

# Development of a P300 Brain-Machine Interface and Design of an Elastic Mechanism for Rehabilitation Robot

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**ABSTRACT:** This paper focus on the development of P300 speller and design of a rehabilitation robot for brain machine interface. This research method mainly points out a norm which can be used to recognize whether the individual's independence is increasing or decreasing comparing with the original signals after extracting and composing some different features. The result shows that this feature combination, SMCF, can keep 90% sorting rate when the "Round" number is 5, also it can reduce the relationship of individual independence. Among the results, the highest value can increase to 36.04%.

On the other hand, considering the interaction between people and machines under safety constraints without utilizing difficult and complex control strategies, this paper proposes a new actuator design, adaptive coupled elastic actuator (ACEA) with adjustable characteristics adaptive to the applied output force and input force. This would provide oncoming robotic systems with an intrinsic compromise between performance and safety in unstructured environments; namely, exhibiting desired intrinsic lower and higher output impedance depending on different operation situations. Finally, experimental results are presented to show the desired properties of the proposed ACEA system.

**Keywords:** *Physical human-robot interaction, coupled elastic actuation, adaptive coupled elastic actuator, compliant actuators, human-machine systems*