NeuroBot: EEG Controlled Turtlebot

Ana Bog & Yannick Künzli

Motivations & Objectives

- Explore Human-Robot interaction
  - The robot acts as a physical extension of the subconscious emotional state
- Theatrical Bio-Feedback loop
  - Create a real-time bio-feedback loop for live performances.
- Co-Dependency
  - The robot serves as a metaphor for the play's theme of co-dependency
- Technical objective
  - Develop a real-time ROS-based system for affective state classification from EEG data

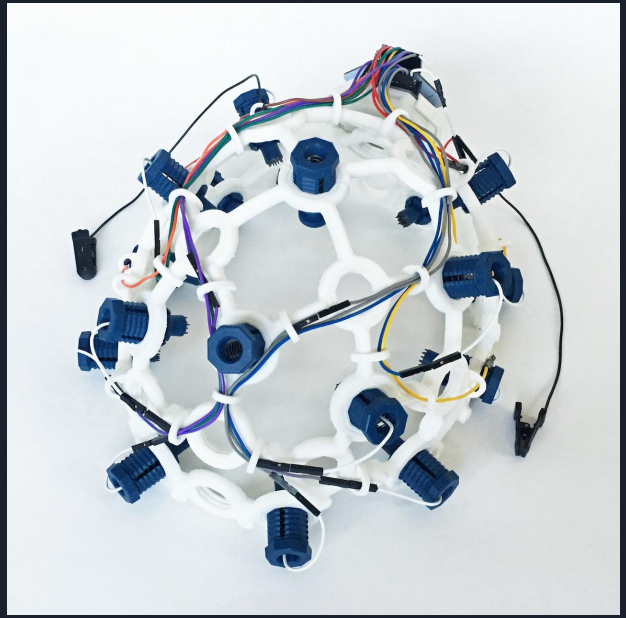
Base Idea

- have the turtlebot be controlled (‘co-dependency’) by the EEG headset
  - > emotions are mapped to different light colors (e.g. sad = blue)
  - > arousal states are mapped to movements (e.g. excited = frenetic movements)
  - > bot ‘base walking’ following a circular axis around the fixed actress

- the EEG headset is worn by someone watching the live theater piece, such that their emotional states are reflected by the performance of the actress through the robot
  - > thus, the actress can get a feedback on the emotions she’s making the public feel, and adapt

Material & Technologies

- EEG: Ultracortex Mark IV (3D Printed)
- Robot: TurtleBot3 burger
- Human controlling the bot (or maybe using the EEG eventually)
- Lights for emotion display
- PC for EEG live analysis and publish ROS messages

