



EGBE 693 Research Seminar for Biomedical Engineering II

EGBE 691 Biomedical Engineering Seminar II

Date: April 1, 2014 Time: 10AM-11AM

Department of Biomedical Engineering

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“New stimulation pattern design to improve P300-based matrix speller performance at high flash rate ”

We propose a new stimulation pattern design for the P300-based matrix speller aimed at increasing the minimum target-to-target interval (TTI). Inspired by the simplicity and strong performance of the conventional row-column (RC) stimulation, the proposed stimulation is obtained by modifying the RC stimulation through alternating row and column flashes which are selected based on the proposed design rules. The second flash of the double-flash components is then delayed for a number of flashing instants to increase the minimum TTI. The trade-off inherited in this approach is the reduced randomness within the stimulation pattern. We test the proposed stimulation pattern and compare its performance in terms of selection accuracy, raw and practical bit rates with the conventional RC flashing paradigm over several flash rates. By increasing the minimum TTI within the stimulation sequence, the proposed stimulation has more event-related potentials that can be identified compared to that of the conventional RC stimulations, as the flash rate increases. This leads to significant performance improvement in terms of the letter selection accuracy, the raw and practical bit rates over the conventional RC stimulation. These studies demonstrate that significant performance improvement over the RC stimulation is obtained without additional testing or training samples to compensate for low P300 amplitude at high flash rate. We show that our proposed stimulation is more robust to reduced signal strength due to the increased flash rate than the RC stimulation.