D3.1 Real-time Agent Creation Demonstration

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Abstract	This document provides the background and current progress, including the look development of the real-time agent creation and the demonstration of the agent inside Unreal Engine.
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1.0 13-08-2020	Document created by Tommy Ting
1.1 14-08-2020	Version submitted for internal review
2.0 26-08-2020	Revised based on Cubic Motion's feedback and added figure 1 Final version

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1. EXECUTIVE SUMMARY

The aim of this deliverable is to demonstrate that the process of creating the real-time agent, Gareth, is well underway and to provide a visual demonstration of that progress. A number of important milestones have been achieved.

The modelling of the base topology for face and body are complete along with UV layout and first pass textures for color and displacement. Further refinement of the color and displacement are underway along with the addition of maps for specular, subsurface scattering, etc. Work on the hair groom is in progress but did not come in time for this deliverable.

Additionally work is well underway on the body rig and a first set of facial blendshapes that will act as the foundation of the facial rig. This progress is not reflected in this deliverable as it has not yet been incorporated into the real-time asset.

A neutral test environment has been created in Unreal Engine that matches the environment used as part of Framestore's standard VFX asset look development pipeline. This environment still needs further calibration to precisely match the environment used in VFX but the majority of the work on this has been completed and is reflected in this deliverable. This calibrated environment will form an important component of the ongoing real-time agent look development process. Further calibration environments are currently being created that precisely match the various reference shoots that were undertaken with Gareth. As the look development progresses these will be used to assess progress.

2. BACKGROUND

D3.1 Real-time Agent Creation Demo is the first deliverable for WP3 Agent Visual Creation and focuses on creating the highest quality real-time rendering of a digital human.

As this is the first deliverable of Gareth for WP3T1, a second demonstration at M30 will showcase the final asset. The main function of this demonstration is to showcase the progress made in creating the real-time agent such as the modelling of the base topology, the creation of initial textures as well as setting up Gareth in a test environment inside Unreal Engine that is congruous to Framestore's standard VFX asset look development environment.

This demonstration enables further discussion and work amongst different partners in this WP, including Background Visualisation (WP3T2), Facial Animation for Virtual Agents (WP3T3) and Behavioural Learning and Knowledge (WP3T4).

3. INTRODUCTION

This delivery consists of a quicktime showing a turntable of the current real-time Gareth asset in Unreal Engine. In addition a compiled Unreal project is provided that contains the scene shown in the quicktime with various keyboard shortcut prompts provided on screen to allow for navigation around the scene and control over the assets rotation. The key demonstrable progress of Gareth is outlined; the modelling of the base topology for the face and body, complete UV layout, first pass textures for colour and displacement and initial real-time shading.

3.1 Main objectives and goals

- The overarching goal of PRESENT is to provide a digital agent that has visual photorealism, believable animation, and reactive communication in the resulting virtual human.
- Photorealistic computer generated digital human rendered in real-time
- to demonstrate progress on the creation of the digital human and what are the areas to focus on for the final asset.
- to design the base topology of Gareth so that it can be subdivided according to the desired resolution for compatibility to all use-cases in PRESENT

- to create a test environment inside Unreal Engine that matches the standard Framestore's look development environment inside Unreal Engine

