EPSCoR State Conference 2017, April 4, 2017, Columbia, SC

Shaping the new human-technology frontier:
Controlling objects using signals emanating from a human brain

Stevo Bozinovski, Liljana Bozinovska

Department of Mathematics and Computer Science
Department of Biological and Physical Sciences
South Carolina State University

Overview

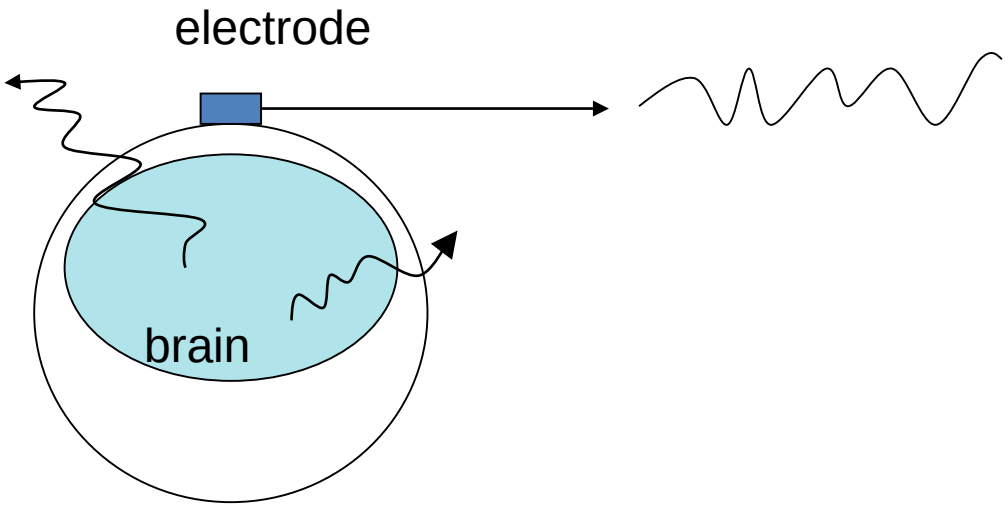
- Psychokinesis challenge
- Idea of EEG based psychokinesis
- Pioneering result, 1988
- Other results in 20th century
- Application of Brain-Computer Interface in 21st century
- EPSCoR support of the SCSU BCI group
- Current engagement of SCSU BCI group

Introduction: The challenge of psychokinesis

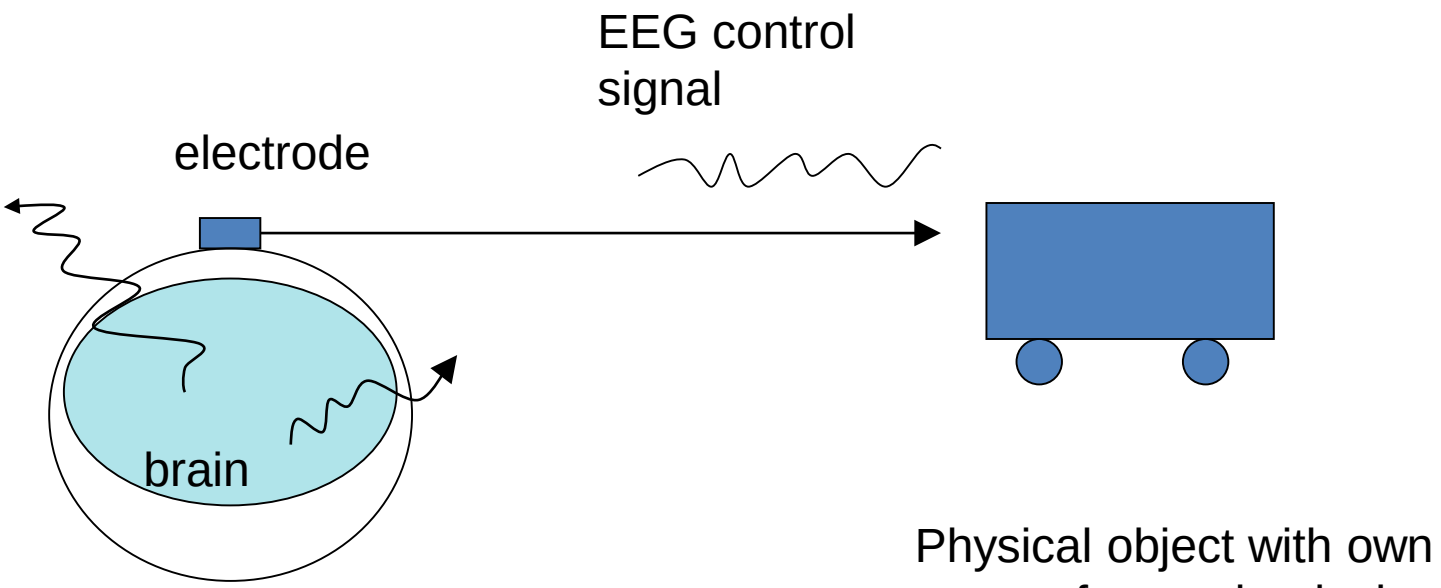
- It was an old dream of people to move physical objects using energy emanating from human brain. It science fiction literature it was named psychokinesis.

Idea: EEG-based psychokinesis

- Observation 1987: EEG is measured on the scalp and electromagnetic energy is generated by the brain: So EEG is representation of electromagnetic energy generated by the brain. Is EEG-based psychokinesis possible?

