Improving Performance in Brain Computer Interfacing

[1]

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Brain Computer Interface (BCI)

"One kind of communication system which does not depend on peripheral nerve and muscle of normal output channels" [9]

Need

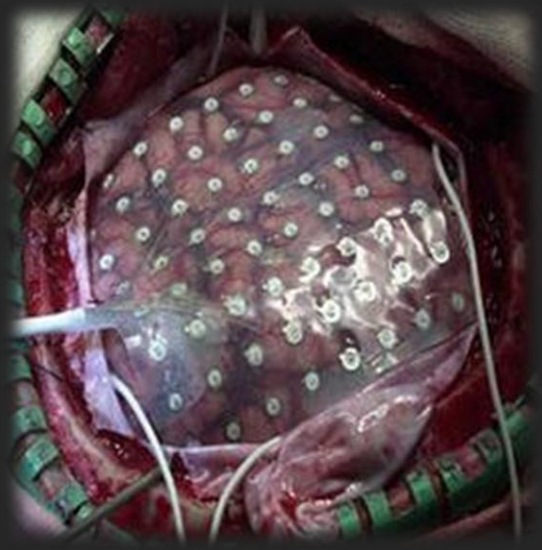
- Who can use BCI?
- What current applications are available?

[2]

Challenges

- BCI illiteracy
- Electrode Placement
- Information Transfer Rates
- Training

Invasive VS Non-invasive

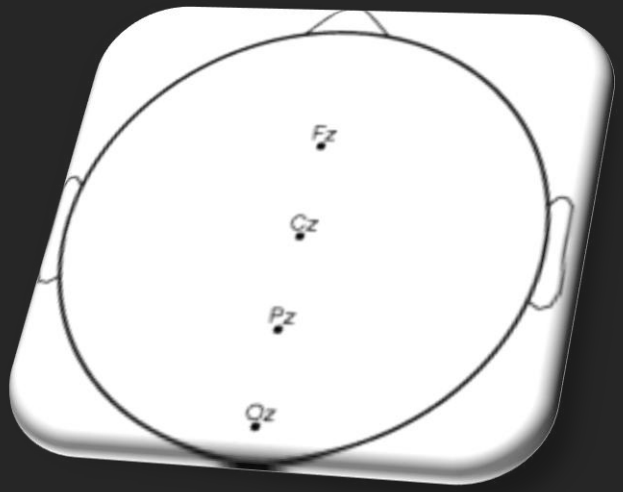


[3]

[4]

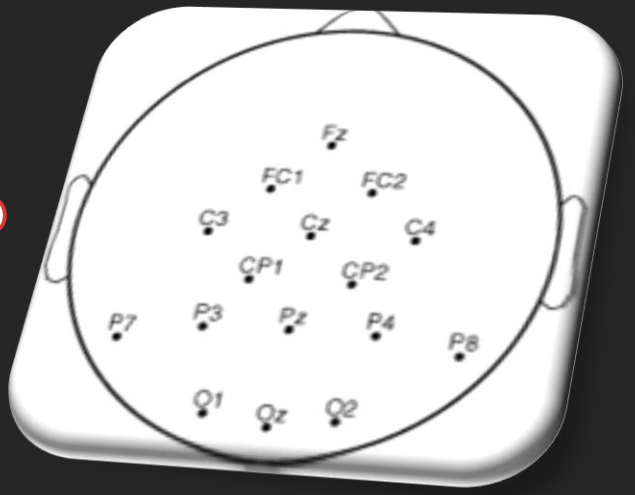
- Signal to Noise Ratio
- Ease of everyday
- Comfort

