

Short Design Document for:

# Elementia

**War for Total Domination**

“ARtonomy”™

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# 1. Game Overview

## 1.1. Common Questions

### 1.1.1. What is the game?

Augmented reality fighting game, with an added strategy element based on the elemental powers (fire, water, earth and air) of the fighting agents (monsters).

### 1.1.2. Why create this game?

This type of game genre is nowadays very well established by the success of iconic games such as Hearthstone, Pokemon and Yugi-Oh. By adding some game-deepening elements to it, we think it could have a bigger impact on the continuously growing eSports market.

### 1.1.3. Where does the game take place?

The game takes place in the current reality, where monsters are invoked by the use of spell-cards. These monsters are summoned from a post-apocalyptical world in constant war (Elementia), where different tribes (each infused with powers of one of the 4 elements) are constantly fighting to gather resources from the other elements, i.e. tribes.

### 1.1.1. What is the main focus?

In the single-player mode, the hero (player) fights against the allies of the evil companies. These evil Companies are the ones who own most of the spell-cards, experimenting with them, and using them for their evil purposes. The hero has to fight them, in order to restore the peace of this world and Elementia. Players start their journey by acquiring one monster-deck (bought or created); and as they play, they learn the strategies needed to improve their fighting skills. In the multi-player mode, the player can choose to play either as one of the allies of the evil companies, or the story hero; and fight against other friends with their own decks.

## 2. Story

### 2.1. Complete story

The World known as Elementia suffers from a constant war going on between the 4 different native tribes, who each looks to dominate over the others by acquiring their resources. Although this destroyed their world, the tribes keep on fighting this war for domination.

On Earth, in an ancient lost city underwater, near the cost of Greece, a diver found a set of cards that changed the history of our world. These cards are portals to Elementia, which summon monsters from each tribe to this world. It was not long until the humans realized that these monsters could be used to their own benefit, and new evil companies appeared, which took advantage of this and started commercializing these cards by duplicating the deck. These companies ran a lot of experiments on those decks and the result was the possibility to summon new monsters and even to create them.

The lack of control over this discovery took our world by surprise, and led to a new world war for supremacy, splitting the world in different factions. A group of fanatics, who call themselves "The millennial summoners", is the most dangerous faction, since they are up to dominate our world, and are supported by the evil companies. The millennial summoners are known because of their evil personalities, and for several attacks against the world population, which led to thousands of deaths. The worst of those millennial summoners are known as "the dark circle", which have personal contact with leaders of the companies. This chaotic situation resulted in the darkest era of human history. Common people, who somehow gets access to these cards are now fighting against each other either for survival, or to get some benefit in an earth, which seems doomed to share the fate of Elementia, but ...

Nowadays, that all hope seems to be lost, in a little town of Germany, called Ilmenau, a student realizes that in order to save the planet, those companies need to be stopped; and the only way to do this, is to destroy them with their own monsters.

### 2.2. Background story

Elementia used to be a peaceful world, inhabited by elemental creatures, corresponding to one of the 4 elemental tribes: Water, Fire, Air and Earth in balance with each other. This all changed when a cataclysmic event happened. A big explosion of unknown origin left the world asunder, disturbing the peace between the tribes. Driven by fear of extinction, the tribes started gathering resources from where they could find them. This led to disputes between them.

Now Elementia finds itself in a state of total war, with no ending in sight...

## 3. Feature Set

### 3.1. General Features

- Augmented Reality
- Monster fight
- Collectable cards (Monsters)
- History mode (Second version)
- Multiplayer mode
- Real world setting
- 3D graphics
- Fighting animations

### 3.2. Gameplay

- Strategy
- Monster analysis and selection
- Physical Deck with a digital visualization
- Action-adventure through several fighting animations
- Good future projection with avatar creation and eSports
- Join a tribe, join a side
- Different worlds, interesting plot
- Good projection for an online multiplayer mode
- Commercial prospects by selling physical cards and avatars (toys)

## 4. Gameplay

### 4.1. Gameplay description

#### Functional requirements

- Players and monsters.
- Four types of tribes: fire, air, water and earth.
- Tribes must be keywords of type constant.
- Monsters belong to a specific tribe and have four basic attributes: attack, defense, evasiveness and hp.
- Each monster has a specific summoning symbol (logo).
- Each monster has an animation when it attacks.
- The player who starts to attack or chooses the monster at second place is randomly selected.
- There are no over-powerful monsters, the game is won by strategy, not by having the best monster.
- The game has 2 players per encounter.
- The game has a pause option.
- Menu with multiplayer, adventure mode and tutorial (later version).

