

P300 speller experiment: Hyperscanning

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Many futurists believe that people in the distant future will use advanced technology to work together more directly, something like a “hive mind”. People could use technology to help them not just work together but also think together, accomplishing goals more quickly and effectively. That future may not be so distant. Recently, the intendiX speller was used for a demonstration called “Hyperscanning” that represents an important step toward direct cooperation through thought alone.

Today, several different groups have EEG-based P300 spellers that (like intendiX) can identify targets reliably with about 3 flashes per letter (Fazel-Rezai et al., 2012; Guger et al., 2012; Jin et al., in press). But, despite very extensive effort from groups around the world, faster communication has not been possible without neurosurgery, since brainwave activity from one flash is usually too noisy for accurate classification.

Recently, eight people worked together to spell “MerryXmas” through intendiX with only one flash per letter (see Figure 1). intendiX spelled all 9 characters without a single mistake. Hence, by combining the brainwave signals across eight people, intendiX managed to substantially improve communication speed and accuracy.

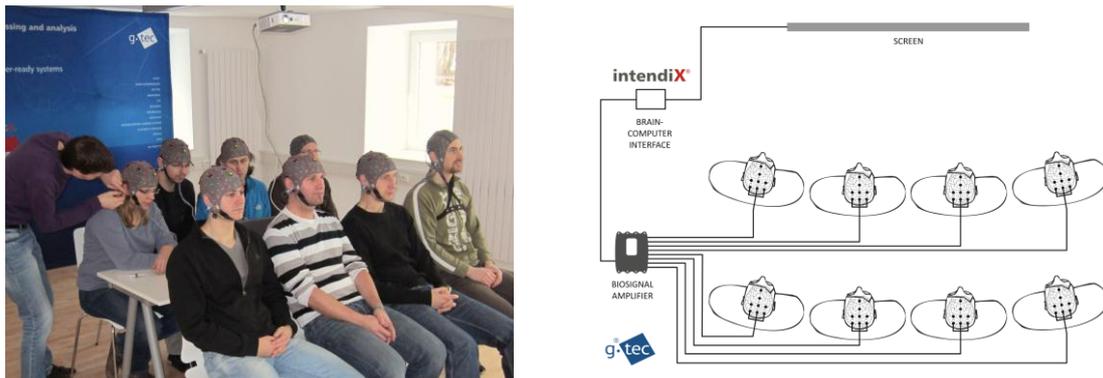


Figure 1: The left panel is a photograph of eight users using intendiX to cooperatively and simultaneously spell “MerryXmas”. The right panel shows a schematic of the Hyperscanning system.

To see this improvement of speed and accuracy, the obtained accuracy level of the applied classifier is calculated as a function of used number of flashes for discrimination. This is done for one subject and all subjects (see Figure 2). One subject reaches an accuracy of 100 percent after 8 flashes, so it takes 20 seconds per character. All subjects together reach an accuracy of 100 percent after 2 flashes, so it takes only 5 seconds per character. A character can be selected much faster and same accuracy with all subjects together as only on subject can do it. The comparison clearly shows the possibilities of such a combination of people.

This approach could be used for cooperative control for many different applications. People might work together to play games or draw paintings by combining the intendiX SOCI or painting modules, or could work together for other tasks like making music, voting or otherwise making decisions, or solving problems. Someday, users might put their heads together for the most direct “meeting of the minds” ever.

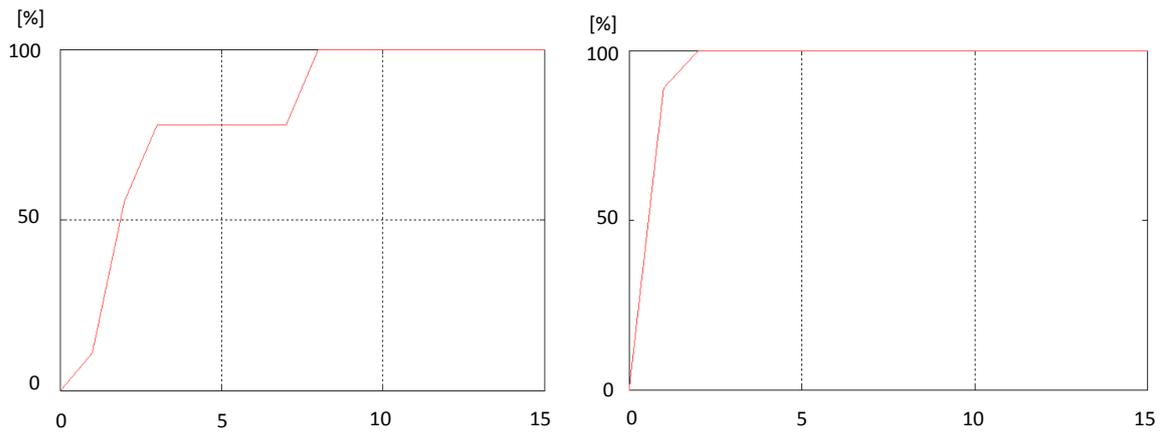


Figure 2: The left panel shows the accuracy level as a function of used number of flashes for one subject and the right panel for all eight users.

Check out the video under <http://www.gtec.at/Research/Videos>