

IoTgo+Arts: The making of an Interactive Experience

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Abstract

IoTgo+Arts is a gamified toolkit specifically designed for artists to help them create interactive and IoT-enabled artwork. This toolkit was co-designed with the artists in workshops. This paper presents the first six artworks created with the help of the IoTgo+Arts toolkit, which together constitute the IoTgo+Arts Interactive Experience. All artworks were created in collaborative manner, with an artist paired with a technology expert. The use of the IoTgo+Arts toolkit helped in generating ideas that were feasible to implement with the technology available to the artists.

Keywords

Arts, IoT, Co-Design, Gamification, Research.

1. Introduction

IoTgo or the Game of Internet of Things is a card-based toolkit developed by researchers of the Human Technology Lab at the Free University of Bolzano, Italy. Initially intended as a toolkit to help teens to ideate, improve, program and prototype smart things, IoTgo has found a new frontier: Art; hence becoming IoTgo+Arts.

Recent works of art embrace Internet of Things (IoT) technology [1] for creating interactive “smart” artwork [2, 3, 4]. However, this requires expertise in IoT and programming, which many artists do not have. IoTgo+Arts aims at empowering such artists by providing inspiration and ways to feasibly create smart artwork and to document and reflect on the creation process.

2. Related Work

Traditional HCI literature focuses on facilitating the creation of interactive, smart or IoT-enabled prototypes using various card-based toolkits. Notable examples are Tiles Ideation Toolkit for


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creating IoT objects [5], and Smart Nature Protagonists (SNaP) for enriching playgrounds and parks with interactive prototypes [6]. There are several toolkits like IoT service kit and Mapping the IoT toolkit, focusing on adding Internet of Things (IoT) capabilities [7, 8].

However, such toolkits do not focus on creation of artistic prototypes. Furthermore, most of these card-based toolkits focus primarily on the ideation stage [9] and very few focus also on prototyping, programming and reflection, for example SNaP [6].

A relevant class of toolkits are those which focus on the cultural heritage domain and story-telling. For example the work by Ardito et al. [10], focuses on creating interactive experiences for children in archaeological parks. The IoT Un-Kit Experience [11] helps users narrate stories about their homes. Other works focus on creating emotionally valuable smart objects for homes using cards and technological components [12].

The IoTgo+Arts toolkit takes inspiration from such toolkits in order to encompass all stages of the design process including ideation, reflection, prototyping, programming and documentation in order to help create interactive artworks.

3. The Toolkit

IoTgo+Arts is a toolkit with multiple decks of cards and a foldable game-board which helps traditional artists in making their artwork interactive and IoT enabled. The toolkit is initially presented in a folded form, with all steps hidden and is gradually unfolded to reveal new steps, each with guidelines for adding cards and the reasons for doing so.

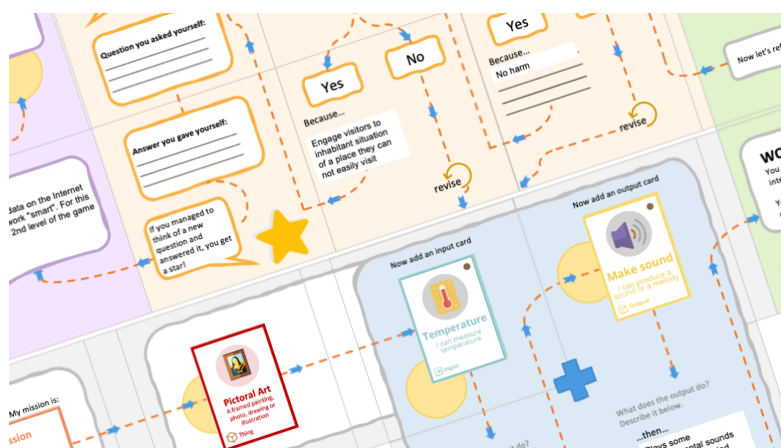


Figure 1: A partially filled-in IoTgo+Arts toolkit, with various cards added

The deck of cards included in the toolkit are missions cards, to help artists define the rationale of creating their interactive art thing (like to add utility, to inspire people), the thing cards for choosing an art medium (like pictorial art, sculpture), specific technology cards for adding inputs (like touch sensor, gesture sensor), cloud services (like twitter, forecast), and outputs (like LED strips, audio). The toolkit also invites artists to write down the interactions of various components and people. See Fig 1 for a preview of the IoTgo+Arts toolkit.

As adding technology or interactivity just for the sake of adding it is not enough, therefore, the toolkit also focuses on inviting artists to think of the goal and rationale behind creation of interactive art pieces. This is done using the mission cards and the reflection questions within the toolkit. These questions invite artists to self-reflect on the relevance to their selected mission, and physical, technological, and IoT-related issues of safety and privacy of their interactive art.