#### Non-functional requirements

- The game runs over all smartphones with AR-settings.
- The monsters are stored either in a database in smartphone or in a database in the cloud (depending on scalability of the game).
- AR apk detects the symbol of each monster with precision and not the complete card.
- The speed of execution is not dependent on the device.
- Multiplayer functionality online using cloud connections for rendering and receiving/sending data between both players.

#### Tribes

There are four tribes in the game (fire, water, earth and air). Each has a tribe-specific improvement in one of their base attributes; as well as an advantage and disadvantage over one of the other tribes, when played against each other.

Each tribe's base attributes improvements are:

- Fire tribe: monsters of this tribe will receive 15 points more in their attack attribute.
- Water tribe: monsters of this tribe will receive 30 points more in their hp attribute.
- Earth: monsters of this tribe will receive 15 points more in their defense attribute.
- Air: monsters of this tribe will receive 25 points more in their evasiveness attribute.

The relation between the tribes is name as “elemental mitigation”, which means how much damage is going to be received considering the tribe of the attacker monster and defender monster. This relationship can be seen in Figure 1. Elemental mitigation code. Figure 1.

```
if(attMonst.mtype == "Fire"):
    if(defMonst.mtype == "Earth"): return 1.5
    elif(defMonst.mtype == "Water"): return 0.5
    elif(defMonst.mtype == "Air"): return 1.0
    elif(defMonst.mtype == "Fire"): return 1.0

if(attMonst.mtype == "Water"):
    if(defMonst.mtype == "Fire"): return 1.5
    elif(defMonst.mtype == "Air"): return 0.5
    elif(defMonst.mtype == "Earth"): return 1.0
    elif(defMonst.mtype == "Water"): return 1.0

if(attMonst.mtype == "Earth"):
    if(defMonst.mtype == "Air"): return 1.5
    elif(defMonst.mtype == "Fire"): return 0.5
    elif(defMonst.mtype == "Water"): return 1.0
    elif(defMonst.mtype == "Earth"): return 1.0

if(attMonst.mtype == "Air"):
    if(defMonst.mtype == "Water"): return 1.3
    elif(defMonst.mtype == "Earth"): return 1.4
    elif(defMonst.mtype == "Fire"): return 1.0
    elif(defMonst.mtype == "Air"): return 1.0
```

*Figure 1. Elemental mitigation code.*

In this way, e.g. a fire monster has a mitigation advantage over earth monsters, but a disadvantage over water monsters; while no advantage or disadvantage is given, when fighting against air, or other fire monsters. The mitigation coefficient is applied in Equation 3.

## **Monsters**

Each monster belongs to a tribe, which improves an attribute. The attributes of each monster are:

- Attack
- Defense
- Hp (Health)
- Evasiveness

Apart from those attributes, there are some other variables included in the code-representation of each monster (e.g. GameObject). The code-representation of the monsters in the game can be seen in Figure 2.

## Players

For the duration of the entire encounter, there are always two players, which are connect to a lobby to be able to play against each other. These players have the following attributes:

- List of monsters.
- Actual monster.
- Name.
- Hp.
- Number of changes.

Apart from those attributes, there are again some other variables included in the code-representation of each player (e.g. visualizer or GameObject). The code-representation of the players in the game can be seen in Figure 3.

