BrainNet allows three people to communicate using brainwaves to play Tetris

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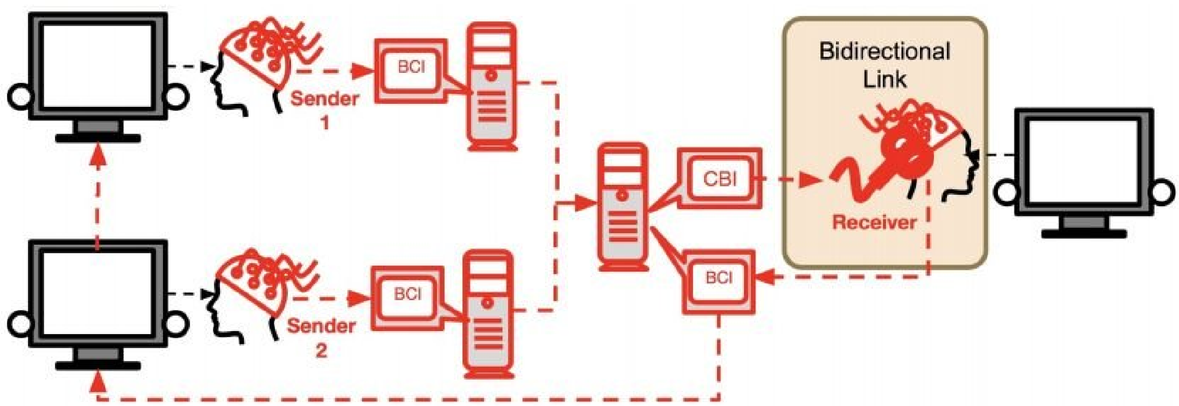

Architecture of BrainNet. Two participants ("Sender 1" and "Sender 2") each use a Brain-Computer Interface (BCI) based on EEG to convey information about a collaborative task (here, a Tetris-like game) directly to the brain of the third participant ("Receiver"). Information from each Sender is transmitted over the internet to the Receiver's brain via a Computer-Brain Interface (CBI) based on TMS. After consciously processing the two inputs from the Senders, the Receiver uses a BCI based on EEG to execute an action in the task. The Senders see the result of this action on the task and have another opportunity to convey to the Receiver's brain new information to potentially rectify an incorrect choice in the first round. While our experiment only used two rounds, BrainNet allows an arbitrary number of interactions between the Senders and the Receiver as they collaborate to solve a task. Credit: arXiv:1809.08632 [cs.HC]

A combined team of researchers from the University of Washington and Carnegie Mellon University has developed what they call BrainNet —a system that allows three people to communicate with one another using only brain waves. They have written a paper describing their system and how well it works and have posted it on the *arXiv* preprint server.

Prior research has shown that it is possible for two people to collaborate to a limited extent using brain waves to play a video game. In this new effort, the researchers have extended the idea to include a third person.

Two volunteers were fitted with electrodes on their scalps to detect brain waves—standard electroencephalogram hardware and software were used to process the signals. A third volunteer was fitted with electrodes for reading brain waves, but also had devices placed near his head for conducting transcranial magnetic stimulation. The first two volunteers were deemed senders—they watched the same Tetris game as the third person, called the receiver, and gave hints using their minds. Prior research had shown that when a person looks at an LED blinking at 15 Hz, their brain waves sync with it, and begin transmitting at the same frequency. Likewise, if that person switches to looking at an LED blinking at 17 Hz, their brainwaves start transmitting at 17 Hz. This allowed the senders to speak in binary to the receiver—rotate the falling object, or don't rotate it.

For his part, the receiver needed the hints from the senders because his view of the game was partially blocked—he was not able to see the bottom half of the screen. By listening to the binary messages from the senders, he would know whether to rotate a falling object or not. Prior research had shown that when a subject received a magnetic pulse to the occipital lobe in the brain, they would see a flash of light. Thus, to "hear" a message from a sender, the receiver would see such flashes of light indicating when to rotate the block. Afterward, the senders could offer more hints based on changes in orientation to the object in the game.

The researchers suggest there is no reason BrainNet could not be expanded to include as many people as desired—they envision such networks being used to solve problems collaboratively using the Internet.

More information: BrainNet: A Multi-Person Brain-to-Brain Interface for Direct Collaboration Between Brains, arXiv:1809.08632 [cs.HC] arxiv.org/abs/1809.08632