

Team Beyond Imagination



Communication Through Brainwaves at a Very Basic Level

Pia Behnsen, Maya Dupont, Laurens van der Harst, Marius
Kirschke, Fleur Meddens

Introduction

- ▶ Verbal communication is one of the most effective and efficient ways that humans use to transfer information
 - ▶ But what if you cannot speak, type, or communicate in any other way?



▶ Roger Ebert,



Steven Hawking,



Jean-Dominique Bauby

-
- ▶ Communication through brainwaves is possible, **BUT:**
 - ▶ With very accurate EEG-headsets
 - ▶ An experiment with letters of the alphabet arranged in a matrix (Nijboer et al., 2008)
 - ▶ With implanted electrodes in the brain
 - ▶ **Our challenge:**
 - ▶ Using a simple EEG-headset with only 14 electrodes
 - ▶ Communication of *words*: not individual letters



Research Question

“Is communication through brainwaves feasible at a very basic level?”



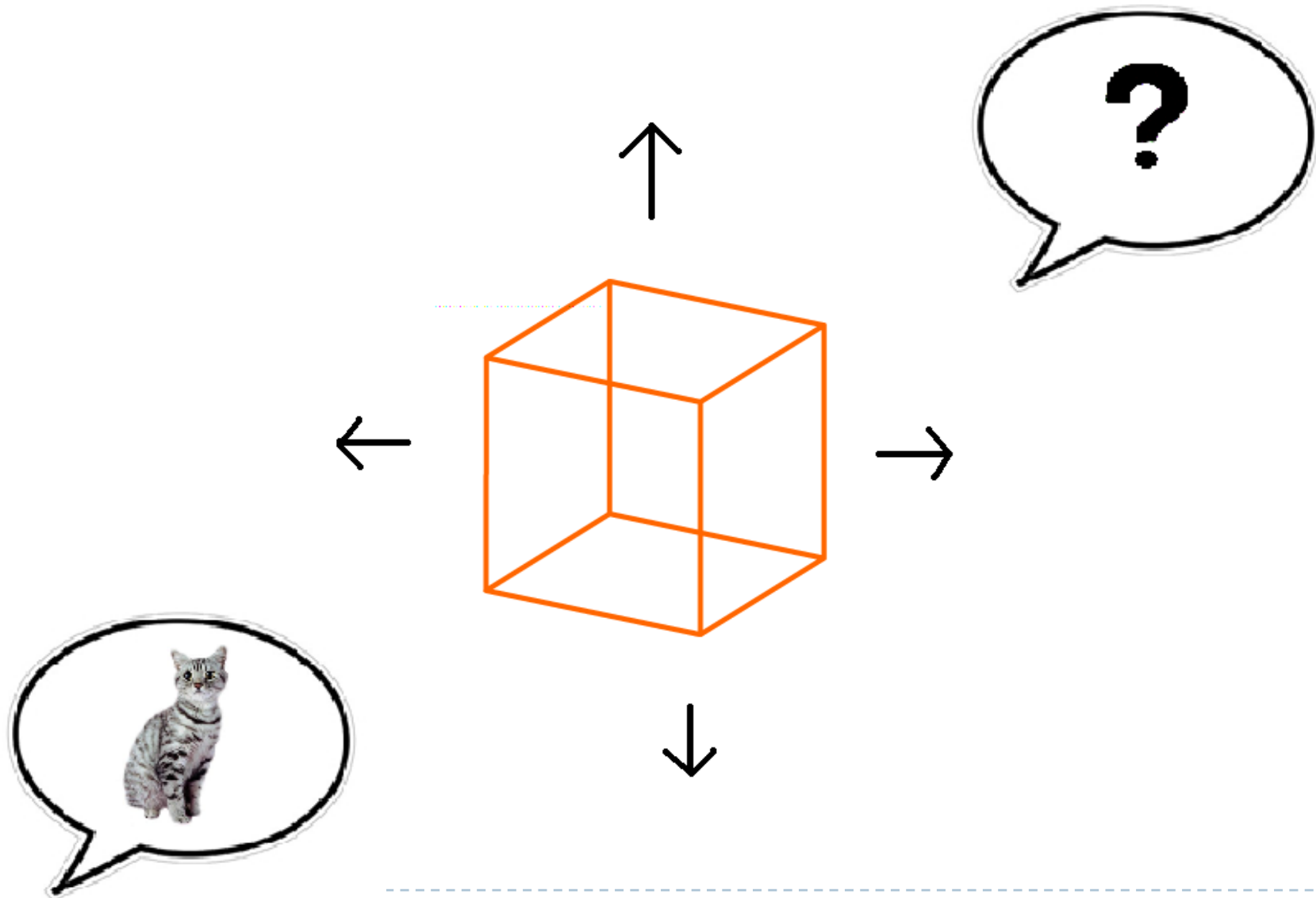
Experimental Set-Up



Experiment 1



Experiment 1



Experiment 2

- ▶ Can we find a correlation between brainwaves and words thought?
- ▶ Emotiv Test Bench
- ▶ Tested 4 Subjects
- ▶ Think “YES” for 3 second every 15 seconds for 1 minute and repeat for the word “NO”
- ▶ 3rd minute alternate between “YES” and “NO”



Project Movie: Our Ideal Result

- ▶ <http://www.youtube.com/watch?v=r9qMWqWBMhQ>



Data Analysis: Experiment 1

- ▶ Main goal: setting a first step in the direction of communication through brainwaves, by finding out whether looking at a certain image can be “communicated” through cube movements in the Emotive Suite



