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**How to run the retro games demo using the buffer\_bci toolbox**

1. **Prepare the Mobita**
   * Take a 10-electrode Mobita and 10 sponges.
   * Rol up each of the sponges and place them inside each electrode of the Mobita.
   * Place the electrode tips with sponges in them in some water in order to let the sponges soak up the water.
   * Connect the green electrode with the long wire to the wristband and place the wristband in some water too.
   * Connect the electrodes with the Mobita battery. A blue light should start blinking on the Mobita battery.
   * Connect the Mobita through wifi with your laptop.
     + **Windows laptop**
       - Turn off the wifi (usually through some fn key combination).
       - Plug in the wifi dongle.
       - Go to your wifi overview (usually somewhere in the bottom right of your task bar).
       - Look for a wifi network called ‘Mobita\_XXXXXXXX’ (where the Xs stand for some kind of number). This might take a couple of seconds. If multiple Mobitas are active at the same time, multiple Mobitas will show up in the wifi overview. Make sure you connect to the correct one!
       - Check the sticker on the back of the Mobita battery in order to see the number of the Mobita you want to connect with.
       - Connect with the correct Mobita through wifi. You will be asked for a password. The password is: MOBITAXXXXXXX (the Xs are the last 7 digits of the number on the sticker on your Mobita battery). Note that MOBITA should be spelled in all capitals.
     + **Mac laptop**
       - Leave the wifi on.
       - Go to your wifi overview (usually somewhere in the top right of your task bar)
       - Connect with the Mobita as described in the last 3 bulletpoints of the Windows laptop above.
2. **Start up buffer\_bci**
   * **Windows demo laptop**
     + Start up the laptop (in case a password is needed, the password is: bciisfun).
     + Start the buffer: double click the startBuffer.batch file that is on the Desktop. A terminal window opens up.
     + Connect to the Mobita: double click the startMobita.batch file that is on the Desktop. Another terminal window opens up. You should see that samples are being sent to the buffer from the Mobita. Also, you should see a green and blue light blinking on the Mobita battery. If startMobita.batch cannot connect to the Mobita: restart the Mobita by disconnecting and reconnecting the electrodes from the battery and/or disconnect and reconnect to the Mobita wifi and make sure you typed the password for the wifi correctly.
     + Start the signal processing buffer: double click the startSigProcBuffer.batch file that is on the Desktop. You are asked for a capfile, choose: cap\_mobita\_black. A Matlab session should be started.
     + Start the demo: double click the runGame.batch file that is on the Desktop. Another matlab session starts and the demo control panel appears.
   * **Windows laptop**
     + Start up the laptop.
     + Start the buffer: go to the buffer\_bci-master folder, go to dataAcq and double click startBuffer.batch.
     + Connect to the Mobita: go to the buffer\_bci-master folder, go to dataAcq and double click startMobita.batch.
     + Start signal processing buffer: go to the buffer\_bci-master folder, go to games and double click startSigProcBuffer.batch.
     + Start the demo: go to the buffer\_bci-master folder, go to games and double click runGame.batch.
   * **Mac laptop**
     + Start up the laptop.
     + Start the buffer: go to the buffer\_bci-master folder, go to dataAcq and double click startBuffer.sh. In case the file is opened in a texteditor programme instead of the terminal, you need to righ-click on the startBuffer.sh file and change the ‘open with’ settings to the terminal (and apply to all).
     + Connect to the Mobita: go to the buffer\_bci-master folder, go to dataAcq and double click startMobita.sh.
     + Start signal processing buffer: go to the buffer\_bci-master folder, go to games and double click startSigProcBuffer.sh.
     + Start the demo: go to the buffer\_bci-master folder, go to games and double click runGame.sh.
   * In case your Matlab only starts with an internet connection:
     + Disconnect with the Mobita and connect to the internet.
     + startBuffer.batch/.sh
     + startSigProcBuffer.batch/.sh
     + runGame.batch/.sh
     + Disconnet with the internet and connect to the Mobita.
     + startMobita.batch/.sh
3. **Set up EEG-cap**
   * Have the participant sign a consent form. No data will be saved and analysed after the demo, but we are still obliged to have the participant sign the consent form.
   * Click on “EEG” in the demo control window. A figure opens up that shows you the raw signal of each electrode. The cap layout is provided by this figure.
   * Put the electrodes in the cap. Each electrode has a number and should go in a specific socket as specified by the cap layout in the figure. So you see numbers 1 t/m 10 in the figure and place the electrodes in the sockets accordingly.
   * Put some more water on the sponges using a syringe if necessary.
   * Put the cap on the subjects head. The cap should go over the back of the head, and is fastened with Velcro around the forehead. So most electrodes are roughly around the back of the head (visual cortex) and two electrodes are in the middle and top of the head.
   * Gently push on all electrodes, so the water leaks from the sponges, between the hair and onto the scalp. You are building a bridge of water between the scalp and the electrodes.
   * Let the participant relax for a couple of seconds.
   * Check the signal quality in the figure and adjust electrodes if necessary. The raw signal should get between a range of [-20mV,20mV]. You can squirt a bit more water onto the electrodes if necessary. However, be careful not too use too much water, as the whole head will get wet, all electrodes will connect with each other and result in the same signal. Try to move hair out of the way as much as possible. You can also squirt water directly onto the head through a hole in the cap if someone has really thick hair.
   * Close the figure and return to the control panel.
4. **Run the retro games demo**
   * Start the practice block from the control panel. A new figure will pop-up. Make the figure full screen. You can use this figure to explain the user-task during the calibration block. Close the figure when you have finished explaining, or wait for it to finish and until the control panel appears again.
   * Start the calibration block from the control panel. A new figure will pop-up or the one from the practice block will change. Make the figure full screen. The participant should count the number of times that the green arrow lights up (flashes in red or white). It is important that the participant really counts the number of times the green arrow flashes. In this calibration phase, we are trying to find out how the participant’s brain reacts to attended vs. unattended stimuli.
   * Once the calibration block has ended, the control panel will appear again. Now feed the data to the classifier by clicking “train classifier”. Two figures and a text box will open up. This might take a while. The first figure shows an ERP plot (you should see a P300 response at the central channels), the second an AUC plot (the most distinctive signal between the unattended and attended data). The text box provides the performance score. If you click ok in the text box, you return to the control panel and the figures will close.
   * Now you are ready for some action! Click either Snake or Pacman in order to play them. Make the figure full screen.
   * The participant can control the Snake or Pacman icon by counting the number of times the arrow pointing in the desired direction flashes.

**Possible things that could go wrong:**

* You lose the Mobita connection during the demo:
  + Disconnect and reconnected the Mobita electrodes. Disconnect and reconnect the Mobita wifi.
  + Restart the startMobita and signalProcBuffer. If that fails, you might need to restart everything.
* Bad performance (around 50%):
  + Check the signal quality.
  + Redo the calibration block and train classifier.
* Train classifier does not work:
  + Did you close the EEG figure before calibrating and training? If not, do so and calibrate and train again.