**“Tower Defense – Game Proposal”**

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# Introduction

This game is aimed at students following the Massive Open Online Course of Wind Energy of the TU Delft. The aim of the game is to help teach students about the basics of Wind Energy while remaining entertaining. The reason a game is created for this is to help retain more students than the usual low amount of students that manage to finish the course.

## Project Vision

The scope of the project is to introduce the players to the concepts of wind energy and allow them to experiment with different options whilst keeping them entertained.

The project goals are:

* Create a game that will motivate players to explore the field of wind energy.
* Through gameplay a player should feel intrigued to finish the game.
* Allow players to experiment with the different challenges of designing wind turbines
* The game should introduce the basic factors of wind turbines in such a way that they are clearly conceptualized by the player through the gameplay.

## Target Audience

The target audience is an educated audience that has around 30 minutes daily maximum to spend on this game. The audience age ranges from late teens to retirement age.

# Detailed Game Description

## Basic concept

The concept that is presented is a tower defense-type game where the objective is to beat various challenges by designing, managing resources and intelligently putting wind turbines in key locations. The aim is to successfully fend off waves of units in order to complete the game goal. Player actions include maintaining the wind turbines and adapting them to changing conditions for the purpose of optimization. Depending on his performance, the player can achieve a ranking on the leaderboard, where he can compare his performance to other players.

The gaming system is resolved around building, heavily customizing wind turbines and connecting them to the grid in order to power up actuators, which in turn will interact with the units depending on the specific scenarios. The actuators draw power from the grid. For example, the power of a water pump is determined by the distance between the turbine and the pump, and the efficiency of the turbine design.

An example scenario could be, having units of water running through the preset lane resembling a river, and then water pumps will extract water from the river to prevent flooding of the town. The rate at which the pumps extract water is proportional to the energy incoming from the wind turbines.

## Advantages of Tower Defense

To enumerate the advantages of tower defense are:

* Easy to pick up
* Direct feedback
* Clear game goals
* Due to the simple structure of the concept, features are easily added to complement additional goals.
* Tower defense games have the important feature that players can provide slightly different solutions to the same problem
* Can pause the game to re-structure your strategy

## Objective of the game

The objective of the game is to prevent a city from flooding. A city is threatened by an overflowing river and the player has to get rid of the excess water by pumping it out of the river. In order to do this, he has to connect pumps to the electrical grid. The power on the grid is generated by wind turbines which the player has to design and place in order to efficiently power up his pumps. The power is distributed from the turbines to the pumps and the amount of power it receives determines its performance.

## Which are the core elements of the gameplay?

The game focuses on:

* Decision making speed
* Turbine, grid, pump placement precision
* Efficient turbine design
* Optimizing the turbines placement based on the level design conditions
* Turning the turbines to accommodate changing wind directions (for turbines that are able to do that)

To elaborate, the different turbine design options are:

1. Number of rotor blades
2. Types of rotor blades
3. Type of drivetrain
4. Type of nacelle
5. Height of turbine

## Description of any A.I. planning to be used

* Units will have to follow a set path until they are interacted by the mechanics of the wind turbines or reach the end of that set path
* A wind direction system will be introduced that will vary depending on the setting, in order to teach the player about the different effects on the performance of turbines.

## What is the interactive structure that is being used

The game will have a chapter system which gradually introduces new concepts in order to achieve the desired learning curve.

## How and why is multi-player implemented?

Multiplayer is a common system used in games for the purpose of challenging each other through competition. In this respect, players are encouraged to improve and figure out ways to overcome the limitations of their own designs. The leaderboard can be seen from the start menu and right after finishing a game.

The final score is representative primarily off of the efficiency of the turbine designs and placement. Additionally, score is gathered by pumping water units and is also negatively influenced by the amount of water that breaches the city.

## How difficult is the game?

The game is required to be easy in the introductory part, and then it would scale based on the learning objectives.

In any case, that a player would find himself lost or stuck, help will be available through an educational system, which will provide information on different topics.

The game is designed in such a way, that the difficulty of the gameplay is influenced by two factors. Them being:

1. The complexity of the level design, meaning difficulties in power distribution, amount of water units that the player has to pump, the flow rate and the weather conditions.
2. The amount of options a player has in respect to designing the turbines to be sufficiently efficient.

To properly create a strategy for every level design, the user is allowed to pause the game, in order to create new designs, place new turbines, and redistribute power.

# Product Design Aspects

## Technology Used

Taking information from the commissioners about the browsers that the target audience use:

* Chrome 50%
* Firefox  14%
* Safari 10%
* IE 5%
* Edge 1%
* Opera 1%

It can be seen from the statistics which browsers the MOOC users utilize. Approximately 85% of people in our target audience are using web browsers through desktops.

We chose HTML5 as the base of our game instead of flash because HTML5 game can be played not only on PC, Mac and devices based on Android or iOS, but also on Firefox OS and all the others that support HTML5 standard. This significantly increases number of potential customers. What’s more beyond HTML5, WebGL is needed to draw graphics that can be accelerated by GPU on the canvas element of HTML5.

In our game, we aim to develop an interesting tower defense game that enable the players to build customized wind turbines and try the physics and mechanism out during the game. Consequently, various engines for physics, animations, particle systems are needed in the implementation of all this functions in our web game. Considering team size, workload and the game scale, we choose to use Unity as our game engine, which allow us to handle the physics simulation, animation control, user interface creation and audio management in a single game system. The latest Unity 5 can successfully export the game onto the web platform supported by HTML5 and WebGL. What’s more, Unity 5 is useful for the future multi-platform development.

## Interaction sounds and theme music

We will use audio cues to give the user feedback about his actions and the state of the game and additionally we will have music to create an engaging atmosphere.

## On-Screen Interface

The user interface shouldn’t interrupt the flow of the game experience that a user will be having. If any, it should promote it. Unity 5 provides a separate 2D user interface system that allows the developers to build 2D user interface without interacting the 3D effect of the game play.