Syntax Error - Choreographic Coding

Extended Abstract

Paul Clemens Bart
BART//BRATKE
45C Great Eastern Street
EC2A 3HP London, UK
paul.bart@ymail.com

Marvin Bratke
BART//BRATKE
Heimstrasse 10
10965 Berlin, Germany
marvin.bratke@gmail.com

Alexander Grasser
University of Innsbruck
Theresiengasse 48
1180 Vienna, Austria
alexander_grasser@hotmail.com

ABSTRACT

The Syntax Error installation's aim is to create a generative, ever transforming sculptural representation of real-time recorded motion data of a dancer, blurring the borders between physical space and digital realm through an interactive feedback loop, that constantly re-informs the dancer with the generated audiovisual feedback through projection mapping. The digital representation's aesthetical appearances are defined by the dancer's constant motion and continuously shifting relationships between moments, creating new input for the physical dance performance.

KEYWORDS

choreographic coding, rhino, grasshopper, processing, kinect, generative graphics, digital sculpure, movement tracking

1 INTRODUCTION

Base for the Syntax Error installation was a hackathon during the first Choreographic Coding Lab at the Motion Bank Conference in Frankfurt am Main in 2013. During this event – later repeated in a second incarnation - the installation was able to track movement of dancers and project live abstract visual feedback. Using the captured data to post-process it into printable 3D mesh-geometry, using personalized scripts, as well as generate an animation reflecting the movement within the sculpture.

2 TRACKING SETUPS AND OUTPUTS

2.1 Syntax Error I : Choreographic Coding Lab Frankfurt am Main

In the first setup, a physical performance space was developed set up by various artists including Waltz Binaire, KlingKlangKlong and Onformative. Hacking a Kinect depth sensor allowed for live tracking of the dancers, visualizing their movement real time in a digital representation of their bodies in form of a fragmentized geometry using a custom script in Processing. During the event we captured some movement sequences, which we later on used as data input for the 3D printed sculpture. The representation and abstraction of movement data was developed using Processing and Grasshopper for McNeel Rhinoceros 5.0. The digital sculpture was presented in a rendered video sequence, where lightpoints were animated following the captured trail of dancer's movement and highlighting various still iterations from the captured motion sequence. The ever changing light conditions were used to re-create a dynamic vision of ‘frozen’ moment of motion within a digital still life.

Fig. 1 Choreographic Coding Lab, MotionBank, Frankfurt 2013, Walz Binaire/ Onformative

Fig. 2 Syntax Error Video, Animated Lights

2.2 Syntax Error II : Platoon Kunsthalle Berlin

In a further development of the project at Platoon Kunsthalle Berlin, the setup, a Kinect depth sensor, a projection screen, and our custom programmed scripts, got additionally audio input, influencing the projected visual geometries as well as the captured datasets. The real time script, allowed for interaction with the visual projection and saved the projected geometry at certain time frames. Freezing the current moments, a representation of the dancers and their interaction during the installation, later embodied as the 3d printed sculpture.

Fig.2 Platoon Kunsthalle Berlin Interactive Installation

Fig.3 Platoon Sound Sculpture, captured moments

3 COMPUTATIONAL DETAILS

3.1 Monitoring the dancer's movement

The setup for the tracked performance space, created around various dancers, can be broken down in elements that enabled feedback loops between tracked output of the performer's movements and the interactive visual installation created from it. During the performance the dancer was tracked using depth cameras (Microsoft Kinect). A processing script was written, using the real time depth image values of the Kinect camera, to creating a point cloud of the scanned person, as well as connecting the points according to custom proximity values. The script is able to export the resulting splines as .dwg file at certain timeframes as well as continuously exporting the geometry during a movement sequence. The room was setup with an overhead projector, projecting the generative lines and the point cloud of the dancer on the floor to inspire the dancer's movement patterns, and allow for an fluid interaction with the realtime script.

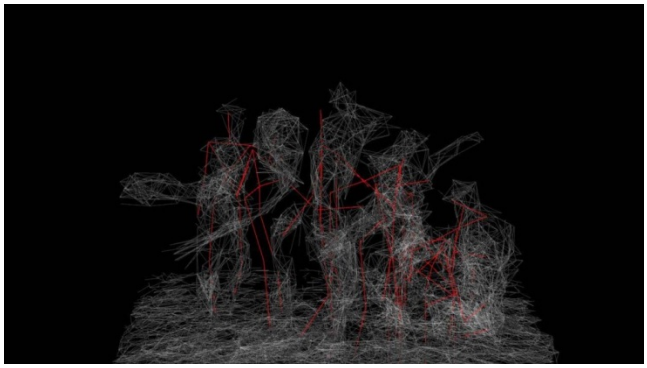

Fig.4 Body Abstraction/Skeleton Tracking

3.2 Post Processing in Grasshopper for Rhino

The exported .dwg file of the dancer's representation was loaded into CAD software McNeel Rhinoceros 5.0 and used as input to generate a printable mesh geometry via the Grasshopper plug-in. Via a special component for Grasshopper 'Kangaroo 3d'[1], double curves were culled from the file, to avoid errors in the further process. In Grasshopper a script was written, that voxelizes curves and gives them a thickness, controlled via attractor points.