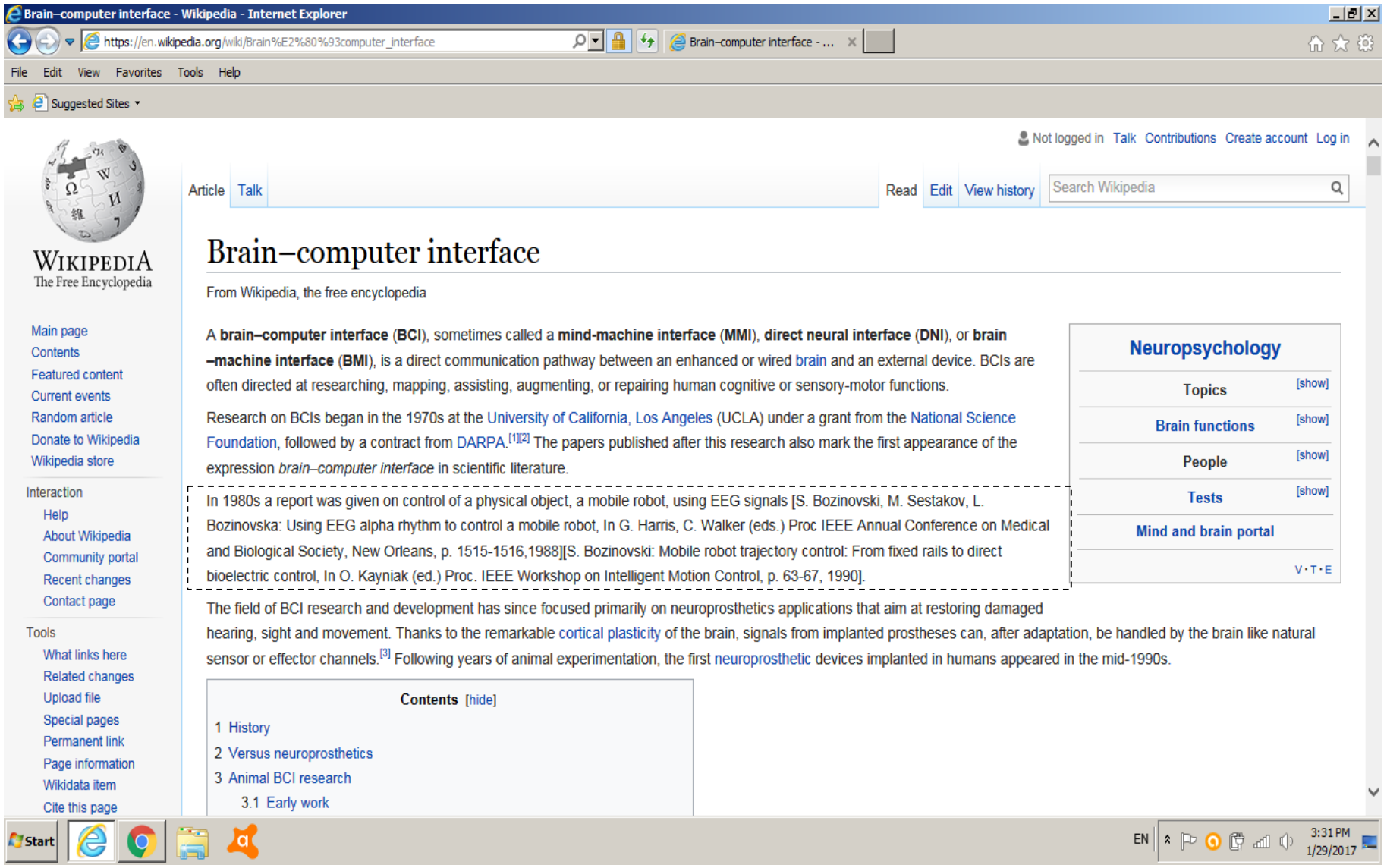


Conceptual design



Physical object with own energy for mechanical movement

Experimental proof of the concept, 1988



20th century achievements

- 1988, Pioneering achievement, in Macedonia, (Bozinovski, Sestakov, Bozinovska): Energy emanating from human brain, non invasively

- 1999, second control of a physical object, in North Carolina (Chapin, Moxon, Markowitz, Nicolelis): Energy measured inside brain of an animal, a rat, invasively

- In 20th century there was no other result in controlling physical objects using energy generated by the human brain

Brain-Computer Interface

- Brain computer interface is a way of controlling both virtual objects on computer screen and physical objects, using biosignals

Applications of Brain-Computer Interface

- In 21st century there are thousands of reports about using brain and other signals to control both virtual objects on the screen and physical objects

Application of brain computer interface

- Writing a text on a computer screen
- Moving a visual object on a computer screen
- Moving a physical object
  - A robot
  - A wheelchair
  - A prosthesis

EPSCoR support for the SCSU brain-computer interface group

- 2005-2009 RII for Neuroscience and Brain Computer Interface at SCSU
- 2009-2011 RII for masters program in Biorobotics and Biofabrication at SCSU

Current work on BCI at SCSU

- Building low cost devices for Brain-Computer Interface

- Report:. Mental states, EEG manifestations, and mentally emulated digital circuits for brain-robot interaction, IEEE Transactions on Autonomous Mental Development, 7(1) 2015