#ArtProject
An Open-Source Art Installation Connected to the Blockchain
In collaboration with Truebit and Jessica Angel 2017-2018

Scaled Wire Frame Model, W:23.5" x L:20" x H:11" Galvanized wire, primer and paper. Proposed structure's real size: W:27 x L:40’x H:22’
INTRODUCTION

Let’s think for a moment about human knowledge. What are we really saying when we put these two words together? Are we talking about the compilation of everything humans have ever known? Is it a network of connections between ideas from all times since the existence of writing? If we think about knowledge as a fabric woven out of borrowed pieces from all eras, and as a complex network of information where humans (the ultimate generators and collectors of data) are nodes, we can find our place in the system, and question our incidence over this ancient sapient being called “Humanity”.

This open source project aims to highlight and celebrate our place in the human network, revealing that each of us is a bundle of connections. Each one of us is a “center” composed out of little pieces coming from others. We adopt patterns and copy from one medium to the other looking to come up with our own creation.

This project will be the platform for connections to happen, for new and unexpected intellectual resonances to succeed. We will jointly achieve the creation of a massive public art installation that honors collective production as a unified effort around this marvelous new technology called the blockchain.

DESCRIPTION

Truebit, in collaboration with artist Jessica Angel, are creating a public art installation connected to the blockchain. This public structure will be the starting point for creative interactions and collaborations with innovators from different parts of the world, using the blockchain as a creative tool. We are facing exciting times in the history of humanity, and this project will pay tribute to the greatness of this technology, while proposing a holistic approach to knowledge; where music, art, education, economics, mathematics, and philosophy take place under the same roof.

BACKGROUND

Truebit is a scalable verification solution for blockchains working, amongst other things, on the development of the Dogethereum bridge. This will be a “bridge” between the Dogecoin and Ethereum blockchains. Once constructed, shibes1 will be able to send doge back-and-forth to Ethereum without using an exchange. This will allow shibes to trade dogecoin for other Ethereum-based tokens and use doge in smart contracts.

In addition to the initiative of creating the Dogethereum bridge, Truebit’s mission is to connect with artists and makers from different fields to reflect upon the convergence between art and technology. Jessica Angel joined the team to generate the vision for this public art installation and create, in collaboration with the Truebit team, a community engagement strategy to explore the creative possibilities of the far-reaching wonders of the blockchain ecosystem.

CONCEPTUAL BASIS

The Public Art Structure - A Single Surface Representing a Unified Network

The starting point to conceptualize the public art structure is the Möbius bridge, a pedestrian bridge over the Avon, designed by Hakes Associates of Bristol, UK. We found this bridge to be remarkably interesting as it explores the structure of the Möbius strip, providing a connection between point A and B while maintaining a single, unified surface.

The Möbius strip leads to the construction of an interesting solid called the Klein Bottle. Imagine connecting the sides of a paper ring to create a donut shape. Similarly, imagine connecting the sides of a Mobius strip, you would end up with a Klein bottle.

1 Shibes are Dogecoin users
The Klein bottle shares the same characteristics as the Möbius strip of having a unified surface. In addition, the Klein bottle provides an enclosed environment perfect for the development of a space to host a public programming schedule of events to gather people within the structure. Hence, the public art structure will be a penetrable Klein bottle.

This mathematical object will symbolize the bridge between the two blockchains, bridging the outer side of the structure with its inner surface through its bottleneck pass way. Here, the single surface topology of the Klein bottle becomes our first edge in the “Internet of blockchains”, which combines Dogecoin and Ethereum into a single network.

The Surface of the Structure – Layers of Network Topologies

With the conceptualization of the art installation bridge defined, proposing a visual approach for its surface is the next step. The Dogethereum software bridge deals with network topologies that overlap, creating a complex grid of interconnectedness. The main highlights in these systems of connections will be represented over the inner and outer surface of the structure, as well as the bottleneck bridge; 1) The network topology that describes communication channels between Dogecoin miner nodes, 2) The network topology that describes addresses or smart contracts that communicate with each other on Ethereum, and 3) The “Internet of blockchains” (i.e. Cosmos, Polkadot, and the Dogethereum bridge.)
PROJECT STRUCTURE

The Website. A portal to connect with the community and engage creatives, revealing the project’s interactions with selected artists. The following items will be addressed in the site:

+ Map of potential cities to which the project will travel.
+ Open call for creatives to realize their vision within the project.
+ Public programming schedule and description of events that will take place within the structure.
+ A fundraising page to allow donors to contribute

The Public Art Bridge. This is the structure described above. The space will host the collaborations developed through the website and the experimentation resulting from meetups and hackathons. Expected subjects to develop with the artistic community include:

+ Software development
+ People interested in connecting the art piece to the blockchain
+ Sound & light interactivity, based on transactions / blocks being created on blockchains
+ Free Form Architecture
+ Artificial Intelligence
+ Interactive and generative art
+ Mathematics/ Geometric Computing
+ Futurism
+ Art DAO
+ Network Topology
+ Art and culture in the blockchain space
BLOCKCHAIN INTERACTION

These interactive explorations will be the result of the collaborations fostered by this project. The team is currently developing and exploring interactive possibilities for both inside and outside of the structure.

