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The web and brain signals

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Entertainment

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As internet users, we are all accustomed to reading the news online, buying stuff online and interacting with friends and family through social networks. We all share one common factor that allows us to do so – we can all move our hands, enough to move a mouse pointer around the screen and click. But what if you didn't have that luxury?

Accessibility is one area of research and practice that attempts to bridge this gap, allowing people with different limitations to access technology and use it to its full extent. The web is one of these technologies, and web accessibility aims at improving the level of usability for people with different types of impairments, including visual, auditory, cognitive and motor. Several standards and recommendations exist, and organisations, as well as the public sector, should take these into account when building their own public-facing systems.

In a recent multi-disciplinary effort, Dr Chris Porter and Dr Tracey Camilleri have started investigating web interaction for people with severe motor limitations, or people who have little to no range of motion. This group of people is generally underserved by the technological community, and in turn by standards bodies and regulators. This was the motivation behind this research.

By reading specific brain signals, known as steady-state visually evoked potentials (SSVEP), the team can capture and interpret user intentions and act upon them. More specifically, the user is presented with a set of flickering stimuli which act as control icons.

The user activates the controls associated with these icons by looking at the respective stimulus. This automatically generates specific brain patterns which are read through non-invasive electrodes placed on the occipital region of the brain and processed through signal processing techniques to identify the user's intention.

By bringing together Dr Camilleri's expertise on biomedical signal processing and human machine interfaces as well as Dr Porter's research on human-computer interaction and web accessibility, the team is developing a web-based and standards-driven technology to allow users to interact online using a non-intrusive brain-computer interface (BCI), hence opening a different communication channel to those with severe motor impairments.

The development of such a brain computer interface presents several challenges including the use of low-cost, wireless, brain signal recording equipment which may constrain the position of electrodes and the quality of the recorded signals, the development of advanced signal processing techniques to determine the user's intentions promptly and with very high accuracy and the development of tools to build online interfaces which afford ergonomic browsing and communication experiences for different types of users. Addressing these challenges will help bring BCIs outside of the lab environment and make them accessible to the people who need them most.

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