Cardiano

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So, we went to Amazon, Ebay...

Motivations

1. Cheaper Material, cheaper piano

2. Can be used on all platforms

3. Easy to set up. Plug, Pair, and Play.
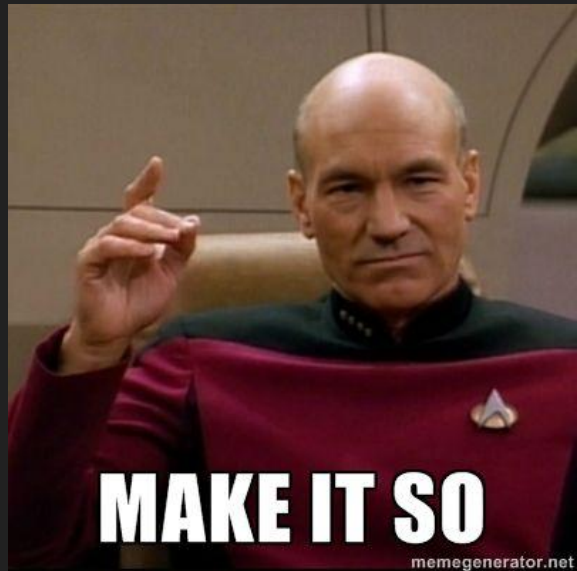
Challenge

We came across several challenges when we first started the project.

This project is unique in a way that it reverses the normal operation process of microcontroller. (The MCU receives data from an input device)

The underlying difficulty can be found in setting up bluetoothctl pairing and connectivity by emulating an input device (Unrecognized hardware etc.)

BlueZ is incompatible with the version of our Raspberry Pi. We spent lots of time debugging the problems caused by default API.

Hardware components

Included in our product:

- A Raspberry Pi 3 with bluetooth module
- An HDMI cable
- A cardboard outer case with piano keys (10 white keys, 7 black keys)

Required for this system:

- A standard computer keyboard

(such as Logitech MK320)

- A monitor with HDMI inputs
- An internet device

(such as PC, tablet or smartphone)

Background

D-Bus: **D-Bus** (for "**Desktop Bus**"[4]), a software bus, is an inter-process communication (IPC) and remote procedure call (RPC) mechanism that allows communication between multiple computer programs (that is, processes) concurrently running on the same machine.

BlueZ: BlueZ is the official Linux Bluetooth stack. It provides, in it's modular way, support for the core Bluetooth layers and protocols.

How it works (Bluetooth)

Raspberry Pi board used for hardware control and data transfer.

Bluetooth LE module that connects to the Raspberry PI is responsible for bluetooth connection setup and transfer.

Bluetooth keyboard connection via Raspberry pi

1. Define a bluez 5 profile object for our piano
2. Initialize the bluz profile to advertise device capabilities from a loaded server record
3. Define a D-Bus service that emulates a bluetooth piano
4. Connect the actual piano with the D-Bus
5. Create a event loop that keep for looking for input information (event driven)
6. When received, forward those input information to Dbus device. The signal is converting through a keymap
7. The input info is then forwarded from Dbus to the client!

Source Code & Step by Step Tutorial

https://github.com/LawrenceXu13467/Cardiano

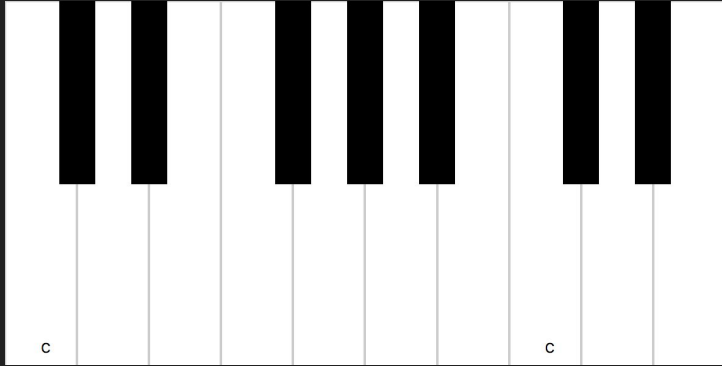# How we make our cardboard piano

Cardboard is cheaper and can be more easier to recycle than other materials.

However, Nintendo switch labo kit is way too expensive!