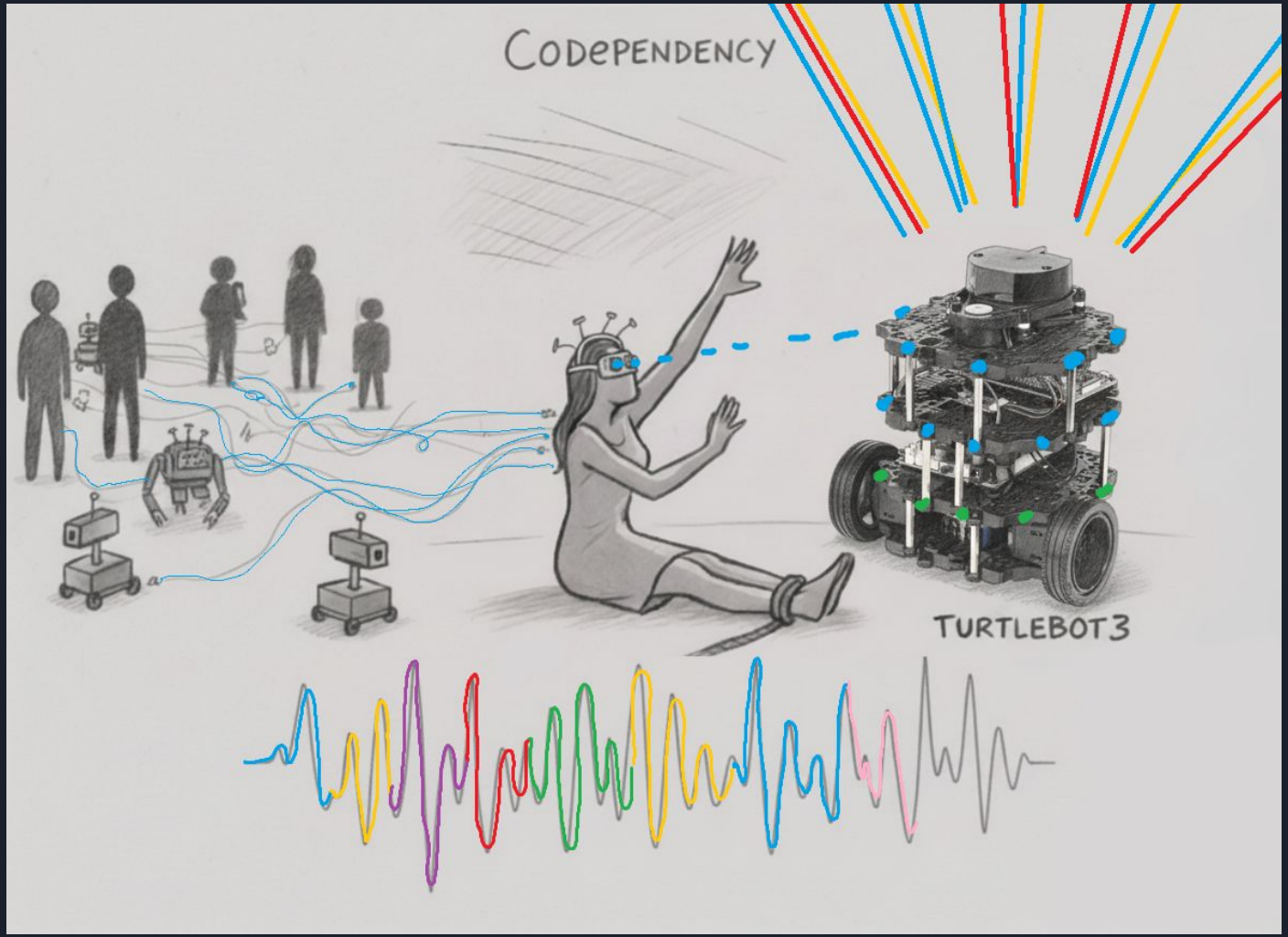


Source: https://docs.openbci.com/AddOns/Headwear/MarkIV/

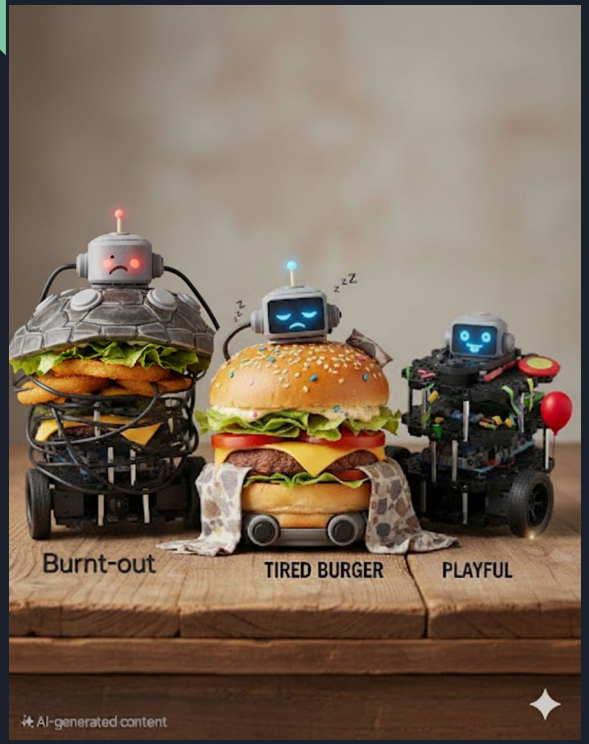
Hardware/Software Architecture

- UltraCortex → bluetooth → PC → WiFi → TurtleBot3

- Node 1
  - Python program connects to UltraCortex via BrainFlow
  - EEG signal Cleaning and filtering
  - Classify emotional states
  - Publish /mental_state to robot via ROS
- Node 2
  - Subscribe to /mental_state
  - Translate the state into actions
  - Controls the LED colors
  - Publishes to /cmd_vel to control robot movement


Codependency
TURTLEBOT3

THANK YOU!



Questions?