It also has a companion browser-based app in which the selected cards can be added to generate ready-to-use code. Thus, artists do not need any expertise in programming to make their artwork smart.

Overall, IoTgo+Arts toolkit, depending on artist's needs, can be used as a step-by-step guide for creating interactive art, a reflection tool, a documentation tool or a code-generation tool.

4. The Workshops

During the IoTgo+Arts workshops, six artists with diverse artistic backgrounds, including graphic design, illustration, jewellery making, product design and comics participated.

In the first workshop, the artists along with two HCI researchers co-designed the mission cards for defining the goals and rationale of creating interactive art for themselves and any artist who might use the toolkit. In second workshop, they co-designed and defined the thing cards. Both workshops were held online, using videoconferencing and an online whiteboard app. The ideation workshop was held asynchronously in which the artists used the toolkit individually, contacting the researchers for clarifications as per need. Once the artists submitted their final ideas, they collaborated individually with one of the researchers, who was both a technology expert as well as an artist, to implement them. The participants then presented the art pieces to each other in a final workshop, again online, and together reflected on the rationale and choices. They also gave suggestions for improving the toolkit.

5. The Making of an Interactive Experience

All artists had the overall goal of creating interactive art pieces, in mind while using the IoTgo+Arts toolkit. Moreover, as the toolkit had clear mission, thing and technology cards, as well as reflection questions for reviewing their idea, the outcomes of the ideation sessions using the toolkit ensued that the generated ideas were feasible to implement. From a technology and programming point of view, ideas implemented through the toolkit were inherently feasible as the toolkit limited the input and output devices and technology to what was available to the artists and generated code automatically for them. The feasibility from the artistic point of view was left to the artists themselves as it was their area of expertise. Details of the created interactive artworks are as follows.

National Art Gallery of Lilliput is a miniature and portable art gallery which randomly appears in various open spaces of human cities. See Fig 2, left. Its hallways light-up when someone peeks into it. Currently, 18 miniature paintings of various genre are displayed in the art gallery. As due to the Covid restrictions all art galleries and museums have been closed down for public use, the idea behind this art piece was to find a way to display art in an interactive

manner in an open space, keeping in mind the Covid restrictions on entering indoor spaces.

Aliferous is the second interactive art prototype realized using IoTgo+Arts. It is a human-sized mirror which sprouts wings when someone looks into it. See Fig 2, right. In times of Covid-19, when everyone is feeling trapped at their home, the idea behind Aliferous is to help a visitor imagine that soon they will be free from this situation. Thus, the wings symbolize hope and freedom. The idea and artwork for both the National Art Gallery of Lilliput and Aliferous was done by Qurrat ul Ain Shaukat while interactive components were added by Mehdi Rizvi.



Figure 2: From left to right: National Art Gallery of Lilliput and Aliferous

The Passport is the third interactive art prototype realized using IoTgo+Arts. It is essentially a refugee's passport, and when picked up, it displays an evacuation notice within its pages, in the form of a ticker. It also plays the sound of an evacuation announcement in Dari and English languages. It also tweets that the passport has been found by someone. See Fig 3, center. The motivation was to let the visitors imagine what a refugee feels when they are asked to evacuate on short notice due to threats or political reasons. The idea and artwork was by Vagelis Kolotsios while interactive components were added by Mehdi Rizvi.

The CompassChime is another IoTgo+Arts interactive art piece. It is a cross between a hand-knitted wind chime and a compass. See Fig 3, left. Essentially, it always tries to point one of its sides towards North, thus adding an additional utility to a wind chime.

Memory Blink is yet another IoTgo+Arts interactive art piece. It is a label accompanied by a framed photo. The label appears to be blank normally, and only shows the details of the photo and when someone is near it, blinking slowly. See Fig 3, right. The idea was to have, instead of static paintings and photos at home, something which tries to interact with people emotionally and remind them of a memory, through soft and playful lights.

The Playful Paintings is the last IoTgo+Arts interactive art piece. It is a set of paintings which seem to interact with one another as a visitor passes by them. The ideas and artworks of CompassChime, Memory Blink, and Playful Paintings were by Mamtaz Banu, Veronica Zen,

and Riccardo Zen respectively, while interactive components were by Mehdi Rizvi.

