



InTangible: A Reflection On Digital vs. Physical Co-Ownership

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ABSTRACT

InTangible is a mixed media artwork and connected object that captures images of a handwoven fabric and sends them through the network. A digital camera with built-in RGB LEDs, configured with a combination of digital parameters, glides over the fabric and allows remote users to enjoy a new, intimate dimension of the textile. The once static and monochrome texture is transformed into colourful, abstract digital dreamscapes, while, at the same time, becomes a material object meant to be exhibited in a physical space.

With InTangible, we challenge classical art ownership, which only allows few individuals to own a select number of artworks. We believe that art co-ownership would allow a more diverse group of people to own and collect art, which in turn, would change the dynamics of both art creation and engagement with art. Nobody has full ownership of the digital version of the canvas. Instead, it is co-owned by users who acquire fragments of it from an NFT (Non-Fungible Token) market.

CCS CONCEPTS

• **Human-centered computing** → **Interaction devices**; **Interaction design**; • **Applied computing** → **Media arts**.

KEYWORDS

tangible interaction, mixed media, internet of things, iot

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1 INTRODUCTION

We define ownership as the act, state or right of possessing an asset, which may be tangible or intangible. Ownership gives the owner the absolute rights and a legitimate claim to an object. The effects of ownership can vary depending on the physical features of the asset that is owned, thus some objects can be owned and possessed at the same time, giving the owner a physical control of an object such as a book, or owned, yet limited in terms of physical control, such as a patent.

Ownership can also involve rights over the same asset, that are held, jointly, by different parties, who own a percentage of the asset. As opposed to partnership, co-ownership does not always arise from a business motive.

While classical art ownership allows few individuals to own a select number of artworks, we believe that digital art co-ownership would allow a multitude of individuals to own a part of the whole, allowing a more diverse group of people to own and collect art.

InTangible is a connected object[3] that digitizes a physical woven canvas. The primitive weaving techniques used in the canvas is probably the same as the ones used in prehistoric times[1] by ordinary people like us. We believe woven fabrics can function as a diary, a tool for self-expression. By offering a new reading on these objects, we aim to find new ways to tell and interact with such stories. We were inspired by the storytelling power of this craft, and we aim to promote the act of artisan creation, rather than taking over it through automation.

A digital camera with built-in RGB LEDs glides over the fabric and allow users to enjoy a new, intimate dimension of the fabric. The once static and monochrome piece of textile is transformed into colourful, abstract digital dreamscapes. However, nobody has full ownership of the digital version of the canvas. Instead, it is co-owned by users who acquire fragments of it from an NFT (Non-Fungible Token) market[5]. Only these owners can actually access a unique image generated by photographing a specific fragment of the canvas, lit with a distinct illumination pattern. The input parameters (camera position, LED and color pattern) are determined by the NFTs belonging to each of these owners. Ultimately, InTangible produces generative art [2] using a tangible input captured according to a combination of digital parameters.

InTangible shares features with blockchains[4], where collective ownership and accountability secures the collective assets. With InTangible, as well as with a blockchain, nobody owns the whole set of assets, and yet everybody is an owner.

It is worth highlighting that InTangible is also a material object meant to be exhibited in a physical space, hanging on a wall, like a painting. Its structure (aluminum surrounding wood) reminisce the frame of a painting, albeit a contemporary, cyberpunk-inspired version. In its most intimate core, familiar pieces of fabric constitute the main material. The exhibition visitors see a physical object that reacts to digital interactions of the anonymous (and remote) owners of the piece, as the device captures and magnifies fragments of the canvas. While we believe fabric to be the strongest metaphor for closeness, the installation invites users to not only be delighted by the explorations of the woven canvas, but also to critically reflect on the hybrid (digital-physical) nature of the installation.

