cnbi
Defitech Foundation Chair in
Non-invasive Brain-machine Interface

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Naturally controlling a MI BCI-driven mobile robot

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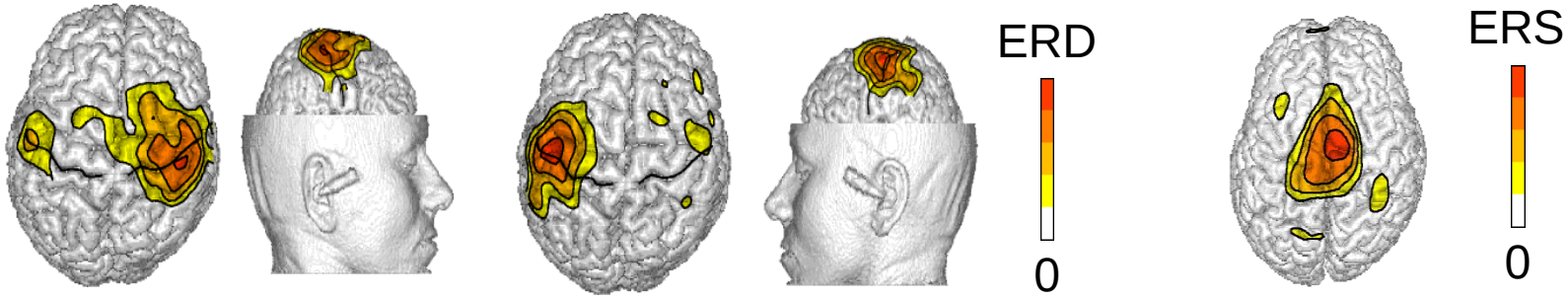
BCI based on Motor Imagination

Classical EEG correlates of MI: Event related [de]synchronization (ERD/ERD)