## Hit function

Evasiveness is an integer value, which represents a percentage of how probable is that a monster evades an attack. This value is compared to a random value in order to know if the attacking monster has successfully hit the defending monster; or the attack was missed, i.e. it represents a Boolean value. This process is named “hit function”.

$$hit = \left( randomValue < \frac{evasiveness}{100} \right)$$

*Equation 1. Hit function, where randomValue is between 0 and 1.*

## Damage function

The hit and elemental mitigation functions are used in the damage function, which calculates how much damage a defending monster will take from an attacking monster. This function considers the attack from the attacking monster, the defense from defending monster, the hit function and elemental mitigation.

$$critical = 0.65 * randomValue + 0.95$$

*Equation 2. Critical hit function, where randomValue is between 0 and 1.*

$$damage = (attackerMonster.attack - defenderMonster.defense) * elm * critical$$

*Equation 3. Damage function where elm is the elemental mitigation and critical is taken from Equation 2*



## Class description

ElementiaMonster:

<<ElementiaMonster>>	
Monster	
- name: string	
- monster: GameObject	
- attack: float	
- defense: float	
- evasiveness: int	
- HP: int	
+ElementiaMonster(name: string, attack: float, defense: float, evasiveness: int, HP:int)	

*Figure 2. ElementiaMonster class.*

ElementiaPlayer:

<<ElementiaPlayer>>	
Player	
- name: string	
- visualizer: GameObject	
- selectedMonsters: ElementiaMonster [3]	
- actualMonster: ElementiaMonster	
- HP: int	
+ElementiaPlayer(name: string)	
+RegisterMonsters()	
+SelectMonster()	
+updateHP(newHP: int)	

*Figure 3. ElementiaPlayer class.*

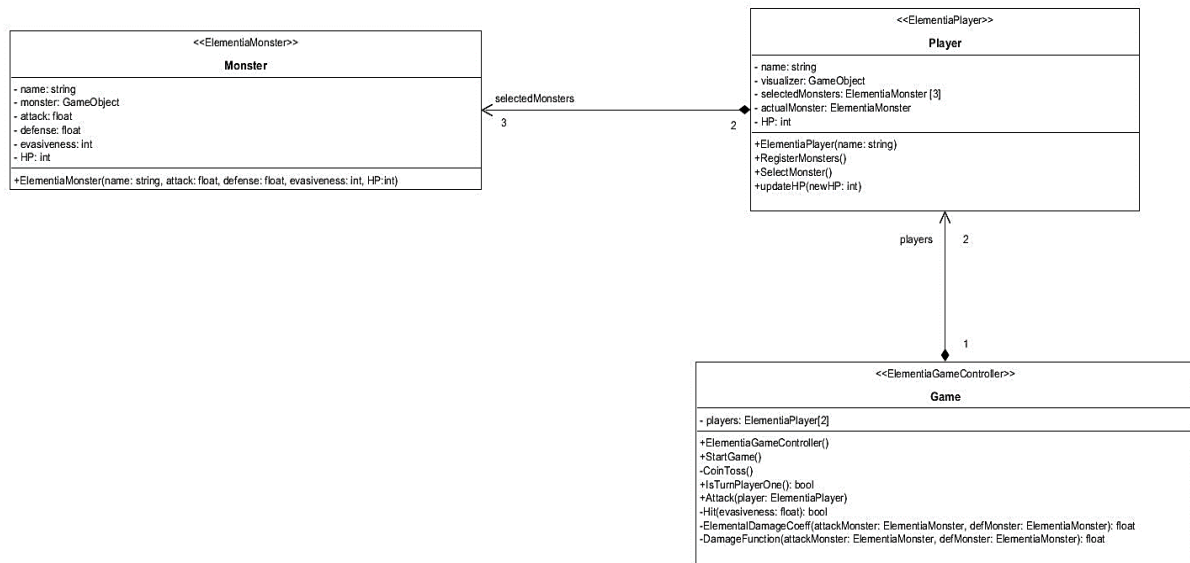
ElementiaGameController:

<<ElementiaGameController>>	
Game	
- players: ElementiaPlayer[2]	
+ElementiaGameController()	
+StartGame()	
-CoinToss()	
+IsTurnPlayerOne(): bool	
+Attack(player: ElementiaPlayer)	
-Hit(evasiveness: float): bool	
-ElementalDamageCoeff(attackMonster: ElementiaMonster, defMonster: ElementiaMonster): float	
-DamageFunction(attackMonster: ElementiaMonster, defMonster: ElementiaMonster): float	

*Figure 4. ElementiaGameController class.*

All the three classes have their respective setters and getter for each private attribute.

