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APPROXIMATE ENTROPY BASED CLASSIFICATION OF DEPTH OF ANESTHESIA

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Monitoring depth of anesthesia (DoA) is one of the current challenges in anesthesia research. Modern depth of anesthesia monitors use frontal EEG signal to derive DoA measures. The anesthetic drugs act mainly on the central nervous system (CNS) hence, EEG signal processing during anesthesia is useful to monitor the patient's depth of anesthesia. This study aims to measure depth of anesthesia (DoA) using approximate entropy of EEG signals and classify them according to the DoA. Approximate entropy of the EEG signal is extracted as a measure of DoA from the EEG signals collected during the four phases of general anesthesia called awake, induction, maintenance and recovery. Approximate entropy is a time domain algorithm that measures the regularity and randomness of the EEG signals during different phases of anesthesia, where EEG signal is considered as a time series data. A low value of approximate entropy indicates anesthetized state where as high value indicates that the patient is awake. Approximate entropy values is high in awake because of the increased randomness in the EEG signal. EEG shows regularity when depth of anesthesia increases. Induction phase EEG signals are more regular compared to all other EEG signals. Therefore the approximate entropy in the induction phase shows low values. Finally these approximate entropy features are compared with commercially available BIS and got 81% correlation. Artificial neural network (ANN) is used in this study to classify EEG signal according to different anesthetic stages. A feed forward back propagation ANN is used to implement the classification. The activation function employed for all the neuron units in the network is. Approximate entropy extracted during the 4 phases are applied as input to the artificial neural network. The whole data set is divided into 2 groups: Training data set and testing data set. Training data sets trains the network where as the testing data set would check the effectiveness of the classifier. In this study, there were 4 output classes: Awake state, light anesthesia state, moderate anesthesia state and deep anesthesia state. The classification accuracy is 91.6%. Present study helps to assist Anaesthesiologists in anesthesia decision making and management.

Biography

Benzy V K worked as Lecturer in MES College of Engineering in Department of Applied Electronics and Instrumentation from from 2004-06. She worked as an Assistant Professor at Prime College of Engineering, Palakkad, Department of Electronics and Communication from 2011-12. She has done PhD in Engineering from Govt. Engineering College, at Calicut University during 2012-2015. She completed her MTech in Technology Management at University of Kerala during 2002-2004 and BTech in Applied Electronics and Instrumentation Engineering at MES College of Engineering, Kerala during 1996-2000.

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