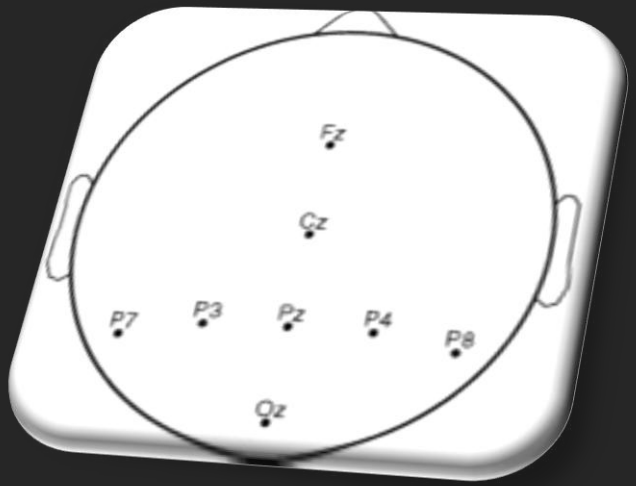
Non-invasive electrode configurations



4?

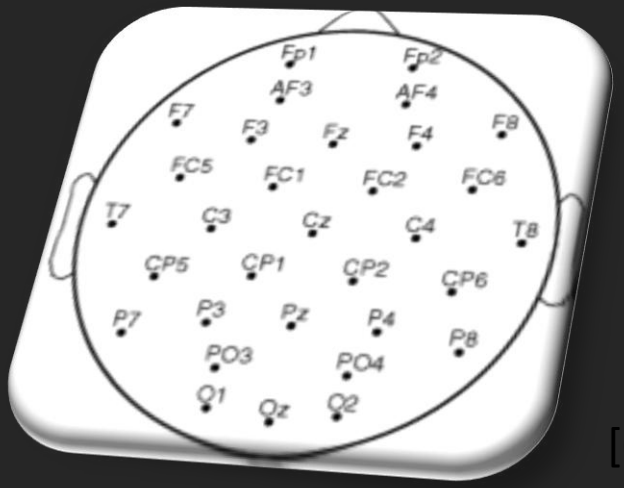
16?





8?

36?



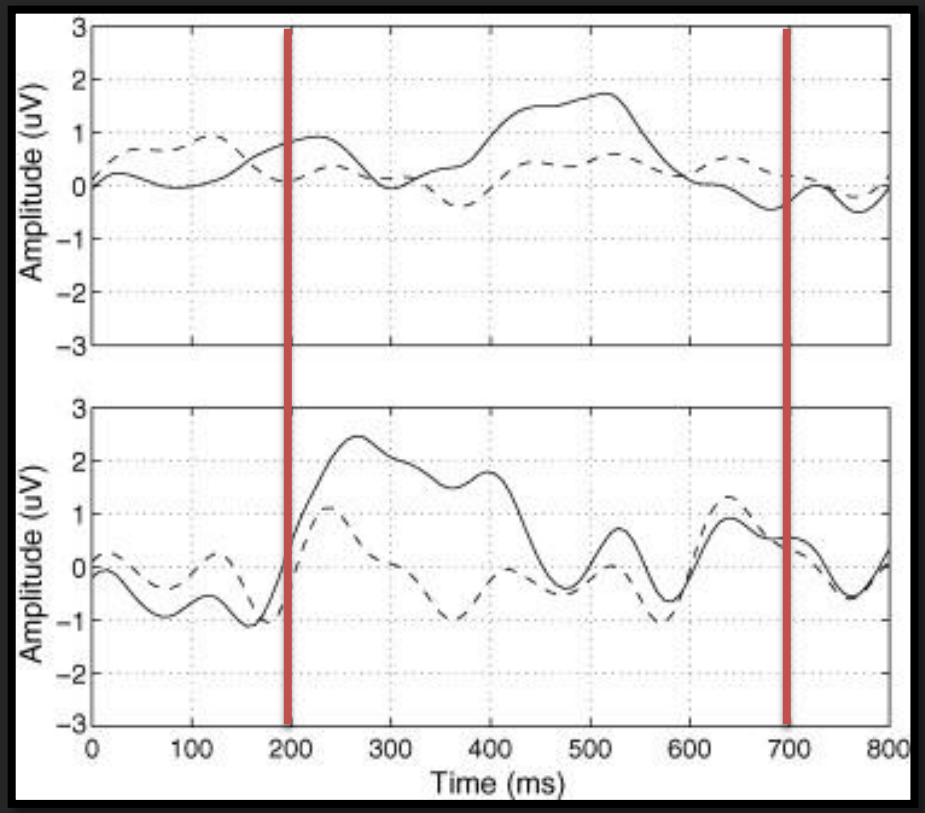
[6]

