

UFCFS4-30-3 Creative Technologies Project Proposal Document	
Student Name:	Hector Martin-Davies
Student Number:	16020968
Project Title:	Dynamic Weather system pipeline

Description

The project will be a dynamic weather system that will produce multiple types of conditions. These conditions will be clear / cloudy, light and heavy rain, light and heavy snow. This will be a pipeline that can be implemented into a game for other developers to use behind the scene of the actual game. The snow affect will only happen when the temperature is set below -2 when the rain is enabled. The system will follow an algorithm pattern to work out what the developer will want the weather to do similar to weather forecast satellites. This project will focus on weather impacts on player characters.

- Produce different types of particles etc. Rain, snow and fog.
- Have switches to enable or disable conditions.
- Have an algorithm to work out a pattern to keep the weather doing similar conditions or drastically changing.
- Use sliders to control strength of conditions and also temperatures.
- To be produced in Unity plugins using C++ and C#.

Research and background

All modern games will have some sort of weather system, the weather system will have a bigger effect on some compared to other games. Racing games will change drastically on weather conditions, if it's dry then the car will grip well if its wet the car will have reduced grip and slide more. Shooter games it can change the sound of footsteps, visibility to see other objects or opponents.

Some games will have dynamic weather, this is when the weather will change and alternate between different conditions, for example in Player Unknown Battlegrounds have a dynamic weather system that will change the weather while the game is in play, this means it will start on one condition then change as the match progresses. Their system has footprints left in the snow and the sound of the snow crunching but only within the snow map Vikendi, also having blizzards.

As this is the first time creating a plugin for unity there is background research for doing this, Unity has been used throughout the year of the games tech course



Figure 1. Showing different weather conditions in Player Unknown battlegrounds, used from <https://allgaming.news/2019/08/22/pubg-update-4-2-out-with-dynamic-weather-destructible-objects/>

but never required a plugin to be created (2019 Unity Technologies). This project will require both managed plug-ins and native plug-ins to produce for it to be accessible for unity.

The transition between conditions will be using similar methods, used to predict weather forecasts for daily news (2010, Stauch, Hug, Schubiger, Steiner Et al). These methods will help calculate when the weather should be changing and how the user may want to change the speed and which it changes.

Objectives

Project objectives

- To create a plugin for unity.
- Intended to use the particle system to make rain and snow.
- Have a pipeline to make it easily controllable, with sliders and switches.

Research objectives

- To find out what problems that can occur when creating a weather system pipeline and trying to avoid these problems.
- Find efficient methods to produce particles with memory leaks not occurring.
- Find out what limitations can impact this project and if there is a way around them.

Learning Objectives

- Gather a better understanding of Unity plugins.
- Have a better understanding of coding with C++ and C#.
- To create an advanced pipeline that controls multiple conditions.

Methods, techniques, tools and processes

The project will be created as a unity plugin, I will be using GitHub as a way of keeping it backed up, allowing me to have the project at any computer with GitHub on it. I will be using both C++ and C# coding skills with managed and native plugins for unity. The project will be data driven, this will mean that inputs are easily changed and don't require a user to go into the code.

Risks and issues

Risk	Mitigation	Contingency
Realistic simulation implementation	Start early and research basic implementation and understanding of simulation	Research vector field integration for unity particle systems
Simulation running in real time	Researching for optimisation and techniques for simulation on the GPU with direct shader	Render out frames for non-real-time demo

Specialist resources and support required

I will not be requiring any specialist resource and support, other than the supervisor that has been assigned to me and the software and hardware that is on the computers in the Games Technology assigned room at UWE Frenchay.

Sources and references

Stauch, V.S., Hug, C.H., Schubiger, F.S., Steiner, P.S. and , (2010) Federal Office of Meteorology and Climatology Meteoswiss, Zurich, Switzerland. *Weather Forecasts, Observations and Algorithms For Building Simulation and Predictive Control* [online]. 3 (0), pp. 1-15. [Accessed 05 10 2019].

https://opticontrol.ee.ethz.ch/Lit/Stau_10_Rep-MeteoSwiss3rdYrContribOptiCtrl.pdf

Unity Technologies, (2019) Unity Documentation. *Plug-ins* [online]. [Accessed 07 10 2019].