Data Analysis: Experiment 1



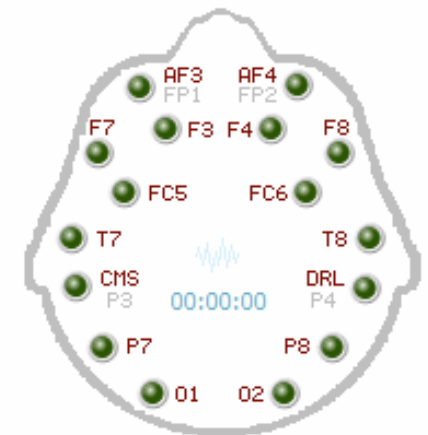
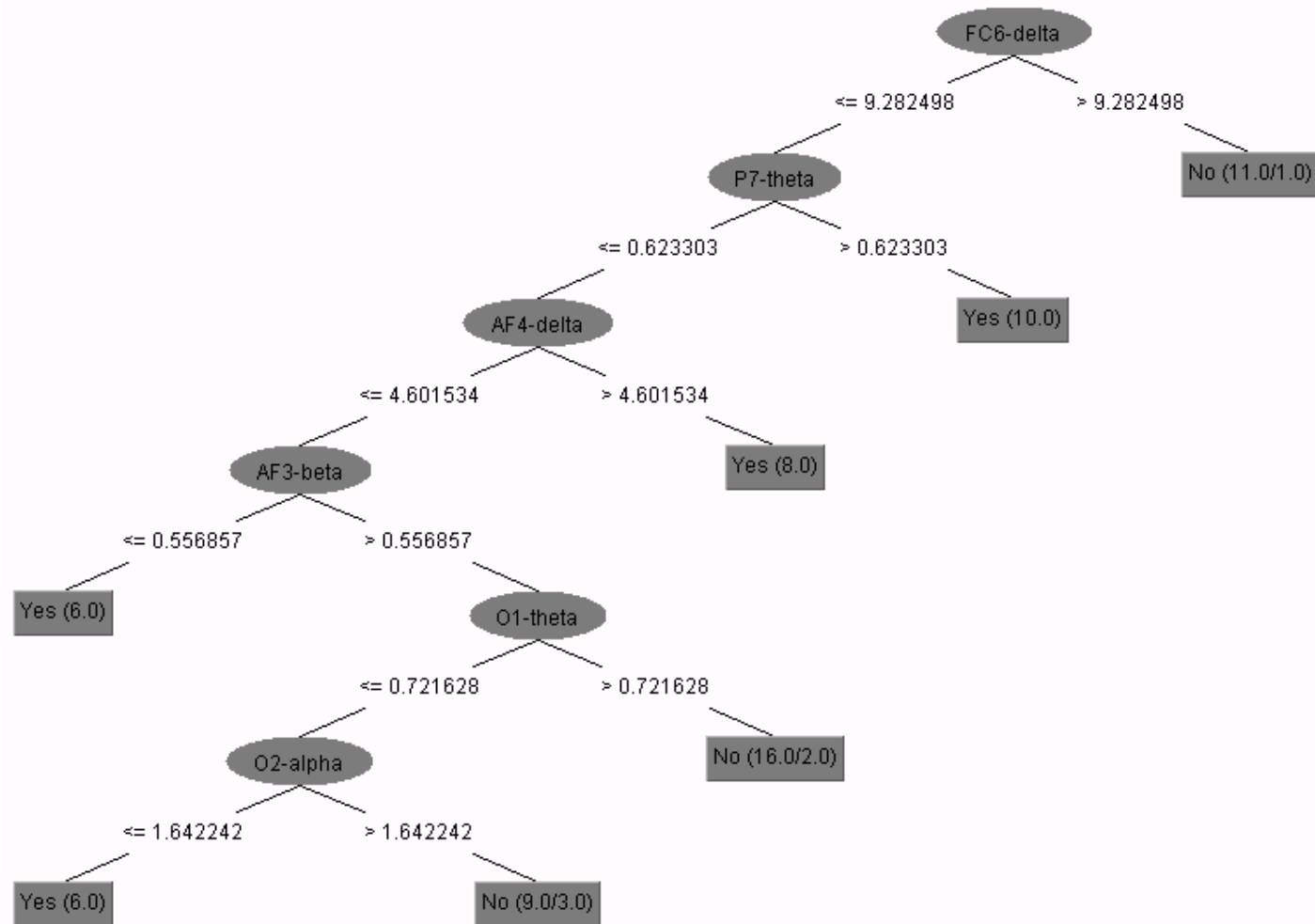
Data Analysis: Experiment 1

Test Subject	Correct guesses
Stefano	7 out of 10 (70%)
Pia	6 out of 10 (60%)
Maya	8 out of 10 (80%)
Average	21 out of 30 (70%)

- ▶ **It seems that with more training it should be possible to increase the success rate and be able to get a wider variety of possible replies.**



Data Analysis: Experiment 2



▶ === Confusion Matrix ===

▶ a b c <-- classified as

▶ 0 0 0 | a = Neutral

▶ 0 24 12 | b = Yes

▶ 0 14 16 | c = No



Conclusion

- ▶ Emotiv-headset was a limitation
- ▶ 'yes' success rate 66.67%
- ▶ Problem: individual differences in actively thinking 'yes' or 'no'
- ▶ Challenge of picking up abstract thoughts
- ▶ Everyone's brain is unique: not possible to find general patterns
- ▶ **In the near future, communication with a simple EEG-headset is not probably not feasible**