## Class diagram



*Figure 5. Elementia class diagram.*

This is the base model for Elementia, which is updated in real-time during the fight, in order to include updates for each player. More information about it can be found on Technology analysis (risks/alternatives).

## Game logic

The main logic of the game is to set up your tactic, by correctly choosing your active monster, so that one finds itself with an advantage over the other player's active monster, increasing the chances of defeating him. The game includes a physical board to show the players where to place the selected cards for the encounter from the deck; as well as the active monsters. A user interface is also created for the device running the game, which contains the player objects (HP/player info), battlefield-visualizer and the interactions of the battle.

## Gameplay description

The game-encounter is divided in the following phases:

### 1. Registration phase:

After clicking start game in Elementia menu, the player has to register the monsters to use in the encounter, from the deck that each player owns.

The registration process should fulfill the next requirements:

- A message appears before the game starts. This message indicates that each player must register 3 monsters for the battle and state that you should do this process hiding your elections (for strategy and game play purposes).
- The user should put the card in front of the camera (this will register automatically) and click add/next button to register the next monster.
- After the registration (of both players) the starting monsters are unveiled and placed in their corresponding spots.

## 2. Coin-toss:

After the monster selection, a random process (coin-toss) is executed, in order to select the player which has the possibility to select one of the following options: either to start the first turn of the battle attacking; or to make a re-selection of the starting monster, once the starting monster of the opposite player is unveiled, and allowing him to start attacking in the first turn. Both options represent a different type of advantage for the winner of the coin-toss. However the opposite player has the chance to beat this advantage by devising a counter-strategy (the correct use of his chances to change monsters).

## 3. Battle phase:

On each turn the player has the possibility to choose either to attack or to change monster (according to each player's strategy).

- Change Monster: The player has 30 seconds to place a card of an already registered monster. There is a maximum number of monster changes of 2 for each player
- Attack: The player will click the attack button and then an animation with the hit or attack of the monster will start.
- The player who is reduced to 0 HP first, loses the encounter.

Anti-cheating features/requirements from the players (fair-play):

- At the beginning, each player chooses 3 monsters individually without the other player knowing the chosen monsters.
- After monster registration, the system stores in an array (locally) the 3 registered monsters as an instance for the encounter, which is constantly inspected, in order to check if the player is playing an already registered monster or cheating by playing a non-registered monster.
- At the beginning of each turn, the system checks if the active monster of the player (smartphone owner) is among the registered monsters. If a non-registered monster is currently in game, the system prints a modal with the message: "Wrong monster". At the same time, the encounter cannot be started, if this happens.

## 4.2. Controls

Monster registration phase:

- In this process, a card must be placed in front of the AR-camera and a button is pressed, to confirm the registration of the monster.

Coin-toss phase:

- Both players have to click in the coin appearing in the screen, in order to start the coin-toss process.

Battle phase:

- On each turn, two buttons appear on screen: the "change monster"-button or the "attack"-button.

- Change monster: In this case the player must change the card in the game field (active monster).
- Attack: as soon as the player clicks the button, an animation will start showing the attack of the monster to the enemy monster.
- A pause button is at all times present during the encounter. By clicking on it, a menu pops-up pausing the fight and the possibilities to surrender or quit the game are present.

### 4.3. Interfaces

Menu with multiple options (history mode – not implemented in this version, versus mode (multiplayer) - main mode of this version and tutorial).

Health bars and timer included in the fight environment (real world with AR-Monsters).

### 4.4. Rules

1. Place your card in front of you and in front of your opponent.
2. You can change your card in the middle of a fight just after the battle begins (limit of 2 times).
3. Maximal 3 monsters per battle.
4. You can only change your monster with one that you have already registered.
5. You cannot change a monster if it is the opponent's turn or if you have already chosen to attack to the enemy.

### 4.5. Winning conditions

Reduce the opponent's health points to 0.

