CEng 491 -- Project KickOff Document Template

“Capturing Human Hand Motion” KickOff Document

Description

The project serves an “empathy construction” and “sign language learning” platform offered with a game concept. Lack of awareness on sign language makes hearing-impaired people’s life harder. So the game aims to grow empathy for hearing-impaired people and teach sign language.

#	Title	Man months
1	(491) Simple gesture identification with 5DT Data Glove Ultra 14.	6 man months
2	(491) Library implementation regarding the gestures collected in first step.	4 man months
3	(492) Projecting the library onto 3D hand mesh.	4 man months
4	(491-492) Processing/analysing user inputs for pattern matching (12 weeks) 12 man-months	4 man months
5	(491) Integration of the “Leap Motion” and the “5DT Data Glove Ultra 14”	4 man months
6	(491) Expansion of the database	6 man months
7	(492) Construction of game context and environment implementation	4 man months
8	(492) Integration of the game with the 3D hand mesh in VR environment.	4 man months

9	(492)(Bonus) Enhancing the visual effects; including game environment and 3D models.	-
10	(492)(Bonus) Implementing additional game content.	-
Σ		36 man months

Detailed Descriptions of High-Level Workpackages

WP1 - Gesture identification with 5DT Data Glove Ultra 14

In this workpackage, the following functionalities / features / work items will be implemented

1. Selecting the most simple gestures, that are expressed using single hand, for introductory purposes (https://www.spreadthesign.com)
2. Capturing the gestures of the corresponding sign words using Data Glove
3. Testing the captured gestures

WP2 - Library Implementation

In this workpackage, the following functionalities / features / work items will be implemented

1. Calculating error tolerances and adding them to the gesture data.
2. Inserting the gesture data into database under “gesture-word” format.
3. Testing the library and its functionality.

WP3 - Library Projection onto 3D hand mesh

In this workpackage, the following functionalities / features / work items will be implemented

1. Creating a pseudo hand model (stick figure) in order to project the data.
2. 3D mesh testing (consistency, latency, accuracy etc.)

WP4 - Data processing & Pattern Matching

In this workpackage, the following functionalities / features / work items will be

implemented

1. Matching the user gesture input with corresponding database entities
2. Implement necessary algorithms such as rounding the user input to the nearest gesture in the database.

WP5 - Integration of “Leap Motion” with “Data Glove”

In this workpackage, the following functionalities / features / work items will be implemented

1. In order to broaden dictionary, add input from Leap Motion.
2. Combine the inputs from Leap Motion and Data Glove and synchronize them.

WP6 - Expansion of the database

In this workpackage, the following functionalities / features / work items will be implemented

1. After completing WP5, use this new feature to add new database entries which can only be identified by combination of Leap Motion and Data Glove.
2. Testing

WP7 - Construction of game context and environment implementation.

In this workpackage, the following functionalities / features / work items will be implemented

1. Construct a simple environment simulating hearing-impaired point of reference.
2. Implementing the proper game mechanics which emphasizes the purpose of this project.
3. Testing “the game”.

WP8 - Integration of the game with the 3D hand mesh in VR environment.

In this workpackage, the following functionalities / features / work items will be implemented

1. Testing and learning how to implement Oculus Rift.
2. Merging the Unity project with Oculus Rift and VR mechanics.

WP9 (Bonus) - Enhancing the visual effects; including game environment and 3D models.

In this workpackage, the following functionalities / features / work items will be implemented

1. Polishing the graphics.
2. Adding new models

WP10 (Bonus) - Implementing additional game content

In this workpackage, the following functionalities / features / work items will be implemented

1. Add new scenarios and content to emphasize hearing-impaired point of reference.
2. Extend the database with new words.

TimeLine

Once the plan presented in this kick-off document is approved by the assistant, the supervisor and the coordinators, you will be asked to map them into OP.

Risk Assessment

1. A problem in “data glove” information integration with “Leap Motion”. This may cause a big restriction for the project’s “sign language words” domain. Data glove can only obtain finger motions. Most of the sign words are made up of the combination of hand-body and hand-face. Hand gestures may have different meanings at different positions on the body and face.
2. A problem in defining/ perceiving differences between signs may be a major obstacle for controlling matching between “ the sign made by the user” with “the correct sign”. This may be tricky and we may need to make separate descriptions and observe different features of separate sign words.
3. Projecting the 3D hand gestures onto mesh model in real time might be problematic due to bugs and glitches in the development environment.

Risk # Description Possible Solution(s)

1. If we cannot find any way to combine this two devices, we can limit our database

with the words that can be detected by only using leap motion. This words must be consist of gestures that two hands never overlaps.

2. Spending excessive time on calibration. Adding extra error tolerance to gesture configuration if the situation is desperate.

3. Reading online documents and forums in order to generate a solution.