Fig.5 Platoon Sound Sculpture, Mesh density

In a further step, to aim for a smooth geometry, the mesh faces were reduced via custom user objects inside the plug-in to simplify the initial geometry and reduce the number of faces.
Using the mesh editing components Weaverbird[2] and Mesh+[3] the geometry could be refined, smoothed and subdivided again to get to a satisfying result.

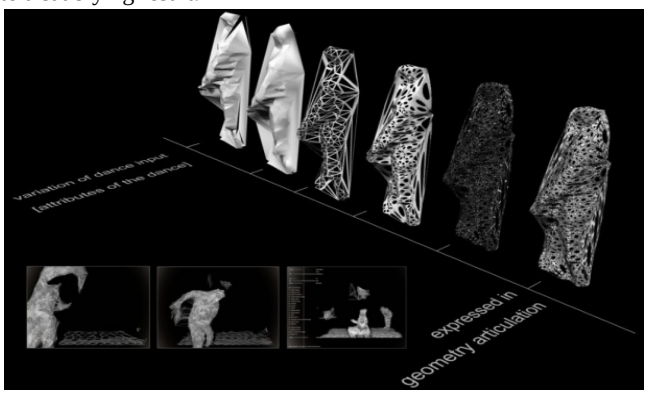

Fig.6 Syntax Error, Mesh Studies

[1] Kangaroo3D by Daniel Piker, http://kangaroo3d.com/
[2] 'Weaverbird' by Giulio Piacentino, http://www.giuliopiacentino.com/weaverbird/
[3] Mesh+ by neoarchaic, http://www.food4rhino.com/app/mesh

3.3 Mesh join and 3D printing

All recorded singular meshes of the participants interacting inside the performance area were post processed, as well as their movement pattern on the ground. Via Z-Brush the discrete mesh geometries were joined into a united single closed mesh to create the final digital representation of the sculpture.
Using Makerware Software for Makerbot the final mesh can be layered for the final printing process.

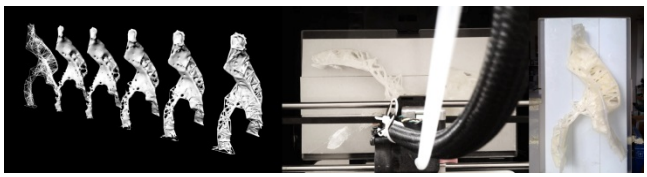

Fig.7 Platoon Sound Sculpture, 3D printing

4 RESULTS AND DISCUSSION

4.1 Visualizing invisible motion patterns via code

The Syntax Error installation creates a generative, ever transforming sculptural representation of real-time recorded motion data of a dancer, blurring the borders between physical space and digital realm through an interactive feedback loop that constantly re-informs the dancer with the generated audiovisual output through projection mapping. The digital sculpture's aesthetics are defined by the dancer's constant motion and variable relationships between moments. Syntax Error is an interpretation of the precision and fine mechanism of a choreography's informal and temporal patterns, translated to a digital experience and back into physical space. The virtual visualization capture and emphasize the fragility of dancers' movements, showing the beauty of human inaccuracy of a dance sequence. The digital sculpture is a representation of individual human interpretation and implies the attributes that contrast human behavior from mechanical perfection.

.

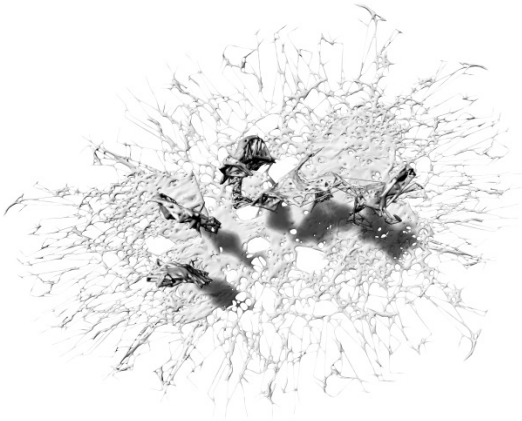

Fig.8 Platoon Sound Sculpture