconds</li> </ol>

		minutes cooldown		
ID19: Destroy own building	Player	<ol style="list-style-type: none"> <li>1. Left click on icon "destroy"</li> <li>2. Building is removed from map</li> </ol>	<ol style="list-style-type: none"> <li>1. A building except the Mystery is selected</li> </ol>	<ol style="list-style-type: none"> <li>1. The building is destroyed</li> </ol>
ID20: Tower Attacks Minion	AI	<ol style="list-style-type: none"> <li>1. Minion is in Range of Tower</li> <li>2. If multiple Minions in range, Tower selects The Lowest Relative HP minion.</li> <li>3. If Multiple Minions have exact same Relative HP, Random is Chosen.</li> <li>4. Tower Fires Projectile at Minion to Deal DMG</li> </ol>	<ol style="list-style-type: none"> <li>1. Minion is in Range of Tower</li> </ol>	<ol style="list-style-type: none"> <li>1. Minion Dies or</li> <li>2. Minion Leaves Range of Tower</li> </ol>
ID21: Move camera	Player	<ol style="list-style-type: none"> <li>1. Move your mouse cursor to the edge of the screen</li> <li>2. Camera follows the direction of the cursor</li> </ol>	<ol style="list-style-type: none"> <li>1. Mouse cursor is on an edge of the screen</li> </ol>	<ol style="list-style-type: none"> <li>1. Mouse cursor is not on an edge of the screen</li> </ol>
ID22: Zoom Camera	Player	<ol style="list-style-type: none"> <li>1. Use mouse wheel</li> <li>2. Behavior of the camera:</li> <li>3. If mouse wheel gets spinned up. Camera will zoom closer</li> <li>4. If mouse wheel gets spinned down. Camera will zoom out</li> </ol>	<ol style="list-style-type: none"> <li>1. Mouse wheel is used</li> </ol>	<ol style="list-style-type: none"> <li>1. Zoom is completed</li> </ol>

## Bufs & Upgrades

**[Optional]** (Element Buff) Table

Element	New tower ability
Fire	Attack applies burn Dot on minions. 30% of poison Dot
Water	Attack slows Minions by 30%
<b>[Optional]</b> Earth	Lose ability to attack flying Minions. Attack stuns minions for 0,75 seconds
<b>[Optional]</b> Shock	Gains ability to attack flying minions. Attack stuns minions for 0,75 seconds
Light	Attack Rate increased by 10
Dark	Damage increased by 10%

Changes from tower when a element buff is applied

**[Optional]** Element Damage factor Table

Defender // Attacker	neutra	fire	water	earth	Ice	shock	light	dark
neutral	1	1	1	1	1	1	1	1
fire	1	0.5	0.5	1	2	1	0.3	0.3
water	1	2	0.5	2	0.5	0.5	0.3	0.3
earth	1	2	1	0.5	1	2	3	3
Ice	1	0.5	0.5	1	0.5	1	0.3	0.3
shock	1	1	2	0.5	1	0.5	3	3
light	1	3	3	0.3	3	0.3	0.5	2
dark	1	3	3	0.3	3	0.3	2	0.5

Damage multiplier on targets of another element

### Tower Upgrade:

To upgrade a tower the player needs to pay 200% of his value (building costs + all upgrade cost). The tower gains +100% of his current HP and +125% of his current attack damage.



## Inspector Lvl Up:

To lvl up the Inspector the player needs to spend  $300 * (\text{Lvl of Inspector})$  glowing goo. Inspector gains +100% of his current damage, +100% of his current HP.

## Structure of the Game

### Game Mode

The game is played in a two-player-coop mode. Two human players defend their Mystery in the center of a map against waves of different minions spawned all around the map. Therefore the player can use BOB to build different towers, use the Inspector to fight minions or Jazzy Harp to buff towers and defend as long as possible.

### Early Game

At the very start of the game the two player begin at two distinct starting points on the map. Each player starts the game with an equal amount of glowing goo owning three different characters:

- The BOB can be used to built towers of different kinds (each specialized to be preferably used against a specific type of minions) using the player glowing goo as payment.
- The Inspector is the combat character of the player (except for towers). It has a variety of different abilities that can be used to fight against the minions attacking the main building. [Optional] Additionally the Inspector is assigned to one of six different elements (fire, water, earth, lightning, light, darkness) that will damage minions in order of their own element assigned. The element is assigned to the Inspector during early game by the player.
- Jazzy Harper has a abilities to heal the Inspector or can be used to [Optional]assign an element to a tower such that the player can react on the type of minions spawned during game.

After a short period of time, during which the player can start building towers on the map, the first wave of minions will be spawned:

- [Optional] Each minion is assigned to one of the six elements mentioned above.
- The number and strength of the minions will increase with game time.
- Having only minions of one element class in a wave at the early game, the composition of minions will be a variety of different kinds and elements in one wave during later game.
- minions generally move from their spawn points towards the main building.

The player try to prevent the minions from reaching the Mystery by killing them using the towers and the Inspector. If a minion reaches the Mystery it starts to attack the building.

For every new wave of minions the player get a specific amount of glowing goo to build more towers or upgrade their characters.

## Mid Game

In the middle of the game the player have built many different towers leading to a kind of maze [Optional]or even blocked the minions completely. The Minions have find their way to the Mystery or create one by attacking buildings in the way. Towers will possibly be upgraded and buffed to get more damage and new abilities. Waves of minions start to get stronger and stronger and the Mystery yet has been damaged.

## Late Game

During the late game the player will be faced tons of minions in each wave. This leads to a heavy combat all over the map challenging the player to cooperate in order to handle the flow of minions before reaching the Mystery.

The game will be over if either one of the two player Inspector dies during combat or if the Mystery is destroyed by minions attacking it. The player can reach different achievements during the game. In the end the Mystery will fall but you learned new strategies for your next round or even beaten the old high score.

## Statistics

- Global statistics:
  - overall playtime
  - overall killed Minions
  - overall done damage
  - overall built towers
  - overall score
- High-Score statistics:
  - longest playtime
  - most killed Minions in a round
  - most done damage in a round
  - most built towers in a round
  - highest score
- Last game statistics
  - playtime in the last match
  - killed Minions in the last match
  - done damage in the last match
  - built towers in the last match
  - score in the last match

## Achievements

There will be Achievements in 3 different difficulties.

- Easy:
  - *Murderer*: Kill 100 Minions
  - *Donald Trump*: Build a Wall
  - *Lemming*: Die in wave one
- Medium:
  - *Survivor*: Survive Minion wave 10
  - *Nerd*: Play the game for 10 hours
- Hard:
  - *A lot of Jazz*: Keep your both Jazzy Harps alive until wave 50
  - *Hacker*: Find all the bugs in the game (unobtainable)