Ethereum & Dogecoin have blocks, and transactions in each block, flowing at different rates. We can use these interactions to trigger various colors & sounds in the art piece. Amongst many possibilities, we propose experimenting with LEDs over the structure walls. For example, every time an Ethereum block is created, according to its block hash, it creates a splash of color.

At a more granular level, each tx could trigger various LEDs in different patterns. Sound design can also be explored. Dogecoin blocks could emit a deep base rhythm that fades out as they are created. Ethereum blocks can trigger parts of a mid-layer rhythm. Transactions could create higher frequency sounds that play on top of this rhythm.

Interactions are also possible between the art piece and the Truebit contract. For events emitted by the Truebit contract. It could display these visually or by sound. For example, every time a challenge game is being played, it triggers a malicious evil “super-Mario-sounding tune.”

We also want to create a focus on user engagement with the art piece. They could send transactions to various pieces of the art piece to “trigger” them into changing. A user can send a tx to a ladder/platform to make it lift up or change shape, while they are standing on it.

PRODUCTION AND PROCESS

Execution is divided in two segments:

Off-Site // The Website

+ The team will work together to create different marketing strategies in order to gather collaborators to either work on this project or engage for future artistic endeavors that Truebit may want to undertake.

+ Follow up with participants to provide them with the necessary information about the project, answer their questions, and solicit feedback. Continuously expand this proposal extending the research while developing visual prototypes to include in the website as the collaborations start to happen.

+ Sending a tailored version of this project to different art organizations and museums to find and lock the dates and locations for displaying the work.

+ All information in regard to this project’s concept, advancement and documentation will be uploaded in the website, the project blog, and different social media sites, in an attempt to circulate the work and disseminate the possibilities of participation and public engagement.

+ Ideas coming from participants will be evaluated by the team and put to the test through hackathons and experimental labs.

On-Site // The Construction of the Public Art Structure

This is the construction of the Klein bottle and the installation of the network design over the inner and outer surface of the piece.

+ With the assistance of a steel fabricator and a structural engineer, the Klein bottle will be created in Vermont.

+ Using sized aluminum panels, the structure will be built with the shape of the angular, network-like Klein bottle [view visual references on page 7]. These panels will be generating the strength required for the structure to hold up steady and safe.

+ The wire model depicted in the images [view visual reference on page 1] shows the apexes of the panels. The sheets will be sized properly to create a clean look on the exterior and interior of the space providing a smooth, continuous skin on both sides of the surface.
To break down the Klein bottle into manageable pieces for it to travel, we need to generate connections that allow the assembly and disassembly of these pieces. These pieces will be made to fit a large shipping container.

Below is a list of subjects that need to be thought about and resolved in order to start designing the actual construction process. Some of these subjects will develop answers as we move forward and others need to be resolved in order to move forward at all.

- Dimensions: 27'-0 x 40'-0 x 22'-0
- Pedestrian traffic: Up to 40 persons
- Design connections: TBD
- Lighting requirements and conduits: TBD after hackathon and selection of collaborators.
- Emergency door requirement within bottle
- Railing Requirements: TBD
- Smallest area or path to comply with ADA: 3'-0 clear with rail on both sides.
- Fire Hazards, Paints, Paper, and Hangers for extinguishers
- Structural Approval: TBA by structural engineer
- Assembly/Disassembly instructions
- Define shipping container dimensions
- Access at front leads into handle elevated
- Handle pitches around at a variable slope or at ground level
- Define an allowed divergence or special gap between panels
- Allowed kink angle of jump from normal vectors

**PROJECT TIMELINE**

**OFF-SITE** (3 Months) January- February – March 2018

- January hackathon- finding a core group of collaborators to determine the interaction of the piece with the blockchain
- Connect the website to the blockchain in real time
- Create guidelines for collaborators
- Creating audiovisual content
- Defining a name for the project
- Updating website and marketing strategies to continue with fundraising
- Structuring a schedule for hackathon, meetups and experimental labs in the cities where the structure will travel
- 70/h design work with steel fabricator
- Approach cultural centers where the structure will be displayed. Lock down exhibition dates.
- Building scale model with the final surface design
- Creating visual mapping prototypes for experimentation
- Feed documentation to social platform - Medium + Facebook + etc.
- Defining final experience
- Implementation of final system
- Buying materials + tech needs + budgeting

**ON-SITE** (6 weeks Installation) April- May

- Construction of the Klein bottle begins after all details have been approved, decided, and locked down.
- Surface design development starts in studio.
- Collaboration with artists begins, building material for to be installed on the structure
- Site visits to VT to oversee the progress of the construction once a week
- video documentation of the process
- Follow up with collaborators and art organizations
- Beginning of PR strategy in the art world. Approach curators, magazines and blogs.
- As the construction starts to shape up, surface design can start to take place.
Scaled wire-model. Side elevation view.

