Lick sensor

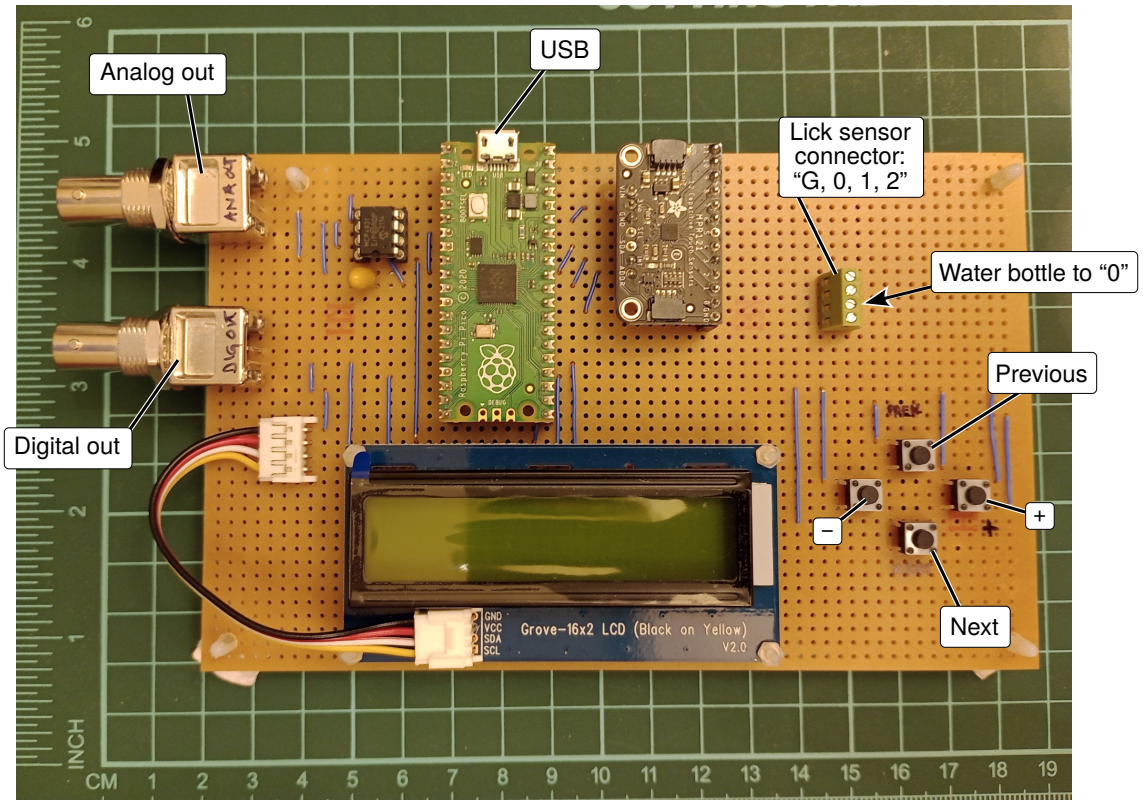

Figure 1. Overview of the lick-sensing device.

Wiring

1. Use a cable to connect input “0” (second from left to right on the “Lick sensor connector”, see Fig. 1) to the (metal) spout of a drinking bottle (Fig. 2A).
2. Connect “Digital out” to your data acquisition system with a BNC cable.
3. (Optional) Connect “Analog out” to your data acquisition system with a BNC cable.
4. Connect a USB cable to “USB”. This powers the device. Do this only after all other cables have been connected and the drinking bottle is in place.

Operation

1. Record data from “Digital out”. This will be the licking signal: a step will appear with every lick (Fig. 2B).
2. (Optional) Record the signal from “Analog out”. This signal increases or decreases with changes in capacitance in the touch sensor and it could be useful at some point if we needed to troubleshoot the system.

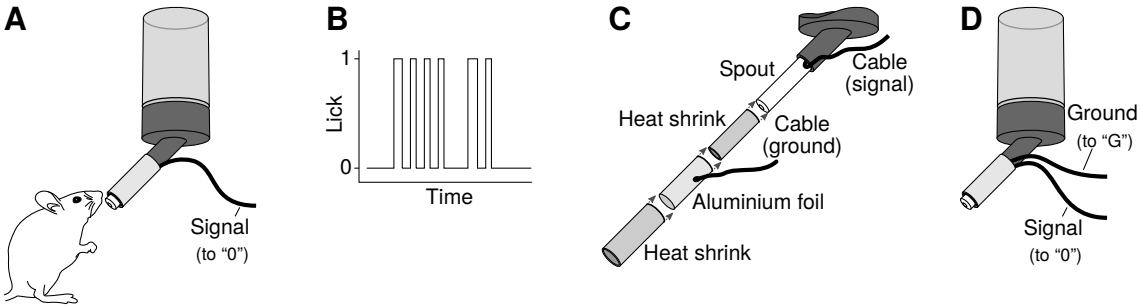

Figure 2. (**A**) A cable connecting the spout of the drinking bottle to the lick sensor is all the wiring required at the animal's end. (**B**) The output of the lick sensor ("Digital out" in Fig. 1) is a series of voltage steps, each indicating a lick event. (**C**) Optionally, shielding the spout of the drinking bottle may help reduce false positives that arise when animals hold the spout while drinking. To do this, surround the spout with a piece of conductive material (e.g. foil) and connect this to ground ("G") on the Lick sensor connector. Use heat shrink or similar to ensure that the foil (ground) and the spout (sensor) do not touch each other. The tip of the spout should be clear of the foil shielding. (**D**) Keeping ground and signal cables separate, connect these the to the lick sensor.

Adjusting settings

The default settings should work just fine. If some tuning is needed, each setting on the display can be adjusted using the buttons:

- "Previous" and "Next" take you through the different possible settings.
- "+" and "−" increase or decrease the value of the setting currently on display.

The most relevant settings are perhaps "Touch threshold" and "Release threshold": when the analogue signal goes above Touch threshold, a touch event (i.e. a lick) is triggered. When this signal goes below Release threshold, the event (lick) is considered to have ended.[1] Thus, these two values set the sensitivity of the system and introduce hysteresis to limit jitter.

Optional: grounding

It may be that animals trigger false positive lick events when they touch with their paw the drinking bottle. These false positive events may be reduced by shielding the spout of the water bottle with foil (Fig. 2C,D) and connecting this foil to "G" (ground) in the Lick sensor connector. Just ensure that signal and ground cables do not make contact with each other.

[1] Note that the value of Touch threshold must always be greater than that of Release threshold.