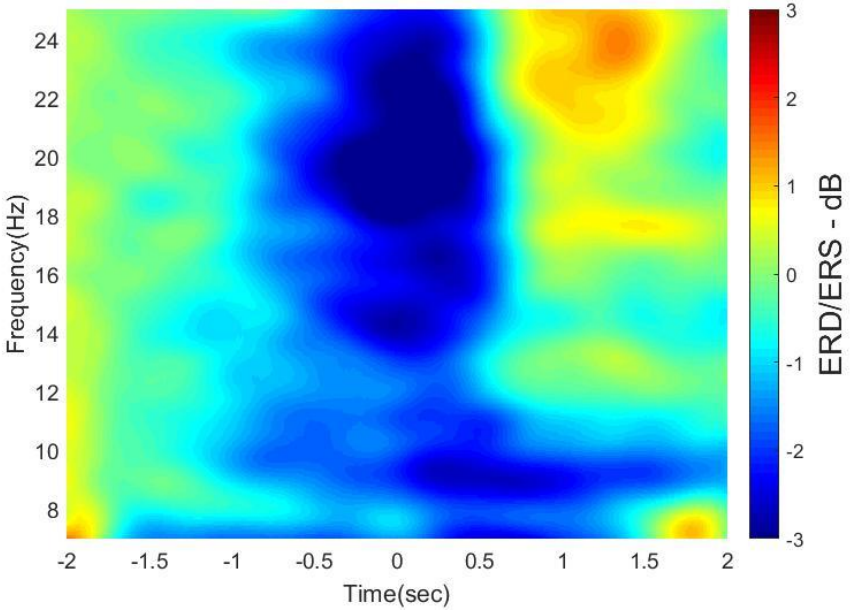
Spatio-Spectral characterization



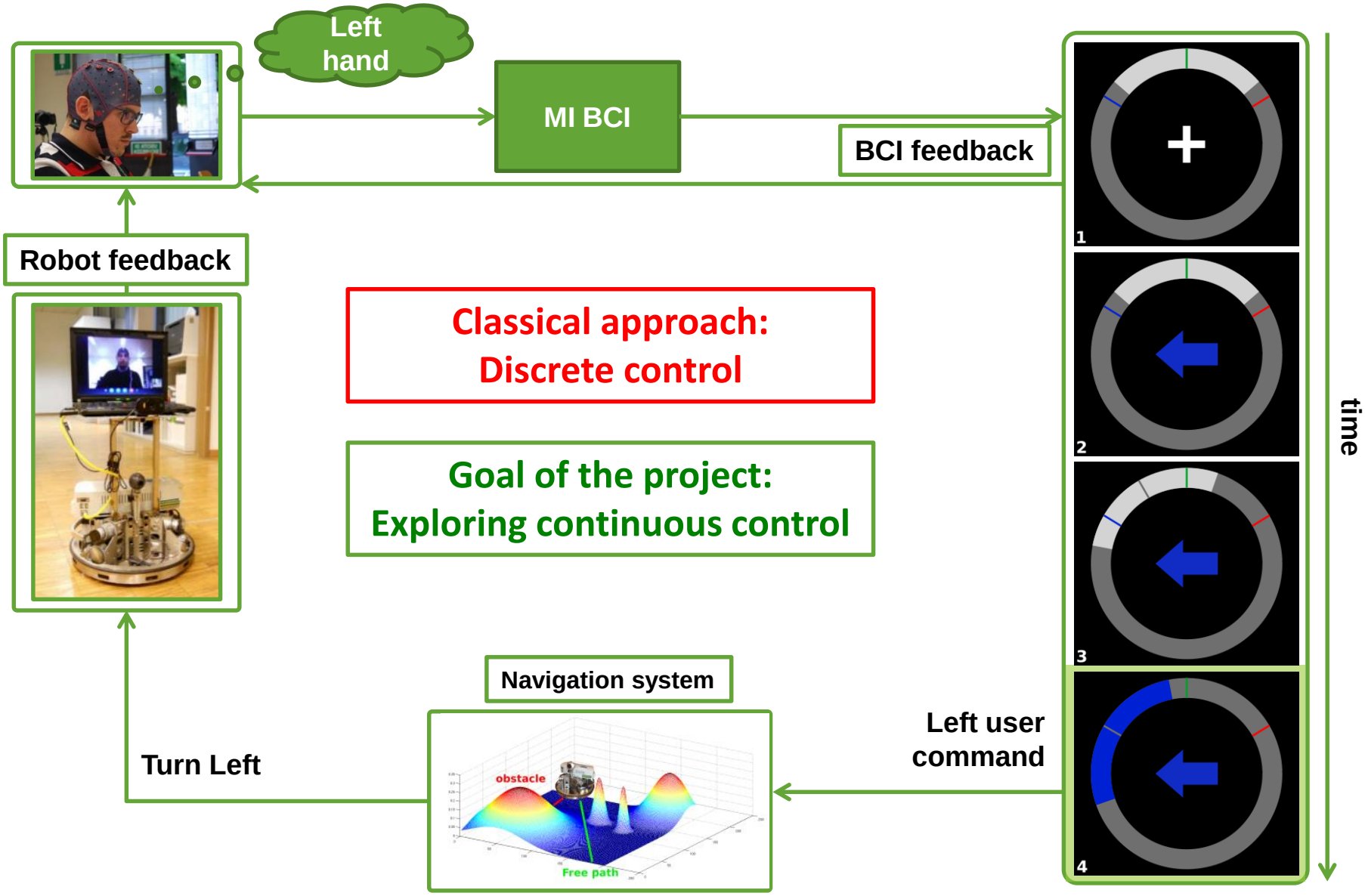
Left hand
9-13 Hz

Right hand
9-13 Hz

Both feet
18-23 Hz



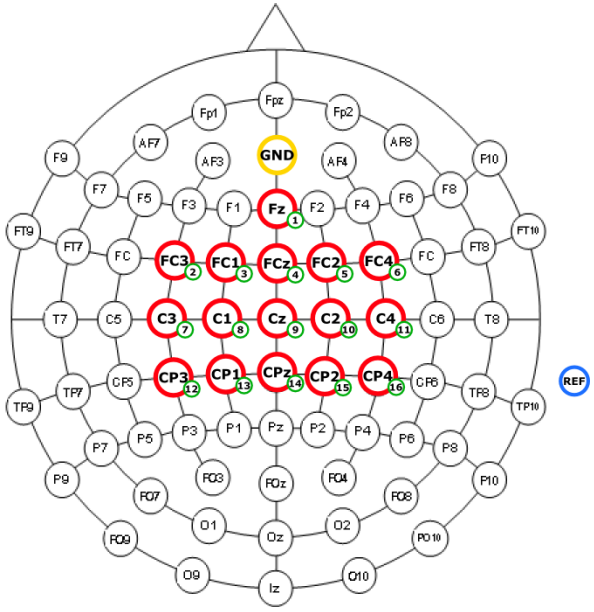