Product design

Map the piano music scale to the keyboard

Find the corresponding keystroke event for the coding and bluetooth transmission

Build-up

- Make the cardboard outer case with piano keys.
- Fit the computer keyboard into the cardboard case under the piano keyboard.
- Stick pins under cardboard piano keys to let them be able to accurately contact the assigned computer keys.
- Connect the raspberry pi with the computer keyboard and put it in the room under the computer keyboard.

Website design (Software Design)

1. Written in CSS and Javascript
2. Some CSS plugins: Font Magician to get web front, Rucksack for animation, Autoprefixer to make easy use of browser prefix
3. We mapped the piano keys onto the corresponding appropriate keys on the keyboard
4. Bind with W3C Touch Events API to complete the I/O request
5. For our piano keys, the corresponding key can be shown in terminal with tmux option on Raspberry Pi
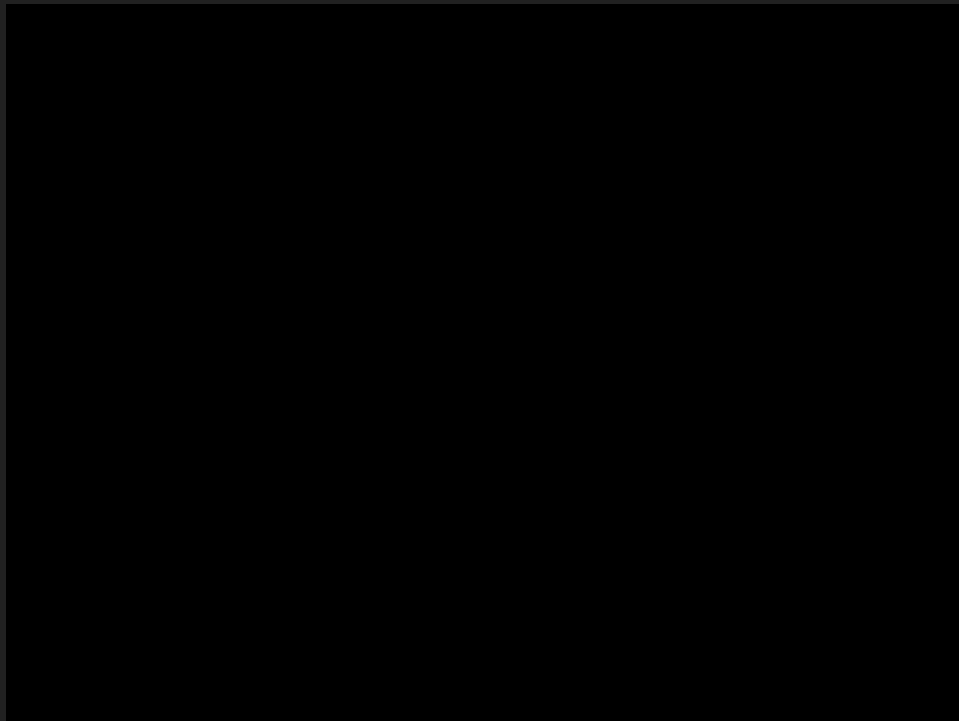
THIS IS AWESOME

CSM117 Project: Cardiano
A modular, economical, full scale Bluetooth Piano made out of Cardboard Boxes. 😎

f 🐦 in GITHUB 114

Demo Time

Demo Video

Why it Matters

It's a prototype of futuristic musical representation, a hybrid of digital and analog concepts at an affordable level.

It also symbolizes the trend of utilizing advanced technologies to refine artistic expression and inspire creativity in our lives.

Also it is a good opportunity to put wireless communication knowledge we learned in CS M117 in to practice. :)

Future work

Integration

Accessibility

Ease to use

Reference

Source code:

https://github.com/LFeh/piano

http://yetanotherpointlesstechblog.blogspot.com/2016/04/emulating-bluetooth-keyboard-with.html?m=1&from=groupmessage&isappinstalled=0

http://yetanotherpointlesstechblog.blogspot.com.au/2017/08/updated-bluetooth-keyboard-client-code.html

https://www.gadgetdaily.xyz/emulate-a-bluetooth-keyboard-with-the-raspberry-pi/

https://www.engadget.com/2018/02/07/diy-cardboard-piano-midi-kami-oto/

Thanks for Listening.

Questions?