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Automatic Control and Systems Engineering

The Department of Automatic Control & Systems Engineering
is pleased to announce the following seminar:

Establishment of a novel multimodal neural interface to measure and modify neural activity: an event-related potential study

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Wednesday, 10 June 2020 at 14:00
Via Google Meet

Host Academic: Professor Ivan Minev, ACSE

Abstract

Neuroprosthetics are microelectronic systems applied to understand the neuronal basis of behaviour especially in case of neurological and psychiatric diseases via recording of the activity of the central nervous system (CNS). Through stimulation, neural implants further aim at modulating neural behaviour to restore lost or impaired CNS function.

Within the present project we would like to exploit further applications of this innovative technology by introducing a 3D printed flexible multimodal neural interface into a new scope: alcohol addiction. Alcohol use disorder (AUD) is one of the most frequent addictive diseases going along with a high economic burden on society. The duration of clinical treatment for alcohol addiction is in the range of several months. The probability of relapse remains high. As conventional behavioural and pharmaceutical therapies reveal a lack of efficacy, brain stimulation techniques might offer an alternative approach and are currently part of research.

The development of an addiction and consistent urge for a drug (craving) are associated with an altered neural reaction to drug-related stimuli measurable in the form of event-related brain potentials (ERP). Addicted individuals display reduced ERP amplitudes and increased ERP latencies that are related to disturbed behaviour control and increased relapse risk.

Here, we successfully established a flexible neural implant for application in awake rats to investigate auditory ERP after acute alcohol application and following implant-driven electrical and chemical brain stimulation: alcohol reduced brain activity as also seen here in dose-dependently decreased ERPs while stimulation was able to enhance ERP amplitudes.

Based on these findings and with further involvement of Machine Learning algorithms we aim at developing a closed-loop neural interface for individual relapse prevention in addictive disorders such as AUD.

Biography

I received degrees in Biotechnology (B.Sc., University of Applied Sciences Zittau/Görlitz, Germany) and Radiation Biology (M.Sc., University College London) before initially working in the area of Radiooncology at the Medical Faculty of TU Dresden. Due to growing interest in neuroprosthetics I further studied Sensors & Cognitive Psychology (B.Sc. and M.Sc.) at TU Chemnitz (Germany), a very interdisciplinary study program focusing on man-machine interaction. Since 2015 I am part of the groups Experimental Psychiatry & Neurobiology of Psychiatric Diseases at TU Dresden, currently working towards a PhD in neurosciences