Strategy is the key, i.e. the combination of monsters and the player's reaction when a certain active monster is on the battlefield. These actions are the main factors which lead to the defeat of the opponent.

Additionally, another instant winning condition occurs when the opponent player surrenders, which automatically triggers a destroy animation of the player's monster (who surrendered), and an event panel appears showing the result of the encounter ("you lose" for the player which surrenders, and "you win" for the other player).

## 5. Game world

### 5.1. Overview

Initially, the real world is the place where the battles with the decks take place. A game-board helps the players identify where the cards must be place during an encounter. Furthermore, the game could take place in Elementia as a mini-game or more battle locations included in the game version 2.0.

## 6. Game Characters

### 6.1. Overview

Game world:

- The millennial summoners
- The dark circle (most powerful millennial summoners)
- Leaders of the companies
- Hero

Elementia:

The monsters of Elementia are ogres, magicians, animals, dragons and other mythical beasts which could own whatever power among the 4 elements of the nature.

- Air tribe: the members of this tribe are distinguished by their evasiveness.
- Fire tribe: the members of this tribe are distinguished by their high damage.
- Water tribe: the members of this tribe are distinguished by their defense abilities.
- Earth tribe: the members of this tribe are distinguished by their strength and resistance.

### 6.2. Enemies, Monsters and other Types

Real world:

- Evil companies: Some companies took advantage of the cards to summon monsters and even found the way to replicate the cards, to summon new monsters and even to create new ones.
- The millennial summoners: they are cards owners who work for the evil companies and try to defeat all the card owners to get more resources and help the companies to dominate the world.

Elementia:

- Animals: The 4 elemental-tribes have animal-like monsters. The flying animals are members of the air tribe, the swimming animals are members of the water tribe, most walking animals are members of the earth tribe and most mythological animals (centaurs, some dragons) are of the fire tribe.
- Ogres (they could be members of any tribe)
- Troll (they could be members of any tribe)
- Magician (they could be members of any tribe)
- Eyeball (they could be members of any tribe)
- Priest (they could be members of any tribe)
- Demons (members of fire tribe)
- Angels (members of air tribe)
- Mermaid (members of water tribe)
- Rock/Stone monster (members of earth tribe)

## **7. Media list**

### **7.1. Interface assets**

The assets used are the monster models and their animations during the battle.

### **7.2. Environments**

Real world, therefore it is not needed the creation of a virtual environment. A battle field board is used to show the player where to place the cards/monsters to use during the battle

### **7.3. Characters**

Monsters (assets) from the asset store.

### **7.4. Animation**

Each monster from the asset store must be chosen considering their animations, i.e. all the selected monsters must have animations to attack, be destroyed or die.

### **7.5. Music and sound**

Some self-generated sounds in a loop will be played during the battle randomly and other free sounds from open source websites.

## 8. Technical specs

### 8.1. Technology analysis (risks/alternatives)

1. The game is initially done for smartphones with Android operative system (version 4.4 or better – allowing ar engine from vuforia).  
Risk: Making the game Multi-platform compatible  
Alternatives: Making the game only for one platform (including other devices, e.g. tablets)
2. The game has 3 classes (among them ElementiaPlayer). The Player model is updated (via cloud) every time during the battle in order to update monsters, hp and interactions (e.g. animations).  
Risk: the messages and the values to be updated can't be reached with the technology (asset, framework used) due to problems with class structure sent through the cloud.  
Alternatives: Due to possible cloud connection problems, it would be better to have ElementiaPlayer as a “virtual class” which is represented by messages, and updated with the incoming cloud data, in order to set the status of each player in a real time environment (connection and game rendering).
3. The smartphone should be connected to internet to be able to connect in the lobby and play against another person. Both players need to be connected to the same network.

### 8.2. Platform & tools

Initially for Android phones, further development for other platforms, e.g. tablets, other AR-devices like holoLens.

### 8.3. Delivery

Android: apk through google store and commercialization (physical) of the monster-cards to use in the game.

iOS: to confirm (first version in android).

### 8.4. Game engine

Unity 2017.4+

Vuforia