بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

شبكة المعلومات الجامعية

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MONA MAGHRABY

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جامعة عين شمس

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قسم

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Thought-Based Animated Character

Thesis submitted as a partial fulfillment of the requirements for the degree of Master of Science in Computer and Information Sciences

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Thought-Based Animated Character

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Abstract

BCI (Brain-Computer Interface) gives people great power to manipulate things around them with the power of their thought: It gives them control on their devices, it is considered a powerful tool to assist people with disabilities: it helps them to move around and control things around them, it allows us to remotely control robots, and could even be useful to get personalized systems depending upon one's mood.

The most important part in any BCI system is interpreting the brain signals. Many different mental tasks are considered by researchers. Our work mostly focuses on motor imagery tasks, specifically imagining left hand movement, right hand, foot and tongue.

We developed three different methods to interpret brain signals:

- In the first method, we used Empirical Mode Decomposition (EMD) for feature extraction and Support Vector Machine (SVM) with Radial Basis Function (RBF) kernel for classification. We evaluated the system using the publicly available BCI competition IV dataset and reached very promising accuracy.

- In the second method, we proposed a feature extraction method based on Empirical Mode Decomposition (EMD), where The Electroencephalography (EEG) signal is decomposed into Intrinsic Mode Functions (IMFs) by

the EMD algorithm and six statistical estimated parameters are calculated. Afterwards, Common Spatial Pattern (CSP) is applied to filter the feature vector and select the best features to overcome the curse of dimensionality problem. Then, the resultant features vector is fed to a Support Vector Machine (SVM) for classification. Promising results are obtained by testing the proposed model on the publicly available BCI competition 2008 dataset where a kappa result of 0.44 is achieved.

- In the third method, we proposed a model based on estimating statistical parameters of the EEG signals and used these as features. We then fed the features vector to a multi-class Support Vector Machine (SVM) for classification. An average classification rate of 90.2% and a kappa result of 0.86 were achieved. The kappa result is considered a very good agreement.

We then showed the results of these methods on a 3D animated character. Each motor imagery task was resembled by a corresponding animation performed by the 3D character. We used Adobe Animator for creating the model and displayed it in matlab.

To my mother and father,
who always picked me up on time
and encouraged me to go on every adventure,
especially this one.

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﴿ الْحَمْدُ لِلَّهِ الَّذِي هَدَانَا لِهَٰذَا وَمَا كُنَّا لِنَهْتَدِيَ لَوْلَا أَنْ هَدَانَا اللَّهُ ﴾ – ٤٣ سورة الأعراف

Noran Elkafrawy

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