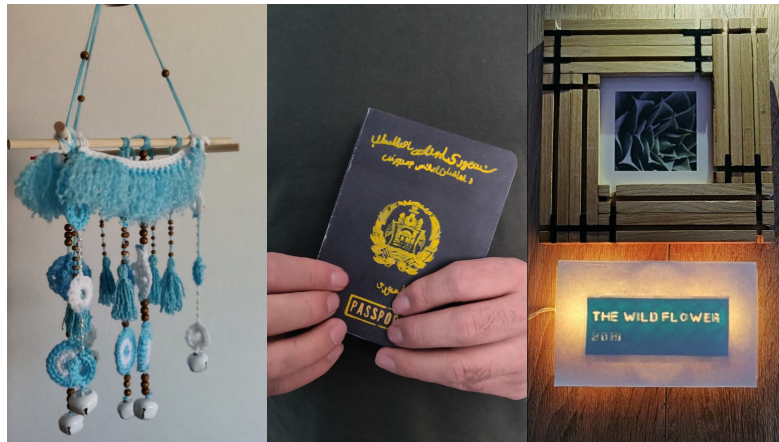


Figure 3: From left to right: The CompassChime; The Passport; Memory Blink

6. IoTgo+Arts and the Frontiers of HCI and Arts

IoTgo+Arts places itself on the frontiers of HCI and Arts. On one hand, it provides HCI research community new insights of co-designing IoT toolkits for artists, with the artists. This is novel as HCI research usually focuses on developing such toolkits for older citizens, teens or children, and not for arts but rather with a focus on ideation, design, programming and/or prototyping.

On the other hand, the art community also benefits as traditional artists with no prior experience of interactive art or coding can successfully create feasible interactive artworks using IoTgo+Arts. They can benefit from HCI research of gamified scaffolding, card-based ideation and reflection not usually used in arts and contribute back to it.

IoTgo+Arts fits within the European priority which calls for “a Europe fit for the digital age”. Many artists feel challenged with the changes the digital age is bringing. IoTgo+Arts provides such artists with an opportunity in the form of a toolkit for adding interaction to their artwork and making it IoT enabled. This empowers artists by providing them with the digital spaces and tools for enhancing their artwork, without being experts of technology and programming.

7. Conclusions & Future Work

Using the IoTgo+Art toolkit greatly facilitated the artists to create artwork focused on a single goal i.e., creating art for an interactive experience. Furthermore, the pairing of each artist with a technology expert, and generation of implementable ideas and ready-to-use code from the toolkit ensured that the creation of artwork for an interactive experience was feasible. The authors suggest such an approach for groups of artists, and even individual artists when designing interactive and IoT-enabled artworks for the first time, especially if they have no prior experience with interactive technology and/or programming.

The authors plan to use the interactive experience as an inspiration for other artists and to involve them in creating more interactive and IoT-enabled artworks using IoTgo+Arts. The next round of such IoTgo+Arts collaborations are expected to happen in summer of 2021.

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References

- [1] S. Greengard, *The Internet of Things*, The MIT Press, 2015.
- [2] D. Goods, N. Hafermaas, A. Koblin, *The e-cloud*, 2010.
- [3] S. Seiting, *Lightbridge: embracing the messiness in exposing the analytics* (2012).
- [4] F. Piccialli, A. Chianese, *Tolkart: an iot platform to create intelligent art exhibition of talking objects*, *Intl. Journal of Internet Technology & Secured Transactions* 7 (2017) 3–20.
- [5] S. Mora, F. Gianni, M. Divitini, *Tiles: A card-based ideation toolkit for the internet of things*, in: *Proceedings of the 2017 Conference on Designing Interactive Systems, DIS '17*, Association for Computing Machinery, New York, NY, USA, 2017, p. 587–598.
- [6] A. Melonio, M. Rizvi, E. Roumelioti, A. De Angeli, R. Gennari, M. Matera, *Children's beliefs and understanding of smart objects: An exploratory study*, in: *Proceedings of the 2020 International Conference on Advanced Visual Interfaces, AVI '20*, Association for Computing Machinery, New York, NY, USA, 2020, pp. 1–8.
- [7] R. Brito, P. Houghton, *Iot service kit*, <http://iotservicekit.com>, 2017. Accessed: 2021-02-20.
- [8] I. Vitali, V. Rognoli, V. Arquilla, *Mapping the iot: Co-design, test and refine a design framework for iot products*, in: *Proceedings of the 9th Nordic Conference on Human-Computer Interaction, NordiCHI '16*, ACM, New York, NY, USA, 2016.
- [9] D. Peters, L. Loke, N. Ahmadpour, *Toolkits, cards and games—a review of analogue tools for collaborative ideation*, *CoDesign* (2020) 1–25.
- [10] C. Ardito, M. F. Costabile, A. De Angeli, R. Lanzilotti, *Enriching archaeological parks with contextual sounds and mobile technology*, *ACM Transactions on Computer-Human Interaction (TOCHI)* 19 (2012) 1–30.
- [11] A. Berger, A. H. Ambe, A. Soro, D. De Roeck, M. Brereton, *The stories people tell about the home through iot toolkits*, in: *Proceedings of Designing Interactive Systems Conference, 2019*, pp. 7–19.
- [12] A. Berger, W. Odom, M. Storz, A. Bischof, A. Kurze, E. Hornecker, *The inflatable cat: idiosyncratic ideation of smart objects for the home*, in: *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems, 2019*, pp. 1–12.