MI BCI driven telepresence robot

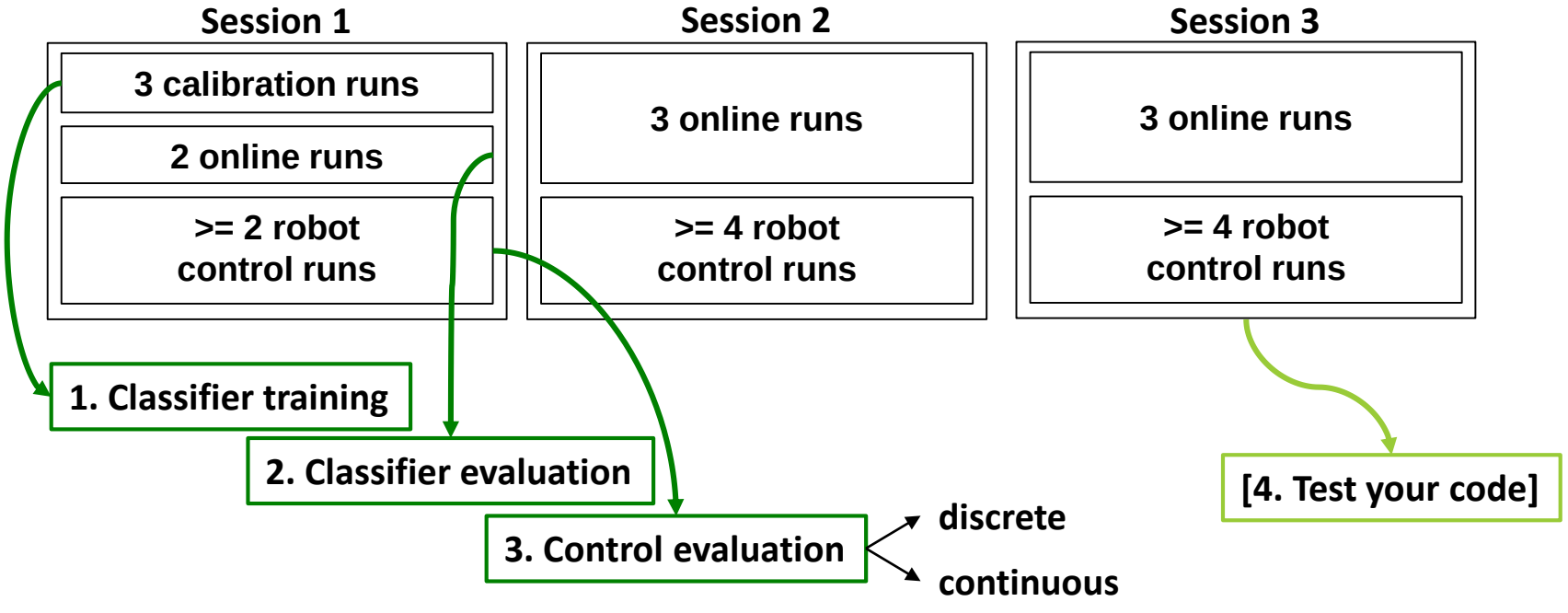


Experimental design

- 16 EEG channels over motor cortex
- Sample rate: 512 Hz
- 2-class Motor Imagery BCI
  (both hands vs. both feet)

