Interactive Audio Visual Game Design

ENS 492 Graduation Project

by

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Summary

This project involves designing an aurally and visually enhanced interactive artwork, where the user input modifies the output in such a way that the output will eventually have an aesthetic and artistic feature. The user input was first meant to be mainly based on keyboard and mouse interactions, whereas the output will be given through the computer monitor and through the loudspeakers, however during the implementation process we also used a Kinect sensor to gather user depth data as well as other features such as hand tracking and thus improved the gathered input data. Our project design used to base solely on Processing at first, namely an open source programming language and integrated development environment, which is built on the Java language; however we later decided to work under Cinder Framework using C++ but still benefit from Processing in means of communication. Kinect sensor gathers user input and Cinder and Processing platforms talk to each other and send the processed data to Pure Data, a node based graphical programming language, over Open Sound Control (OSC). Pure Data receives the data, decides what to do with the received information and sends signals to Ableton Live, a common digital audio workspace, which runs a VST plug-in called Massive to produce adequate sounds through this digital synthesizer according to the received MIDI signal.

Progress, Changes and Results

Instead of our initial plan to prototype with Processing and go further in Cinder with implementation, we switched to Cinder and use Processing as a communication aid software, in order to obtain better efficiency and gain more experience with the developer environment. The project shaped up as implemetation advanced and changed in the direction of the libraries and capabilities of the framework.

In the first step, after a considerable amount of research, some important information on different basic sea creatures (mostly deep sea creatures) was collected. Since we were looking for an amorph model to alter and create animation, the anatomy and movement of these creatures were the focus points. The *Ctenophora* (which are also known as Comb Jellies) with their crude and low-poly like geometrical/spherical bodies and pulsating movement were the starting point of the modelling process.

With vertex based mesh modelling and procedural geometry we managed to create surfaces easy to manipulate and deform, and with the help of the VBOMesh class included in Cinder some of the vertex drawing operations were implemented over the GPU for performance. As our aim was to come up with a generative algorithm for the deformations and reshaping, the parameterization was done accordingly and the mesh is fully based on variables. This enabled us to start working with animation and sound simultaneously in order to find a balance for a generative and hence auto-interactive application.

The sound integration has been implemented using Open Sound Control (or OSC) to communicate between Processing and a digital audio workstation, which in our case is Ableton Live. Ableton Live ran a VST plug-in called Massive, which is basically a digital synthesizer and this plug-in realized the received MIDI messages and converted those messages to an audible output. The animation and audio-interactive based parameters was the connecting information for this process and the animation bases on the pulsating/breathing-like movement which is similar to the swimming motion that of the jellyfish.

A new aspect of our project has been the implementation of the Kinect sensor. The sensor collects user depth data as well as providing features such as hand tracking. The distance between the user and the sensor is measured by infrared streams and according to this distance, the movement of the jellyfish (or rather its form) changes. When a user approaches the sensor, the jellyfish gets startled and quivers with fear and when the user moves away from the sensor, the movement of the jellyfish slows down. Also, the hand movements of the users affect the shape of the jellyfish and this produces different sounds accordingly.

Materials & Resources

During the process, we tried out many different software and worked with several platforms and frameworks. However the final version of our project consists of one PC/Laptop, with installations including: Cinder Framework, Microsoft Visual Studio 2010, Pure Data, Ableton Live Suite, Massive VST plug-in and Kinect sensor drivers. As seen, the large amount of connections require large resources, so we made it possible to use two different PCs/Laptops to divide the amount of work that has to be done into two seperate parts. The connection between two PCs are done by OSC connection, which bases on UDP. We enabled our code to connect Cinder Framework on one computer to Pure Data on other computer over IP addresses and an open port. This way one computer will not suffer under a huge process and one computer will do the sensor input and rendering whereas the other computer will receive the input data and produce sounds.

