

Vader's Birthday-O-Matic: an interactive celebration and greetings machine

“Even Villains have a birthday”

Hybrid greetings card and gift providing a unique, interactive birthday celebration experience

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We present an electronic device with light, sound and printed outputs designed as an interactive greetings card addressing a birthday celebration to a recipient. The machine is both a metaphor for traditional cards and a refusal of the now widely established, automated and taste-less online greetings, triggered, standardized and processed through social media platforms. The device engages the recipient and user towards a personalized, tangible interaction experience, reflecting the intention of the sender, in order to reveal the present of which the device remains part of, unlike disposable gift-wrapping or greetings cards.

CCS CONCEPTS • Hardware • Sensors & Actuators • Sound-based output

Additional Keywords and Phrases: microcontroller, programming, embedded electronics, sensors, ledstrip, sci-fi, thermal printer, lightsaber, 3D printing, greetings card



1 INTRODUCTION

From Season's Greetings to birthday cards or general forms of celebrations sent remotely have evolved, following the natural path of our digitized society and available tools. Postcards got replaced by emails and SMS followed by anonymized mass texting for shared events like the 4th of July or the Christmas Eve. However, digital tools also have provided new paradigms for casual items such as a postcard and turn it into something customized and meaningful. Avid user of the Fizzer service [1], I combine revisited traditions with direct messaging¹ to stay in touch with a limited group of people, far below Dunbar's Number [2]. In parallel, I tend to illustrate my warmest thoughts for my very distant friends with In-Real-Life items, shipped by traditional mail. Those can be hand crafted cards or items such as t-shirts or decorative items, usually embedding a message: the subsidiary layer is that the card can be the gift or that the gift embeds the card. Recipient engagement remains extremely important to me and receiving my gift is neither intended to be passive nor neutral but rather a source of enjoyment and emotions, stating that I apologize for not being there in person but here is a bit of me and our friendship in this self-contained unit. Known in my inner circle for "confusing people for a living", this engagement sometimes goes beyond the simple operation of the item and can be escalated to puzzles or riddles to solve, providing a sort of private escape-game-in-a-box experience, with home delivery (figure 1).



Figure 1: Lüüv Balm (Canned Love) and Ceaser's Chest (Puzzle Box using Ceaser's Cypher) presents

In this article we present a sci-fi themed electronic device that explores a tangible card and gift hybrid combination, following the birthday ritual of blowing the candle on the cake while using screens or displays alternative peripherals to interact with a distant user and gift recipient. This work can be related to previous TEI contributions. Mugellini & Al [9] propose the use of personal objects as tangible interfaces in the context of sharing and recollecting memories. Cheung & Al [11] explore the relationship between fictive interfaces from the movies and real-life TUIs.

2 BACKGROUND

In this section I briefly recall two types of art works and research I have been developing over the years. The proposed artwork can be seen as a binding of my activities of designing tangible interfaces for music and performing arts, and the crafting of specific sci-fi props replicas.

¹ such as WhatsApp

2.1 Musical controllers

Research on new musical controllers and instruments have grown to become a major topic over the past 2 decades, propelled by the diversity of sensors available. At IRCAM, and to a larger extent speaking in the community of the New Interfaces for Musical Expression, we have studied how to process and map sensed data sets in order to control audio synthesis [3] or link sound with gestures [4]. For the past 15 years, the frontier between computing, Internet of Things (IoT), wearable electronics and embedded electronics has been thinning to the point they can be hardly distinguished [5]. This now leads to self-contained devices both capable of motion sensing, gesture mapping and sound generation [6].

2.2 Props replicas

In parallel with IRCAM musical applications of gestural sensing and recognition, Plecter Labs specialized in movie props replicas embedded electronics with a unique motivation line: “Props that work”. Since 2005, we design electronics boards with programmable interaction scenarios to bring life to movie accessories, including the iconic lightsaber from the Star Wars movies [7] with motion-to-light and motion-to-sound mapping [11] for both collectibles entertainment and in-movie experience gathering through a tangible prop [12].