- 3 recording sessions (days):
  (up to 120 mins each)





Objectives

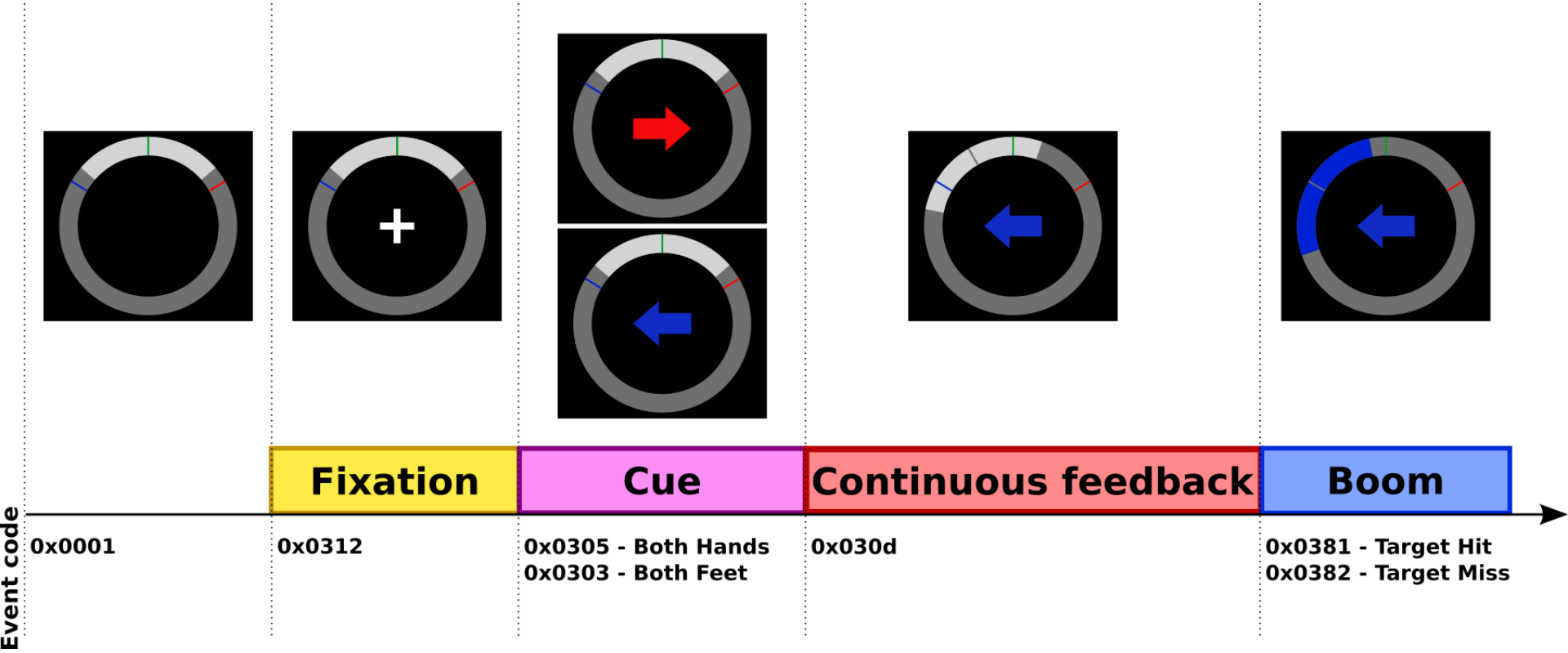
- Investigating **EEG correlates** of Motor Imagery
  - EEG data analysis
  - Highlight EEG correlates of Motor Imagery tasks

- Developing **your own 2-class BCI** based on Motor Imagery
  - Removing possible artifacts
  - Filtering the data
  - Extracting Motor Imagery related features
    (feel free to explore different features)
  - Selecting best features to train the classifier (calibration runs)
  - Using these features to evaluate the classifier (online runs)
  - Reporting BCI performances

