TagoPhone: Tactile Interface for Playful Music Control

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Abstract*—TagoPhone is a tangible music interface that reimagines digital music streaming as a physical interaction through the metaphor of vinyl records. Shaped as a record player, it utilizes NFC tags embedded in laser-cut cardboard "vinyl records" to trigger music playback from streaming services such as Spotify.

I. Introduction

TagoPhone is a tangible device for controlling audio playback using Spotify API. Users place physical discs resembling vinyl records on top of the device, initiating playback of a song, album, or playlist stored on the disc. The disc can be made of any material as it does not contain actual audio recordings. Rather, it has NFC tag stuck to the centre of the disc that contains the id number of the item to play. Removing the disc from the device consequently stops the playback.

The design idea emerged from curiosity-driven exploration combined with domestic convenience. The idea came from a practical limitation, supporting a household member who couldn't access Spotify via their phone, but the project grew into an exploration of how our interactions of digital media change when we anchor it in tangible form. Unlike the standard Spotify interface, TagoPhone does not have rich tangible screen, no infinite browsing, no personalisation.

The prototype explores multiple design questions: What happens when we reintroduce physical constraints and tangible representations into digital music selection? What shifts occur in household dynamics when streaming controls move from personal devices to shared physical objects? Can the deliberate curation of musical tokens encourage more mindful engagement with digital content?

The project draws conceptual inspiration from slow technology frameworks [1] and tangible interaction design [2].

II. Related Work

Previous academic research has shown how material qualities change the perceptions of digital possessions [3], and the value of seeing one's music collection in a physical form, which is disappearing with the onset of streaming services [4].

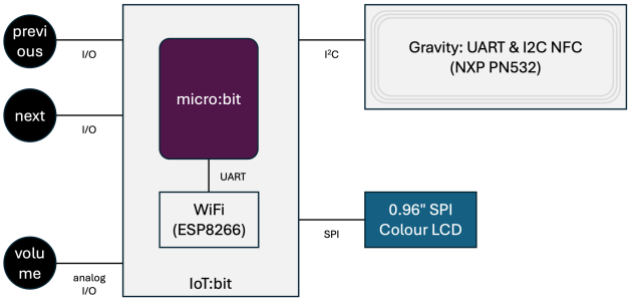
The interest in physical audio devices is evidenced by Chüne, a music service that comes with an NFC-enabled device that moved past the prototyping phase through crowdfunding. A physical form allows to take advantage of a social environment where multiple users can control the playback.

Several DIY projects have also been using physical tokens or NFC based tags to control audio playback [5, 6, 7], further demonstrating interest in playful and nostalgic interfaces for controlling streaming media. These projects were primarily focused on learning, technical implementation and nostalgic interaction, often referencing the ritual of physical media as inspiration. Tagophone similarly uses NFC as a trigger but differs in its use of a BBC micro:bit as a lightweight controller, its intentionally handcrafted aesthetic, and its conceptual framing rather than recreating vinyl nostalgia for its own sake.

III. Device Prototype

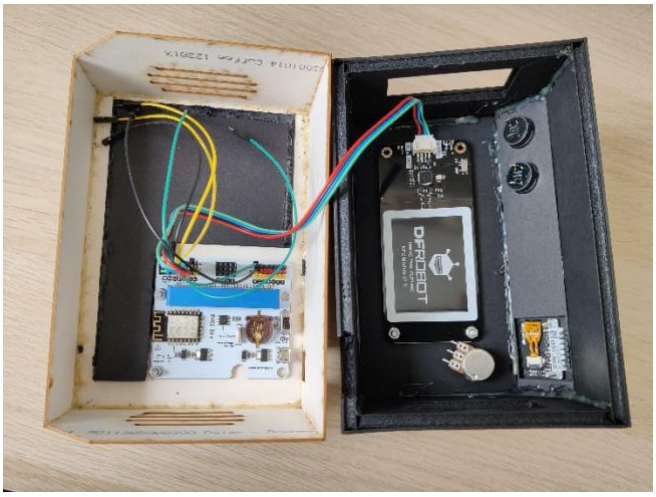
A. Hardware

The device is using micro:bit V2 as its central processing unit. Two physical push buttons are connected to it to switch to previous and next tracks for albums and playlist, as well as a panel mount 1K linear potentiometer with a slim metal T18 knob (10×15mm) to control the playback volume using a built-in A/D converter in the micro:bit.