3 DESIGN & BUILD

3.1 Interaction Scenario

The general layout of the scenario is the remote celebration of the recipient’s birthday with an interactive object. The design theme and idea is Star Wars based: the recipient is a sci-fi movie fan. It naturally got propelled by an inner voice stating “no OLED display this time” and the urge to use a thermal printer instead for talking to the user. While sound is intrinsic to most of the objects I would craft, it is used here as punctuation in the interaction flow which is mostly handed to the printer with a deliberate slower pace to restore the intimate connection with the user and proposing the acceptance of patience. The object incarnates the traditional celebration of blowing the candle on the cake, followed by congratulations and gifts. A wooden box (MDF) embeds a microcontroller board capable of playing digital audio from a SD card, a thermal printer and a decorative 3D printed (PLA) cake topped with a mini Star Wars lightsaber with a working blade composed of 38 individual pixels². As the device gets powered, the thermal printer and Earl Jones impersonated voice invite the user to proceed to light up the cake using an actual lighter on a temperature sensor, blow it and redeem his gift. The device can be operated again, as long as the printer is fed with thermal paper and memories can be revisited, like opening a Dancing Ballerina music box. This too confers it a status of Madeleine of Proust [8, 9]. Once the candle facsimile has been blown, the actual gift is revealed under the form of printed GPS coordinates at which to find it³. The device is the card, the giftwrap, the celebration remote guide and a gift by itself, albeit a “traditional” present is offered through the interaction process as a still wrapped, distant surprise stimulating more curiosity and excitation.

3.2 Construction

The case design was achieved with an online box template generator⁴ further edited with Adobe Illustrator to add engraving layers to the laser cutter job, details such as the helmet and the lettering. Design assembly uses finger joints for

² Recipient is getting 38 years old. Age scalability of the device and its concept isn’t discussed here.

³ An alternate QR code is eventually provided as a fade out from the interaction scenario

⁴ <https://www.makercase.com/#/basicbox>

a simplified gluing process doubled with the iconic *laser cut look* featuring burnt edge patterns and signature⁵. The cake was printed using a scaled and modified model from Thingiverse⁶ to allow for installing of the lightsaber candle and accent LEDs. Finally, the hilt was printed on a Forms 2 SLA printer from a personal 3D model further hand-painted and a diffusing, translucent blade was 3D printed in Zortrax's Z-Glass filament in 2 halves then glued together with the pixel strip inside.

3.3 Hardware

The core of the device is built around a CFX, a custom ARM32 Atmel microcontroller driven board embedding a 6D IMU sensor (LSM6D), a I2S fed 3W class D amplifier and a μ SD card as shown on figure 2. The board features a complete configuration system reading parameters files from the μ SD card as well as digital audio (WAV) or still pictures (BMP). A highly optimized DMA driver renders animations on individual RGB LEDs referred as addressable pixels⁷ forming the light blade and refreshed as fast as 250 fps. Programming is achieved in C++ using a tailored Arduino Core [10] and toolchain using the GCC compiler. A specific low level driver library was added to control the thermal printer through the UART serial port of the CFX board⁸. The library allows for printing text of different size as well as barcodes and pictures that we dynamically read from the SD card. We used here a fraction of what the usual lightsaber interaction scenario offers, including the accent LED programmable sequencer used to animate spinning LEDs around the 3D printed cake, in a deliberate childish, naïve, toy-like fashion. A I²C temperature sensor SHT21⁹ completes the system to detect the flame that will trigger the lightsaber. Increments of 10°C are logged by the printer with Star Wars referenced & humoristic lines until ignition occurs followed by a printed invite to blow it out (figure 2). Budget wise, the main costs of the device are the microcontroller board (75€) and the thermal printer (25€). Additional parts and materials such as wood, plastic filament, miniature ledstrip, speaker and power supplies take the whole artwork project cost to about 150€.

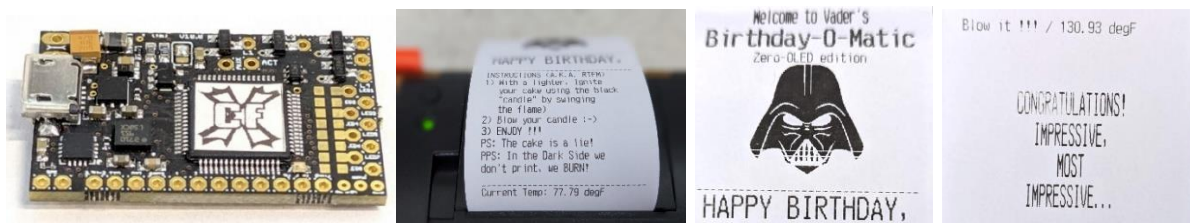


Figure 2: The CFX board (34 x 20.5mm) and different sections of the thermal printer output

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⁵ Temperature and burning is also used here as an Ariana Thread regarding Lord Vader's character

⁶ <https://www.thingiverse.com/thing:1923164>

⁷ Also known as WS2812 neopixels - <https://www.adafruit.com/product/1507>

⁸ <https://github.com/AndersV209/Pos-Printer-Library>

⁹ Double coated with heat shrinking tube protecting the sensor against the direct flame

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A APPENDICES

A.1 Video Demonstration

<https://youtu.be/DWYm47uv01k>