Scaled wire-model. Front elevation view.
Scaled wire-model. Plan view.
Case Study - The Lotus sculpture for the 2012 Goodwood Festival of Speed

This sculpture is being used as a reference for the kind of construction we are proposing for the Klein bottle. There is no internal framework or spine here. The only structural components are the three surfaces themselves. These surfaces were developed in software into 2D cutting patterns (Figure 26) and laser cut from 6 mm steel plate. The plates were then welded together into eleven transportable sections and site-welded into the finished piece.

Custom software was written by the author to convert the geometry into a finite element mesh that could be processed in the STAAD Pro structural analysis tool, where wind loading studies and structural dynamic analysis were used to verify the structure.
Construction. The segments are installed incrementally. This photo shows the sculpture approximately 80% complete. The props provide temporary stability during construction and will be removed on completion. Photo by S. Horrod.

Assembly of one segment. This is 18 m long and the full sculpture consists of eleven different segments.
GENERAL REQUIREMENTS AND PERMITS FOR TEMPORARY PUBLIC ART

The type of permit needed, and the procedure for obtaining it, depends on the site. In general, it is most important to discover who owns the space, and consult with owners/managers of private spaces or the appropriate agency or agencies responsible for city owned spaces. There are several categories of sites, as well as types of activities, for which permits must be obtained. The list below will help us get started in determining the correct procedures for this project. The best way to find the most up-to-date permit requirements for each agency is to visit its website.

It is important to get started early on permitting, as the process can take many months. We must keep in mind that projects may need to go through up to 5 layers of permissions once submitted. For a project, this scale we need to plan for a long lead-time and be sure to follow up on our requests. Note that even when not explicitly required by the agency issuing the permit, it is a good idea to gain the local community board’s approval of the project.

PROJECTS IN PRIVATELY-OWNED BUILDINGS
(E.G., A CORPORATE PLAZA OR ATRIUM)

In the case of most buildings, permission can be secured through the building’s owner or management team. It is important to consider who uses the section of the building where the project will take place, and if the project will present any barriers to normal use. Most lobbies and other public areas of buildings contain plaques with the name and contact information of their owners. In the case of storefronts, restaurants and privately-owned institutions, it is necessary to work with the proper administrative departments on all stages of a project, and also to consider the public who uses the space.

TEMPORARY VISUAL ART INSTALLATIONS IN PUBLIC PARKS

Temporary public art installations in parks are commissioned through each city’s Department of Parks & Recreation’s Temporary Public Art Program. NYC Parks & Recreation, for example, fosters the creation and installation of temporary public art in parks throughout the five boroughs by artists and arts organizations. For many parks projects, depending on the scope, it may be necessary to obtain the approval of the local community board.

CONSTRUCTION TEAM

The team to construct the Klein bottle is already put together. Communication with the team is up to date.

Jessica Angel - Director
Matthew Wells- Construction Adviser
Dan Kleinhans- Fabrication Director
Tim Anderson – Shop Fabricator + 4 assistants
Structural engineer managed by Dan Kleinhans
Detailer managed by Dan Kleinhans
Joe Luppiani – CAD designer
LINKS AND REFERENCES

Methods for Creating Curved Shell Structures from Sheet Materials

Clarifications about the Klein Bottle Being a 4D Object
https://www.physicsforums.com/threads/mobius-strip-and-4d.770405/

Mobius strip and Klein Bottle Images
https://christevcreative.com/tag/parametric/

Network Science Book by Albert Laszló Barabási
http://barabasilab.neu.edu/networksciencebook/

Adaptive Bridge
http://www.tehranplatform.com/tp/adaptive-bridge/

Public Art permits and Legal Matters

The Mathematics of Architecture

Mobius Visualizations/Examples 3D
http://www.tehranplatform.com/tp/adaptive-bridge/

Art and the Klein Bottle
http://www.sculpture.org/documents/scmag09/june_09/reyes/reyes.shtml

Geometric Computing for free Form Architecture

Case Studies in Cost-Optimized Paneling of Architectural Freeform Surfaces

Geometry and Free Form Architecture
https://pdfs.semanticscholar.org/2b35/7b5c1c1d0e38b32472f1c9f2123c091c6cd2.pdf

I Am a Strange Loop. Douglas Hofstadter

Truebit for verified off-chain computation, by Sami Mäkelä
http://www.orafol.com/Products/TechnicalDatasheets/AMericas/EN/oraguard/oraguard-255AS.pdf

Zaha Hadid CAD Drawings

Resources for Temporary Public Art in NYC