

CordChord Assembly Instructions

This document outlines the basic assembly steps for CordChord. It assumes you are familiar with basic electronic principles and have access to the datasheet for the QRD1114 optical distance sensors (also linked in Bill of Parts below). Images are provided for reference.

Please also refer to the following documents in this submission:

- ./perfboard/CordChord_perfboard.fzz – perfboard Fritzing project
- CordChord_frame_diagram.svg – design file for the frame to understand the general construction
- CordChord_frame_dimensions.xlsx – spreadsheet of all necessary dimensions i.e., plank lengths, hook sizes, etc.

Find this document, other documentation, and project files at: <https://github.com/hathuwic/CordChord>

Bill of Parts

Item	Quantity/ Amount
584mm L x 69mm W x 18mm H plank	2
287mm L x 69mm W x 18mm H plank	1
170mm L x 69mm W x 18mm H plank	1
Polyester cord (diameter 7mm)	2m
Circular metal hook	4
Copper tape w/ adhesive (20mm W)	1m
QRD1114 optical distance sensor	8
Bela w/ headphone adapter & micro-USB<->USB cable	1
TrillCraft	1
2.5mm perfboard (at least 39 x 21 holes)	1
680 Ω resistor	8
330k Ω resistor	8
Hot glue & hot glue gun	Consumable
Stranded wire	Consumable
Solid wire	Consumable
1.2mm/0.6mm heatshrink	Consumable
Female header	Consumable
Male header	Consumable
Electrical tape	Consumable
Solder & soldering iron	Consumable



Frame Fabrication

The frame of CordChord consists of a wooden frame comprised of 4 pieces of wood. The instrument is fabricated from planks with a cross section of 69mm x 18mm.

The following plank lengths are required:

- 2x 584mm (neck and support brace)
- 1x 287mm (bottom plank)
- 1x 170mm (top plank)

The planks should be nailed together such that:

- The neck and support brace are perpendicular to the top and bottom planks
- The neck sits flush with the ends of the top and bottom planks
- The ends of the support brace are in the middle of the width of the top and bottom planks
- The neck and the support brace are 67mm apart along the length of the top and bottom planks

The hooks should be screwed into place as follows:

- 15mm from the edges of the width of the top/bottom plank
- 40mm from the near side of the neck

The strings should be threaded through the hooks towards the neck, and glued in place a required around the support brace. Alternatively, devise a peg system allowing for adjusting the tension of the strings.

Optional: attach felt pads (as designed for chair legs etc.) to the underside of the bottom plank for added stability and a reduced chance of damaging surfaces.

Optical Distance Sensor Placement

- Mark 44mm from the top and 40mm from the bottom of the neck. The 500mm space between these marks is the 'active' length of the strings.
- Make further marks 75mm and 150mm from the ends of the active length of the string, and 15mm from the edges of the neck. These 8 points are the locations for the optical distance sensors.
- Solder an approx. 1m length of solid wire to each pin of the QRD1114 optical distance sensors.
- Attach each sensor to the wooden frame using hot glue, taking care to ensure each sensor is placed:
 - a) Pointing directly towards the string and directly away from the neck.
 - b) With the pink/purple window towards the middle of the neck, and the black window towards the outside of the neck.
- Route the solid wires down the inside middle of the neck, as this area is not used while playing the instrument.

Capacitive Strip Placement

- On the back of the neck, measure 44mm from the top and 40mm from the bottom of the neck plank. As in the previous section, this defines the 'active' length of the string.
- Apply the tape in 500mm lengths along the length of the 'active' string length. They should be 10mm from the edges of the plank, with an approx. 9mm gap between them along the length of the neck.
- Apply solder to the bottom ends of the copper tape to connect a solid wire to each.
- Route these wires around the base of the instrument towards the protruding section of the bottom plank.

Perfboard

The perfboard should look something like Images 1 and 2 below.

