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### Authors
Kolar, Prasanna
Kolar, Prasanna



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# Implementing Riemannian Geometry Based Cognitive Brain Computer Interfacesin Smart Assistive Technologies

**Prasanna Kolar**
UTSA, San Antonio, Texas, United States

**Prasanna Kolar**
University of Texas At San Antonio, San Antonio, Texas, United States

**Abstract**

The world is witnessing an increase in the need of technology for human assistance and some of the most prominent may be due to the surge in numbers of elderly needing assistive care, a surge in the numbers of people without mobility either due to accidents, disease or age and the surge in assistive safety technologies like driver assistance. Although asynchronous electroencephanography(EEG) can play a key role in providing assistive technologies in all three of the mentioned areas, the focus of this research is the development of technologies that utilize cognition-in-the-loop to improve living situations of individuals and the community. We have developed a hybrid Brain Computer Interface that implements a signal classification system based on Riemannian Geometry to classify the measurements from the scalp of the user and generate the necessary commands to enable the smart assistive systems to function. The hybrid brain computing interface consists of a steady state visually evoked potential subsystem coupled with a P300 cognitive subsystem, both the systems complement each other. The accuracy seen with the SSVEP system was around 92


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