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Brain signal analysis for emotion recognition and brain machine interface

Emotion recognition by analyzing electroencephalographic (EEG) recordings is a growing area of research. EEG can detect neurological activities and collect data representing brain signals without the need for any invasive technology or procedures. EEG recordings are found useful for the detection of emotions through monitoring the characteristics of spatiotemporal variations of activations inside the brain. Specific spectral descriptors as features are extracted from EEG data to quantify the spatiotemporal variations to distinguish different emotions. Several features representing different brain activities are estimated for the classification of emotions. A brain machine interface using EEG data facilitates the control of machines through the analysis and classification of signals directly from the human brain. The collected EEG data is analyzed by an independent component analysis based feature extraction methodology and classified using a multilayer neural network classifier into several control signals for controlling a robot. The system also collects the data of electromyography signals indicative of movement of the facial muscles. Research work is progressing to extend the range of controls beyond a set of discrete actions by refining the algorithmic steps and procedures.

Biography

Vijayan K Asari is a Professor in Electrical and Computer Engineering and Ohio Research Scholars Endowed Chair in Wide Area Surveillance at the University of Dayton, Dayton, Ohio, USA. He is the Director of the Center of Excellence for Computer Vision and Wide Area Surveillance Research (Vision Lab) at UD. His research activities include development of novel algorithms for human identification by face recognition, human action and activity recognition, brain signal analysis for emotion recognition and brain machine interface, 3D scene creation from 2D video streams, 3D scene change detection, and automatic visibility improvement of images captured in various weather conditions. He received his BS in electronics and communication engineering from the University of Kerala, India, and M Tech and PhD degrees in Electrical Engineering from the Indian Institute of Technology, Madras. Prior to joining UD in February 2010, he worked as Professor in Electrical and Computer Engineering at Old Dominion University, Norfolk, Virginia for 10 years. He worked at National University of Singapore during 1996-98 and led a research team for the development of a vision-guided microrobotic endoscopy system. He also worked at Nanyang Technological University, Singapore during 1998-2000, and led the computer vision and image processing related research activities in the Center for High Performance Embedded Systems at NTU. He holds three patents and has published more than 480 research papers, including 80 peer-reviewed journal papers in the areas of image processing, pattern recognition, machine learning and high performance embedded systems. He has supervised 20 PhD dissertations and 32 MS theses during the last 14 years. Currently 18 graduate students are working with him in different sponsored research projects. He is participating in several federal and private funded research projects and he has so far managed around $15M research funding. He received several teaching, research, advising and technical leadership awards. He is a Senior Member of IEEE and SPIE, and member of the IEEE Computational Intelligence Society. He is the co-organizer of several SPIE and IEEE conferences and workshops.

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