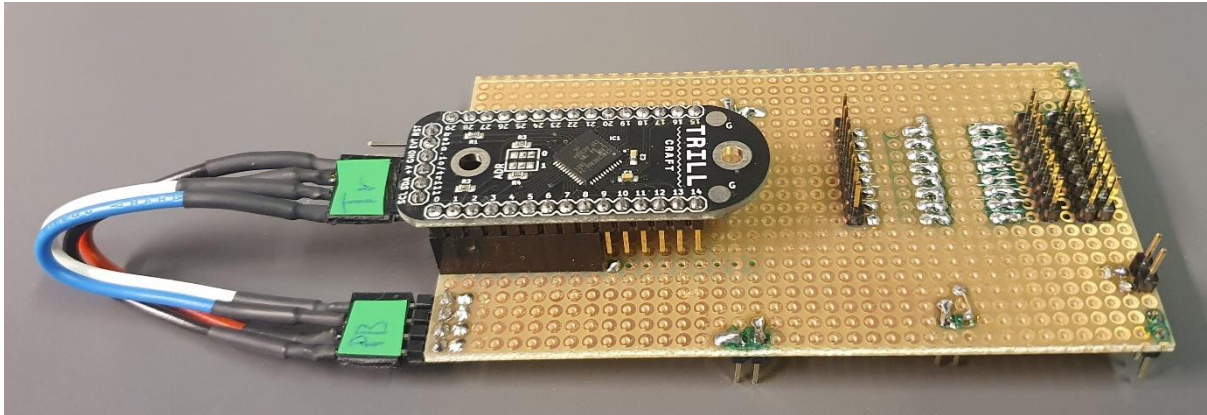


Image 1: Top of the perfboard

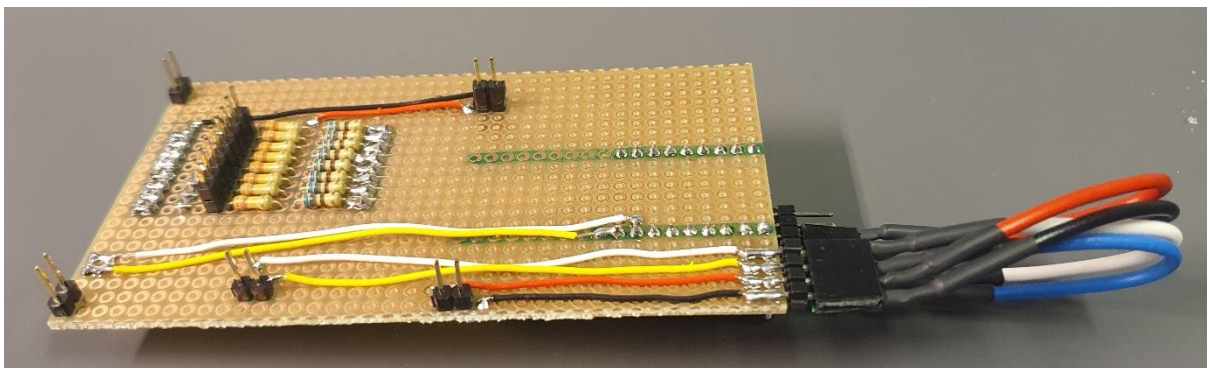


Image 2: Bottom of the perfboard (this side attaches to Bela)

There are 4 rows of 8 male headers on the top of the perfboard, as shown below. They are:

1. Ground (interchangeable)
2. Ground (interchangeable)
3. 5V to IR photoresistors via 330k Ω resistors
4. 5V to IR LEDs via 680 Ω resistors

Connect these to the appropriate wires coming from the optical distance sensors.