The micro:bit is housed in a IoT expansion board by Electfreaks, which provides power supply over USB, real-time clock and most importantly the ESP8266 WiFi module. The micro:bit communicates with the WiFi module over serial port to issue HTTP requests to the Spotify service to control the playback.

A Gravity: UART & I2C NFC module by DFRobot is connected to micro:bit over I²C bus to sense the tags placed on top of the device. This needs to mounted as close as possible to the top side of the enclosure.



Finally, a small display (160×180 px) colour LCD on the side of the device is meant show the current playing album and song information as provided by Spotify. This display is interfaced using SPI.

B. Enclosure

The protype has been cut using laser cutter from cardboard (outer shell) and foamboard (inner shell) that slide into each other. Both parts have cutouts for ventilation The outlines for the design were created in Adobe Illustrator, individual sides put together using hot glue. Finally, a logo at the front was lasercut from acrylic with silver finish.

The components boards are attached to the enclosure using screws. For both aesthetical and practical reasons, an extra layer of foam board is placed on top of the encloser in the form of two half-circles. This helps to align the “vinyl records” tags placed by users correctly over the NFC reader, and it hides the screws needed to attach it to the enclosure.

The tags are also lasercut from cardboard of various colours, which allows users to annotate them with handwriting or stickers, and one can envision printing or etching customized tags of different materials for the extra valuable songs.

A round, 25 mm in diameter NFC sticker tags (NTAG213 by ZipNFC) are placed in the centre of the “records”, giving further impression of classic mechanical audio discs and records.

IV. Progress so far

The first author created and assembled the enclosure and programmed the micro:bit to perform the playback task. This involved writing MicroPython libraries for the NFC board as well as rewriting parts of the ESP8266 firmware to fix some critical bugs.

The media playback system is working. In the depicted enclosure, putting a tag on the device causes it to send a request to a server which uses Spotify API to start or stop the playback.

The push buttons, potentiometer and display components were tested, but have not been connected to the API yet. More ESP8266 fixes are need to be able to properly receive the data to show on the display.

V. Responsible innovation

The prototype was constructed using readily available, low-cost components (micro:bit, ESP8266, NFC tags) that have established educational and maker community support and recycled/recyclable materials (leftover cardboard from previous projects). This approach demonstrates how exploratory design need not require expensive or specialised equipment.

The separation of physical interaction from screen-based interfaces also holds potential for increased accessibility for certain user populations and contexts where virtual interaction is challenging or undesirable.

VI. Author bio(s) / experiences

Dalya Al-Shahrabi is a Research Software Engineer with a background in human-computer interaction and electrical engineering. Her work spans web, mobile, and IoT systems, with a focus on curiosity-led research blending practical implementation with creative expression. She enjoys building experimental tools and interfaces that reframe everyday digital experiences. Her recent projects include KaraokAI, an AI-generated karaoke system based on academic papers (CHI 2025 Interactivity, Best Demo).

Prior to her role as a Research Software Engineer, Dalya worked as an embedded systems engineer at a startup developing custom hardware solutions, where she gained hands-on experience diagnosing and repairing science museum exhibits, in-house PCB fabrication, chemical etching processes, and surface-mount component assembly.

Jan Kučera is currently a post-doc researcher in human vision and colour science at Newcastle University. With background in HCI, he enjoys bringing technical and prototyping skills into fields where they are often overlooked, including humanities and natural sciences. He has experience with both hardware and software prototyping, soldering, PCB design, laser

cutters and 3D printers. He contributed to both .NET Micro Framework and .NET Gadgeteer prototyping platforms.

VII. Acknowledgements

The authors are thankful to Open Lab at Newcastle University for the ability to use laser cutter during prototyping this device.

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