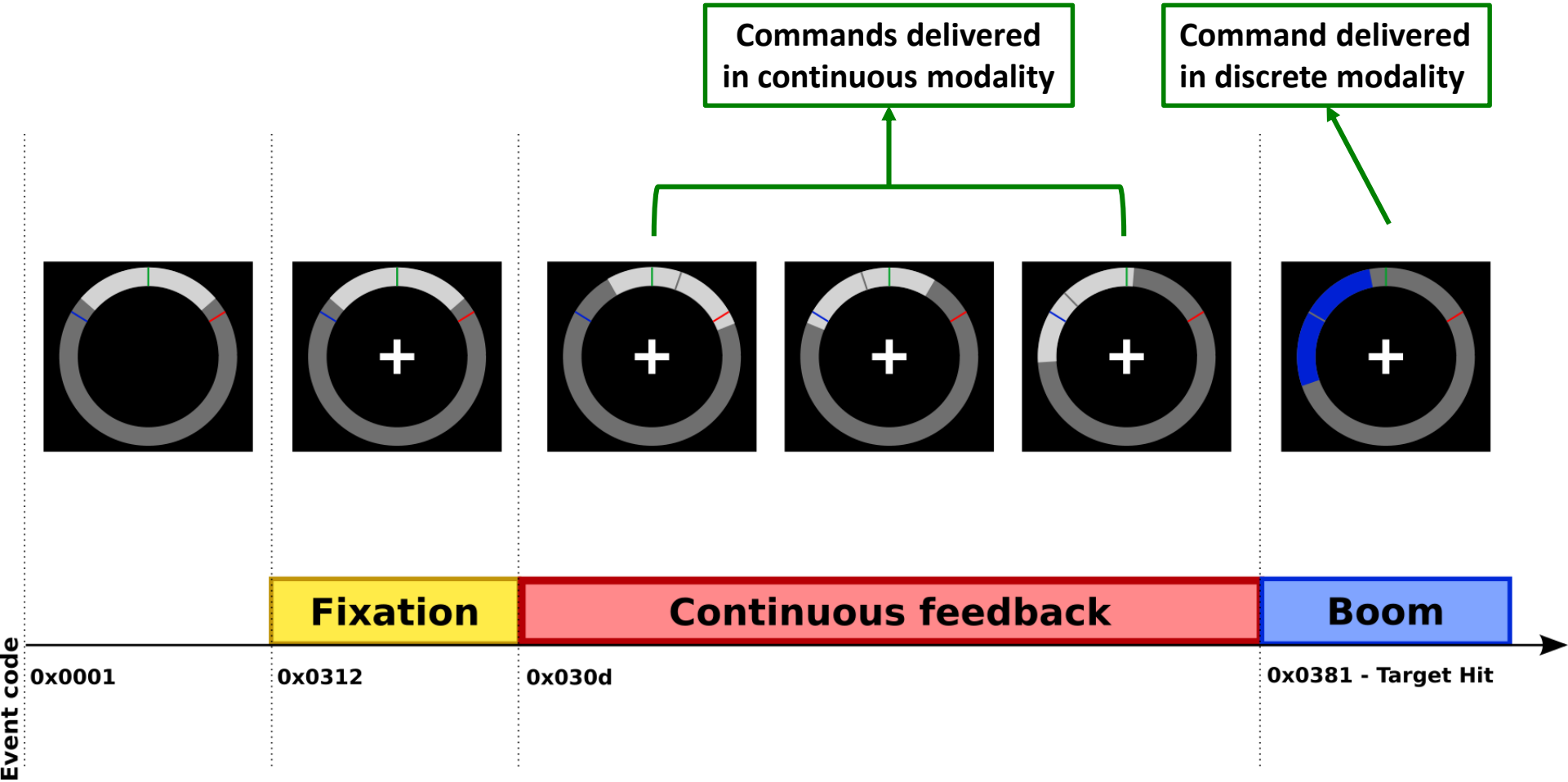
- The whole process should match the **online requirements** of a real BCI

