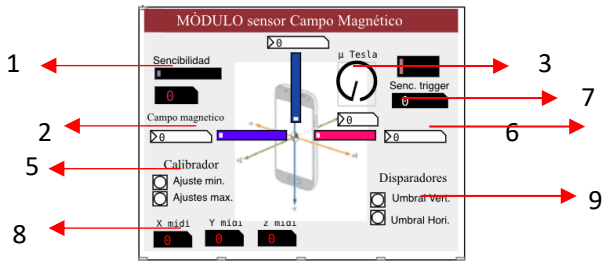
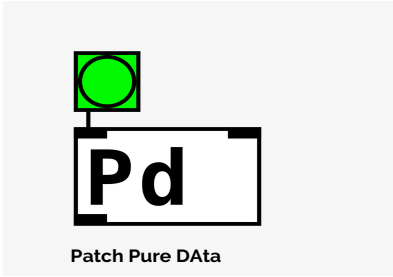
Patch Pure DAta

# MAGNETIC FIELD
# MODULE

Diseño y desarrollo de sistemas MMHCI híbridos con bioseñales y un DMI de smartphones, para obras bio-interactivas mixtas y performáticas

Pure Data Patches for the PhD Thesis: Juan Pablo posada Alvarez




1. **Filter window setting** (moving average): Reduced values in this parameter allow for uninterrupted signal flow with noise, while high values contribute to the stability of data variation by decreasing the noise level. It is recommended to adjust this parameter according to the tests carried out with each device interacting with the magnetic field. If it is of sustained excitation, it is not recommended to adjust with low values, since they do not filter the values and the control is less. Conversely, if the excitation is impulsive, as it is for event trigger threshold detection, a low value is recommended so latency is lower.
2. **Phone's Front Magnetic Field:** The purple slider and number box provide visual and numerical information of the proximity of a magnetic field detected on the front (Display) of the Smartphone, see image. As a magnetic field is detected, the slider scrolls from left to right indicating that it is more intense or the magnetic interaction element is closer to the smartphone.

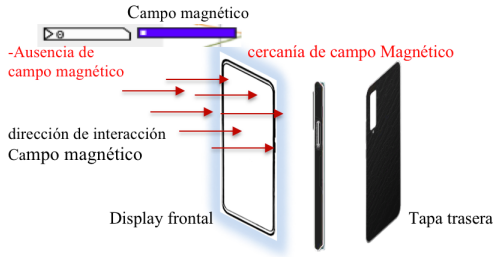



Illustration of the possible detectable magnetic field

3. **Phone's Top Magnetic Field:** The light blue slider and the number box provide visual and numerical information about the proximity of a magnetic field detected on the top of the Smartphone's phone (top of the Display), see As a magnetic field is detected, the slider will move from top to bottom, indicating its strength or the proximity of the element to the Smartphone.

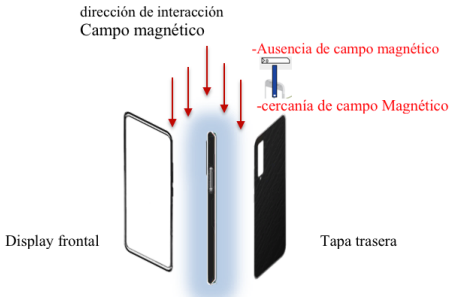



Illustration of Detectable Magnetic Field Top

4. **Phone's Rear Magnetic Field:** The pink slider and number box provide visual and numerical information of the proximity of the magnetic field detected on the back of the smartphone.

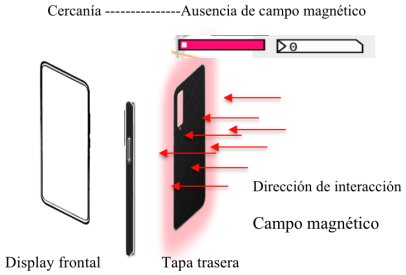
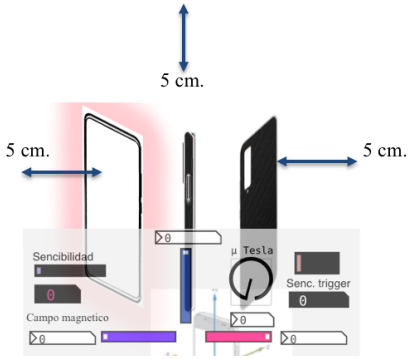



Illustration detectable magnetic field back

As a magnetic field is detected, the slider moves from right to left indicating that it is more intense or the magnetic interaction element is closer to the Smartphone.

It is convenient to consider that the variations in the implementation of magnetic field sensors in different smartphone devices. These differences affect the sensitivity points of the sensors in each phone, as well as the strength of the magnetic field they interact with, which can influence detection distances and thresholds. Common cylindrical magnets have been used in the tests for the module design, which do not require any additional power source. Each magnet and smartphone has an operating region of three-dimensional space around the magnetometer sensor. The operating region can be defined by an inner and outer sphere around the sensor, where the presence of a magnetic field can be detected as long as the magnetometer is not saturated. With another test smartphone, interaction with average values was obtained at a distance of 2.5 cm from the sensor, which confines the operating region between 1.7 and 5 cm, see Figure 4.15.




Operating distance and distance display
No presence of magnetic fields

5. **Calibrator. Min. – Max Adjustment:** The module has been designed with the ability to adjust magnetic field detection data to suit specific device conditions and user preferences in interacting with magnetic devices. To carry out these adjustments, the smartphone is placed in a place free of nearby magnetic fields and the "minimum setting" button is pressed. Subsequently, the maximum saturation threshold or limit of magnetic interaction is adjusted. Once the highest value of interaction or proximity of the magnetic field has been obtained, the "maximum setting" button is pressed. If necessary, intermediate adjustments can be made when the device is exposed to high temperatures or when the internal temperature has increased significantly compared to the start of the adjustment.
6. **Senc. Trigger:** This slider allows you to adjust detection thresholds to suit specific device conditions and user preferences. By increasing this value, the thresholds for the detection of magnetic field proximity events decrease, this means that the magnetic interaction objects need to be closer to the Smartphone to be activated. Conversely, when this value decreases, the thresholds for detecting magnetic field events increase, which means that magnetic interaction objects need to be less close to the smartphone to be activated.
7. **Knob magnetic field:** This knob visualizes the average magnetic field proximity for the entire Smartphone. The values are in (μT), magnetic induction.
8. **MIDI Data:** The three values associated with the MIDI data output allow the display of values in a range of 0 to 127 for each of the three axes of the magnetic field sensor. The scaling of these values will depend on a fine-grained fit between the data on the device and the data on the magnetic interaction object.
9. **Vert-hori Threshold Triggers:** The module is programmed to detect high levels of magnetic fields on two axes. 2 triggers have been designed, each with independent detection thresholds on the vertical and horizontal axis of the device plane. The displays are activated with each detection, and are useful when making sensitivity adjustments for the smartphone device and the object of magnetic interaction.

The module is connected as follows:

- **Inlet:** Input for OSC module
- **Outlets 1, 2 and 3:** Output values between 0 and 127 for MIDI control of magnetic field detection data.
- **Outlet 4:** Threshold detection bang output for proximity of magnetic fields in the vertical plane

**Outlet 5:** Threshold detection bang output for proximity of magnetic fields in the horizontal plane.