**Team 1**

**COMP16 - Systems Engineering**

Dance Competition - Phase 1

M. Aghamelu, J. Zhong, J. Backwell Date of Report: 06/12/19

**Summary**

We have continued research into how best to combine multiple video feeds from V2 kinects into a single 3D model. The two main options we have been looking into are skeletal tracking and point cloud merging. Ultimately we decided that point cloud merging has the most upsides and the potential for the best final result so that is currently technique we will be using going forwards. We discovered a project called Brekel Body that looks promising in that it appears to already be capable of using multiple kinects to create a point cloud. We will be looking into whether it is possible to integrate the Brekel Body software into our project in the next week or so. We have also begun building the skeleton of the website required for our project. We decided that a web-app built with Django and tailored pre-existing html and css templates would be best suited for the report website.

**Skeletal tracking**

Pros:

* Easier to implement
* The Kinect SDK has lots of support for skeletal tracking
* Easier to track specific body parts

Cons:

* Does not create a sophisticated model, meaning that lots of additional work would need to be done if a lifelike model was required
* Skeletal tracking sometimes struggles to track when limbs cross over one another which is obviously not ideal for recording dancers
* Skeletal tracking is only accurate in a range of 1.5 to 4.5 metres from the kinect, further limiting the size of the dance floor that we would be able to capture

**Point Cloud Merging**

Pros:

* Accurately captures the scene being recorded, i.e faithful recreation of colour, shape etc
* Less likely to run into difficulties when recording multiple dancers compared to skeletal tracking
* Better range than skeletal tracking ( ~ double the range)
* Due to the fact that it doesn’t rely on recognising a human shape, point cloud merging has applications beyond the recording of humans, making it interesting for future research

Cons:

* Processing power required and size of point cloud recordings. Kinect recordings of 15s can be up to 2Gb in size when uncompressed
* The algorithms for smoothing point cloud images are extremely complicated

**Highlights**

We gained a thorough understanding of the pros and cons behind the two possible methods for creating the 3d model. The discovery of the Brekel Body software should hopefully save time as it implements lots of point cloud functionality already. Once we have the software license for the most recent version of the software we will know more about its capabilities for multi point cloud merging. The skeleton of the report website is in place so we can add content to it as we go, meaning that we can focus on getting the “Must Haves” of the MoSCoW implemented.

**Lowlights**

During our research into point cloud and skeletal tracking merging, we came across many pre-existing projects and lots of academic research into these topics. Digging through the code bases and algorithms used took lots of time, and we ran into many dead ends. The age of the kinect V2 means that lots of the projects were up to 5 years old, so even getting the code to compile and run was often a challenge and time consuming. It was difficult to ultimately select one of the two methods, as both come with significant downsides.

**Issues**

The issues are similar to the previous report; At the moment hardware is a serious concern, as we have still not received our requisitioned Kinect V2s or Intel Realsense cameras. Moreover, the high bandwidth demands of Kinect video and the large processing power and space requirements required for the point cloud implementation are a concern, although we are reasonably confident that these are problems that we can handle as they crop up. We are moving away from using last years project as a springboard due to concerns over the usability of the code.

**Next Period Plan**

The key goal for the next week is to further investigate the Brekel Body software to ensure it can be integrated into our project, as well as securing the license for the beta branch of the software which has the ability to merge multiple point clouds which is ideal for our project. Beyond that, we are hoping to receive the ordered Kinect V2s so that we can start testing the merging of 3+ feeds. Dean has asked us to get in contact with a couple of relevant experts to see if they have any further advice on how to go about implementing the 3D model, so the methods we decide to use are still subject to change.