- Understanding the challenges of using **BCI to control an external device**

Calibration/Online paradigm

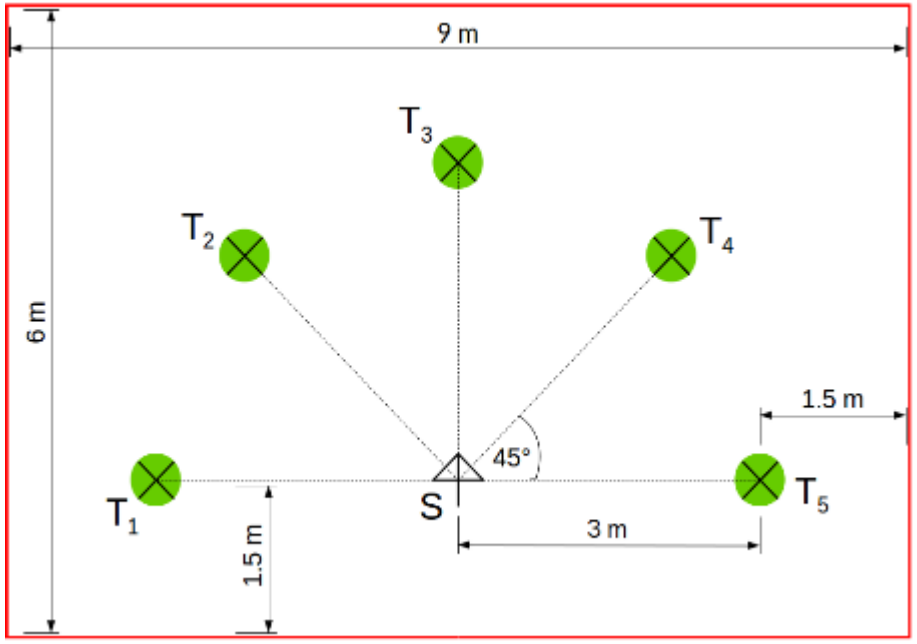


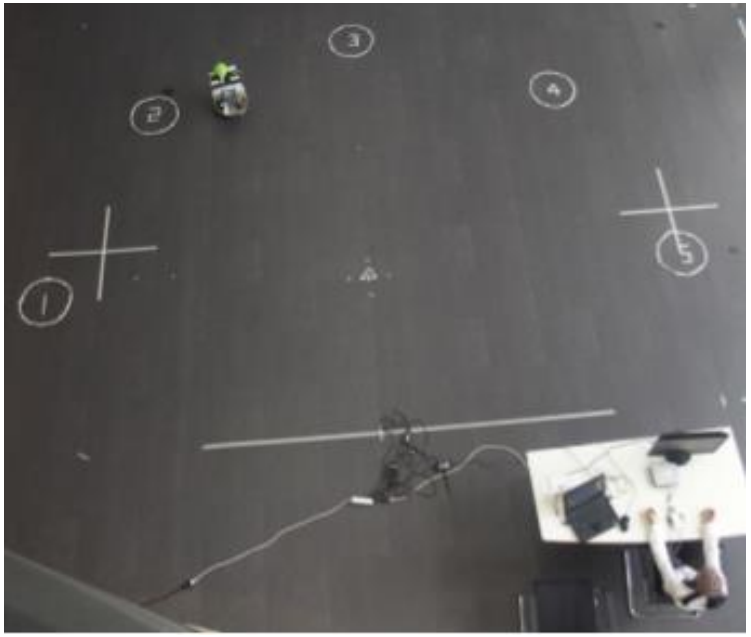
Control paradigm (uncued)



Robot BCI control task

- Driving the robot from the start position (S) to the selected target (T1-5)
- 5 targets randomly selected
- 2 modalities: discrete and continuous control
- Rules:
  - Do not exit from the field
  - Timeout 2 minutes
  - Subject can look at the BCI feedback





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