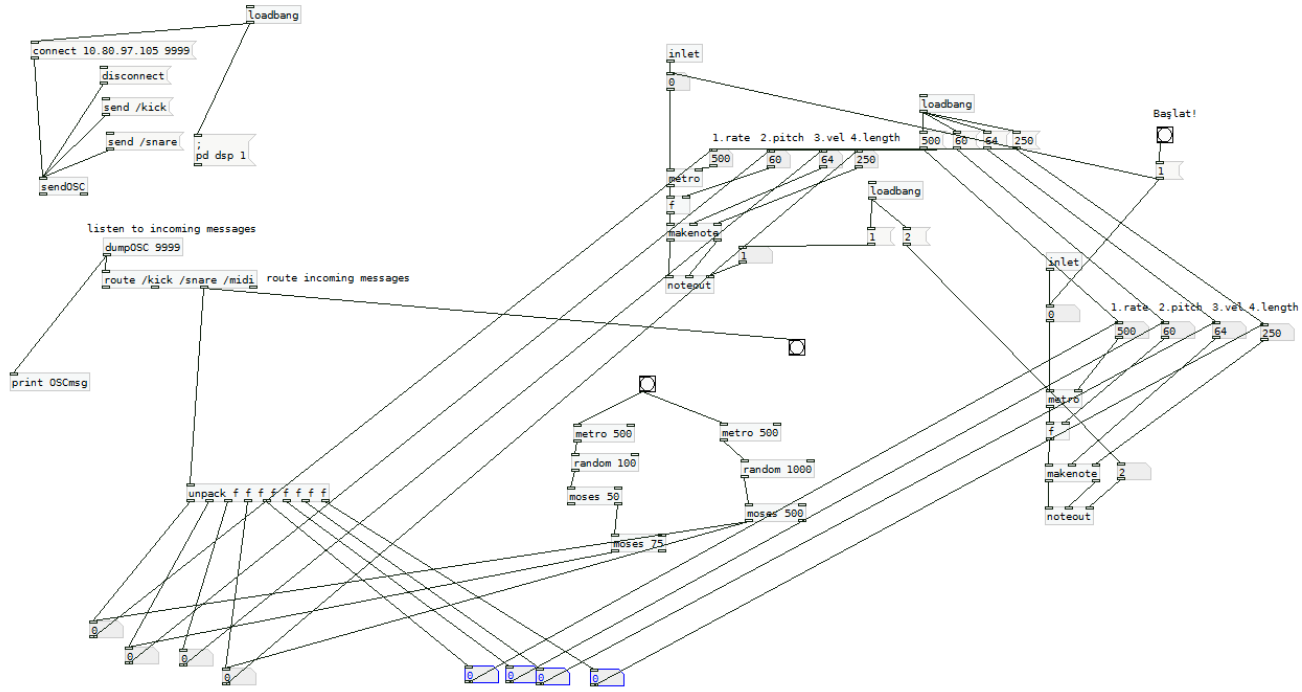

Image 1: Here you can see the Pure Data schematic. This was used to receive user input data and process it into a MIDI note, and send over MIDI to Ableton Live.

Image 2: The GUI of Massive plug-in. This is a digital synthesizer that enables us to play MIDI notes in a much more sophisticated way.