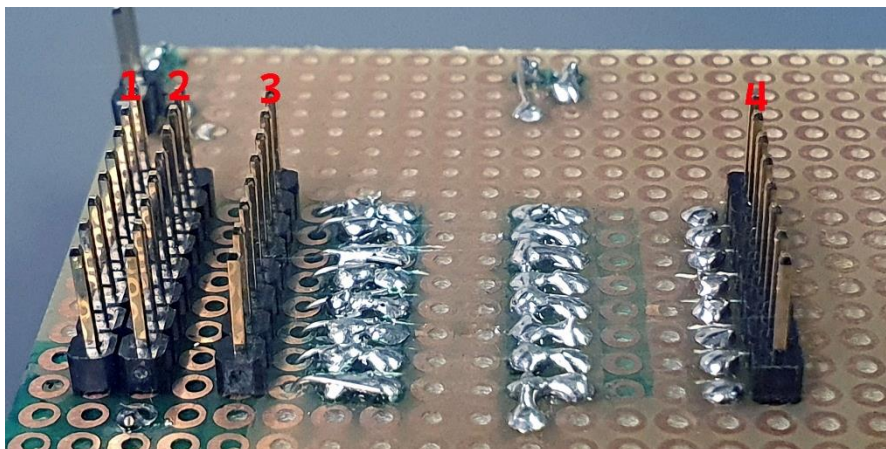


Image 3: Four rows of 8 male headers, for connecting the optical distance sensors

The placement of the TrillCraft module is shown in Image 1. Note the two headers in the bottom-right of Image 1 – these are the headers for connecting the two wires from the capacitive strips.

The perfboard is also shown in the Fritzing diagram in Image 3 below, and at `./perfboard/CordChord_perfboard.fzz`. Note this diagram moves the resistors, wires, and some headers to the top side for easy viewing. Please refer to Images 1 and 2 to determine which should be on which side.

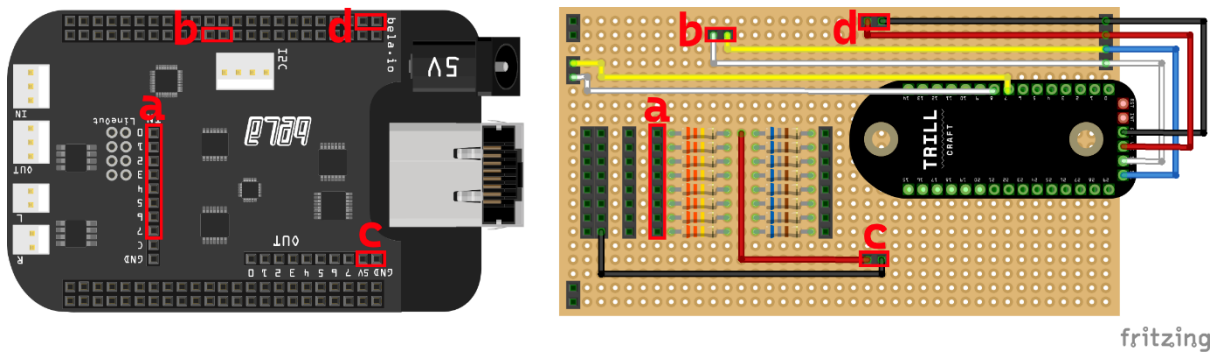


Image 4: Perfboard Fritzing diagram

The sets of two male headers in the corners of the perfboard should fit into the furthest headers on the end of Bela with the white connectors (i.e., the opposite end to the USB port and barrel connector). This will align the following with the required pins on Bela:

- a) The headers for the Bela ADCs
- b) I2C SCL and SDA for TrillCraft
- c) 5V and GND for the optical distance sensors
- d) 3.3V and GND for TrillCraft

The third row of 8 headers on the Fritzing diagram should be on the underside of the perfboard (and are therefore not shown in Image 3) and connect to analogue inputs 3-10 on Bela.

Bela Patches

NB: Because the machine learning model in CordChord assumed the dimensions of your system, unless you copy the measurements described here exactly, it is highly likely that the Neuralnet regression model included in the Bela project will perform poorly in your system. You are encouraged to record your own dataset using the patches in `/dataset_collection/` and train a new model using the patches in `/model_training/`.

To run the project, add everything in `/bela_files/` (and your own model) to your Pure Data project on Bela. Click 'Run' and get playing!