<https://docs.unity3d.com/Manual/Plugins.html>

Monthly project plan

October	Final proposal to be submitted by 10/10/2019 Start producing the plugin – this will require using the reach I have gathered and understanding of the libraries, to be applied to the start of my project. Plan what will be needed in the plugin.	Date – 25/10/2019 After hand in
November	Continue working on the plugin – having rain being admitted to have some effect on player character.	Date – 17/11/2019

	Transition – working to produce snow from rain.	Date – 26/11/2019
December	Further work on plugin- transition and snow build up Transition – getting a smooth transition from rain to snow that is driven by a temperature variable, as this variable goes lower the more snow will be produced. Snow build up – when snow falls it builds up on the ground, there will be tracks behind the player that will slowly start to fade out as snow continues to build.	Date – 05/12/2019 Date – 15/12/2019 Date – 20/12/2019
January	Transition – have the opposite effect when the temperature rises the snow will start to melt, having a humidity float will cause fog to appear. Lightning – lightning will appear when enabled but only if it is currently raining with a high temperature.	Date - 10/01/2020 Date – 20/01/2020
February	Transition – having slippery ground when turning colder to affect player grip, walking through snow affecting players movement speed.	Date – 20/02/2020
March	Smoothing out the system to run efficient bug testing fixing any problems that occur.	Date – 20/03/2020
April	Continue fixing any problems and polishing, having the project finished. Hand-in 23/04/2020	Date – 05/04/2020 Date – 20/04/2020

Ethical Review Checklist for Undergraduate and Postgraduate Modules

Please provide project details and complete the checklist below.

Project Details:

Module name	Creative Technologies Project
Module code	UFCFS4-30-3
Module leader	Michaela Palmer
Project Supervisor	James Huxtable
Proposed project title	Dynamic Weather System Pipeline

Applicant Details:

Name of Student	Hector Martin-Davies
Student Number	16020968
Student's email address	Hector2.Martin-Davies@live.uwe.ac.uk

CHECKLIST QUESTIONS		Yes/No	Explanation
1.	Does the proposed project involve human tissue, human participants, animals, environmental damage, or the NHS.	No	<i>If the answer to this is 'No' then no further checks in the list need to be considered.</i>
2.	Will participants be clearly asked to give consent to take part in the research and informed about how data collected in the research will be used?	No	
3.	If they choose, can a participant withdraw at any time (prior to a point of "no return" in the use of their data)? Are they told this?	No	
4.	Are measures in place to provide confidentiality for participants and ensure secure management and disposal of data collected from them?	No	

CHECKLIST QUESTIONS		Yes/No	Explanation
5.	Does the study involve people who are particularly vulnerable or unable to give informed consent (eg, children or people with learning difficulties)?	No	
6.	Could your research cause stress, physical or psychological harm to humans or animals, or environmental damage?	No	
7.	Could any aspects of the research lead to unethical behaviour by participants or researchers (eg, invasion of privacy, deceit, coercion, fraud, abuse)?	No	
8.	Does the research involve the NHS or collection or storage of human tissue (includes anything containing human cells, such as saliva and urine)?	No	

Your explanations should indicate briefly for Qs 2-4 how these requirements will be met, and for Qs 5-8 what the pertinent concerns are.

- **Minimal Risk:** If **Q 1 is answered 'No'**, then no ethics approval is needed.
- **Low Risk:** If **Qs 2-4 are answered 'Yes' and Qs 5-8 are answered 'No'**, then no approval is needed from the *Faculty Research Ethics Committee* (FREC). However, your supervisor must approve (a) your information and consent forms (Qs 2 & 3) and (b) your measures for participant confidentiality and secure data management (Q4).
- **High Risk:** If **any of Qs 5-8 are answered 'Yes'**, then you must submit an application for full ethics approval *before* the project can start. This can take up to 6 weeks. Consult your supervisor about how to apply for full ethics approval.

Risk Assessment: Separate guidance on risk assessment can be found on UWE's Health and Safety forms webpage at <https://go.uwe.ac.uk/RiskAssessment>. If needed, you must complete a Risk Assessment form. This must also be attached to your application for full ethics approval if your project is **High Risk**.

Your supervisor must check your responses above *before* you submit this form.

Submit this completed form via the *Assignments* area in Blackboard (or elsewhere if so directed by the module leader or your supervisor).

After you have uploaded this form, your supervisor will confirm it has been correctly completed by "marking" it as *Passed/100%* via the *My Grades* link on the Blackboard.

Further research ethics guidance is available at
<http://www1.uwe.ac.uk/research/researchethics>