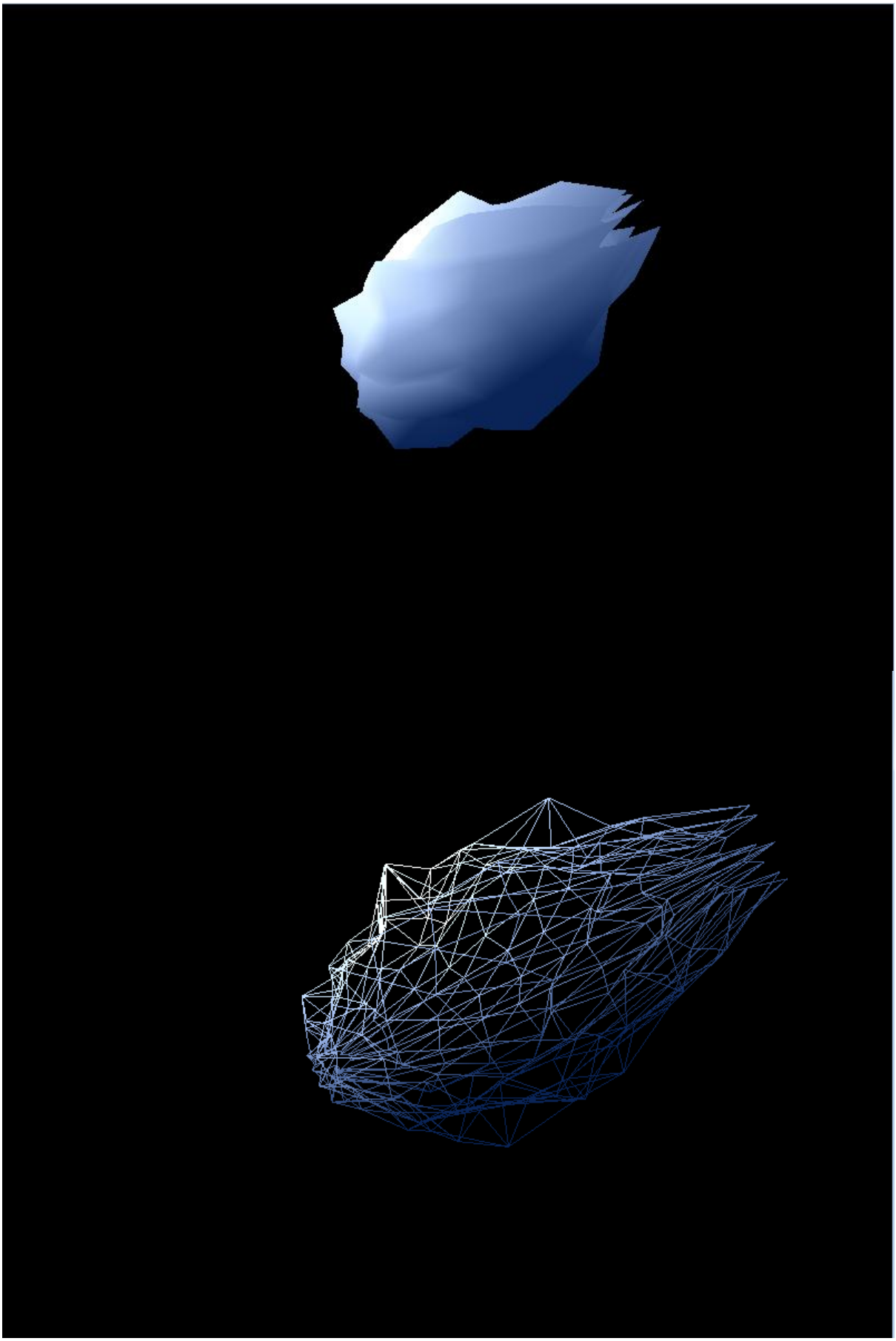

Image 3: Two different captions of Amorphonic

Conclusion

During our project, we went through many different phases and encountered many errors, which often lead us to think of a new approach to overcome the issue. We changed the platform we worked on, added new features to our project including the Kinect sensor and the Massive VST plug-in, hence we are now experienced in all of these software and platforms. We also learned how to approach a new project when the outline isn't clearly defined and we have to define it clearly over our work. This was probably the most challenging issue since at the beginning we only had an appealing but challenging idea that we had to realize but no know-how about how to approach the problem and overcome the issue of implementation. Both our advisors helped us by sharing their opinions with us over the process and we eventually succeeded in our task. We called our project *Amorphonic* and we believe that we achieved something we wouldn't be able to think in the beginning.