Inria Research & Development for the Cybathlon BCI series

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Team NITRO:
Neurotechnology Inria Team Racing Odyssey

INTRODUCTION
▪ Team NITRO, from Inria (French national research institute for digital technologies), gathers 2 Inria research teams: Potioc (Bordeaux) and Athena (Sophia-Antipolis).
▪ Team NITRO trains two Cybathlon BCI pilots, one in Bordeaux and one in Sophia-Antipolis.
▪ Both research teams work together on the BCI design [1] and implementation, based on OpenViBE [2].
▪ We introduce each pilot, as well as their BCI system and training procedure below.

PILOT 1 - Presentation
▪ Wilfried Panatier, Graphic Designer, president of Pratikable (http://www.pratikable.com), an association to highlight disabilities through boarding, skating and extreme sports for all. He is himself tetraplegic and a rider!

BCI system & training protocol
▪ 4-class mental imagery BCI
  – Left/right hand motor imagery, mental subtraction, rest
▪ 46 active EEG channels, g.tec gUSB Amp
▪ Classification: Adaptive Riemannian classifier [3]
  – Features: Spatial covariance matrices in 8-24Hz
  – Classifier: geodesic filter MDM with adaptive Rebias
▪ Progressive user training [4]
  – Pairs of 2 classes => 4 classes => Game control
  – 1 session/week => 2 sessions/week => 3 sessions/week

PILOT 2 - Presentation
▪ Karine Leclerc, who lives at the René Labreuille centre. She is president of the CVS (social life council) of the centre’s residents.

BCI system & training protocol
▪ 4-class mental imagery BCI
  – Right Hand motor imagery
  – Language imagination
  – Music imagination or Left Hand motor imagery
  – Rest
▪ 23 EEG channels, ANT Neuro Refa8
▪ Classifier: Linear Discriminant Analysis (LDA)
▪ User training
  – Pairs of 2 classes => 4 classes => Game control

References
[3] Kumar, Yger, Lotte, BCI Winter conf, 2019