4. REAL-TIME AGENT CREATION

4.1 Modelling

The base topology has been designed so it can be subdivided to increase the resolution of the mesh. The base mesh is designed with such restrictions in place on polygon count that when subdivided it hits resolutions that fit nicely just under the memory limitations of the various use-cases. This design allows us to use a low subdivision level for background agents, a medium-high subdivision levels for the Unreal agent while retaining the highest subdivision levels for non-realtime use-cases. However, in all cases compatibility is retained.
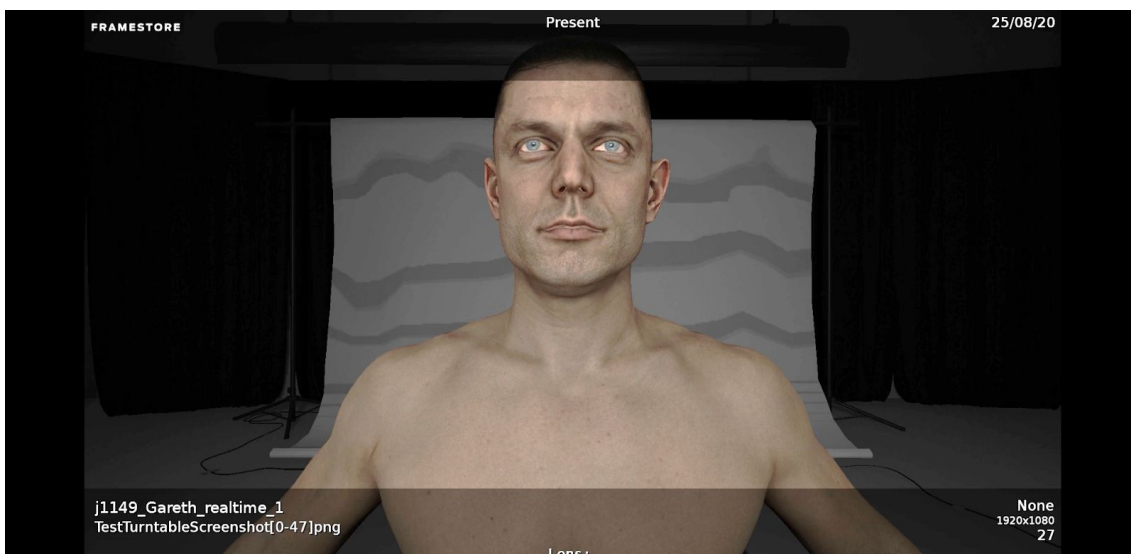

Figure 1. Screenshot of the current work-in-progress real-time Gareth asset in Unreal Engine

4.2 Look Development

In lookdev, shaders are assigned to the model which determine the way the model interacts with light when going through the rendering process. The shaders typically require
texture maps as input. Separate maps are created that determine properties such as colour, specularity, wetness, sub-surface scattering, etc. Subsequently, the shaders and shader settings are tweaked until the desired look of the asset is achieved. This happens in constant reference back to the photographs and photogrammetry of the captured performer which serves as the base of our digital agent, to make sure progress is constantly inching further towards that target until the digital version is indistinguishable from the captured reference photography.

For PRESENT, the lookdev process needs to happen twice, one for the non-realtime asset and then again for the realtime asset, as the different types of render engines used (raytracing versus raster) require different shaders. Framestore is using the concept of Physically-Based Rendering as the underlying approach to both the realtime and non-realtime workflow. Using the same underlying set of principles means that we are able to achieve greater integration and greater standardization across workflows, and have the ability to constantly evaluate the generated outputs from the realtime and non-realtime agents against each other and work towards removing discrepancies, hopefully allowing the realtime agent to inch closer to photorealism in lockstep with the advances in lookdev made on the non-realtime agent.

4.3 Unreal Engine

As agreed in the architecture, all interfaces and components in PRESENT are defined within the Unreal Engine environment and are based on Unreal Engine SDK. Therefore, it is crucial that our first deliverable in this work package shows progress on the digital human asset, Gareth, with its base topology as well as the associated textures inside Unreal Engine.

5 CONCLUSION

This deliverable demonstrates that the process of creating the real-time agent is well underway as well as all the key milestones that have been achieved. Although foundational work is also well advanced in other areas, such body rigging, facial rigging and groom, these are not at a point where visual demonstrations are yet possible within the real-time engine.

The Unreal Engine environment demonstrated in the deliverable still needs further calibration to precisely match the environment used in VFX but the majority of the work on this has been completed and is reflected in this deliverable. This calibrated environment will form an important component of the ongoing real-time agent look development process. Further calibration environments are currently being created that precisely match the various reference shoots that were undertaken with Gareth. As the look development progresses these will be used to assess progress.

6 TERMINOLOGY

Look Development is a part of the pre-production phase where a show, or in this case, the asset's overall artistic and scene styles are established.

Real-time used to describe the way in which a computer system receives data and then communicates it or makes it available immediately.