Types of Stimuli

- External
  - User responds to visually evoked stimulus
  - Flashing LED or buttons on screen
  - Steady State Visually Evoked Potential
- Internal
  - User responds to self-generated signal
  - Motor Imagery
  - Event Related Desynchronization
- Hybrid
  - Simultaneous stimuli (External & Internal)

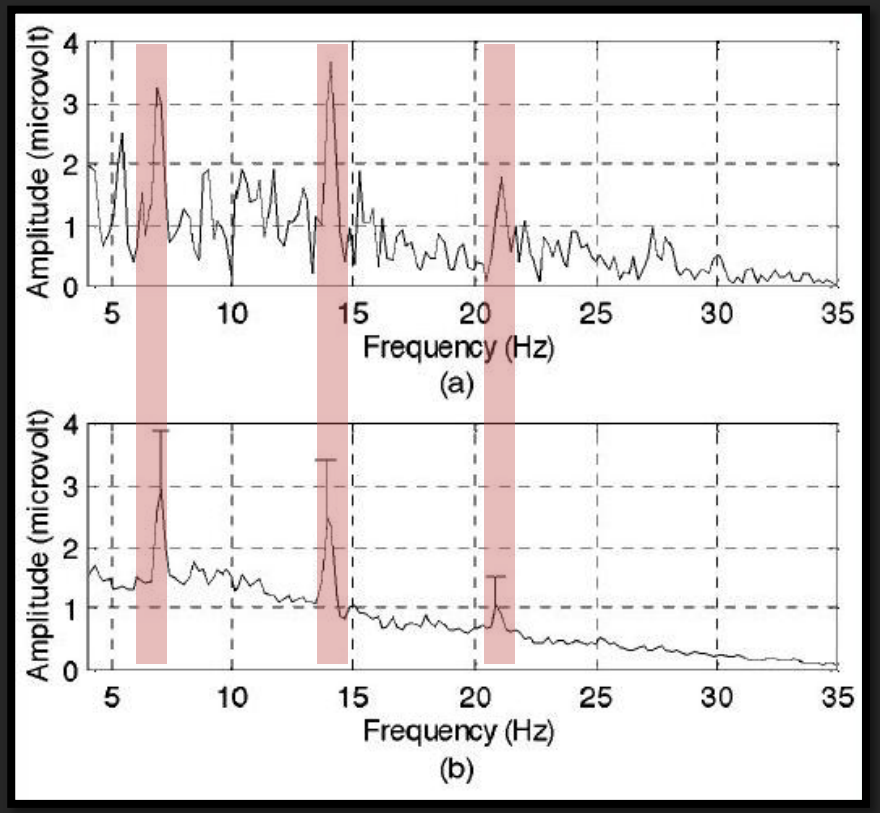
[5]

Signal Processing



[7]

P300



[8]

SSVEP

Other Approaches

- BCI for Dialling phone numbers [10]
  - Spatial locations of stimuli
- Robotic Wheel Chairs [11]
  - Overcome slow ITR
- BCI spelling system [12]
  - Test reliability of the data

Conclusions

- Electrode placement: best with 4 – 8 configuration
  - ❖Better signal = increased performance
- BCI Illiteracy can be minimised by using hybrid Stimuli techniques
  - ❖Increased universality = increased performance
- The external stimuli techniques require less training
  - ❖Increased efficiency = increased performance

References

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