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2 DESCRIPTION AND IMPLEMENTATION

InTangible is a mixed-media artwork and connected object consisting of a woven canvas, a camera, and a 2D motion system (Figure 1). The camera features a macro lens and hovers over the canvas at a close distance, while an LED ring providing illumination when capturing close-up images. The camera can be precisely positioned at set intervals, creating a 9 x 15 grid that defines 135 distinct canvas fragments. By selecting one fragment of the canvas and generating a specific illumination pattern, a unique image is produced.

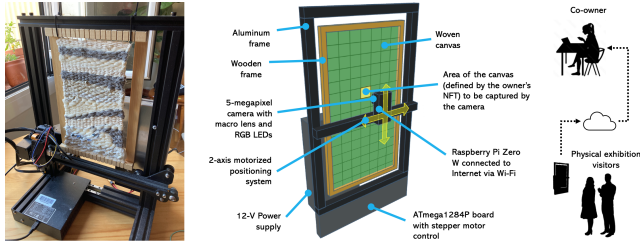


Figure 1: InTangible - Photo and diagram

The woven canvas was created by interlacing white cotton thread (the warp) at a right angle with strips of fabric scraps (the weft) made of cotton, linen, viscose and plastic netting. All the fabrics, except for the plastic netting, which was purchased new, were repurposed from old cotton sheets or purchased from a dead stock fabric shop. The canvas measures 14 by 26.5 centimetres (5.5 by 10.4 inches) and follows an abstract pattern reminiscent of a snow-covered landscape. The loom on which it was woven measures 19.5 per 29.5 (7.7 by 11.6 inches) centimetres and was handmade by a local artisan out of spruce wood.

2.0.1 Implementation. Besides the canvas, most of the system was built from pieces of an old 3D printer. The shape was modified to be hung on a wall like a painting¹. A Raspberry Pi Zero W² is the brain of the system. On one hand, it controls a Pi camera³ equipped with a macro lens and a ring of 12 RGB LEDs. It also sends messages to the step motor control board (based on an ATmega 1284P microcontroller) for precise positioning of the camera. Finally, it runs a Python WebSockets⁴ application that links the system with a Web application running on the cloud.

2.0.2 Workflow. Users acquire canvas fragments from an NFT market (e.g. OpenSea⁵)—effectively becoming owners of a fragment of the digital canvas. The cloud application allows owners to access their unique images when they visit the right URL and connect their NFT wallet. It uses data from the owner's NFT wallet (the *transaction hash*⁶) and sends it to InTangible via a WebSocket connection. InTangible uses these data and process it to select one of the 135 fragments of the canvas and an illumination pattern (consisting of

a certain combination of on and off LEDs and RGB values). The whole process is deterministic, so every time a specific owner visits the site, the same image will be generated. It is worth mentioning that slight variations might occur due to the physical nature of the materials (Figure 2).

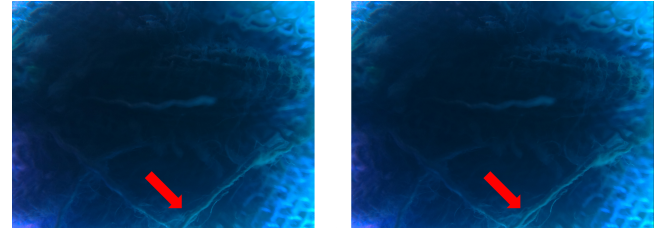


Figure 2: Example image obtained by a visitor/co-owner. Note the small differences in the material, probably caused by gravity or wind.

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¹At the time of this writing, the device stands on “feet”. The definite conversion to a hanging format will be completed for the TEI art exhibition.

²<https://www.raspberrypi.com/products/raspberry-pi-zero-w/>

³<https://www.raspberrypi.com/products/camera-module-v2/>

⁴<https://www.w3.org/TR/2009/WD-websockets-20091222/>

⁵<https://opensea.io/>

⁶<https://support.opensea.io/hc/en-us/articles/4406007666579-How-do-I-find-my-transaction-hash->