Title: Mobile Brain-Machine Interface for Integrated Information Social/Cognitive Network Operations
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Summary:
In order for the information network to interact with the social/cognitive network in collaborative operations, it is important that it has precise knowledge of the "state-of-the-mind", e.g., overloading of the latter, so it will provide information matched to the human cognitive capability. Researchers use an Electroencephalography (EEG) based brain-machine interface (BMI) as a sensor or detector of human cognition, and use it to extract quantitative "neural signatures" of brain responses. In such a BMI, electrodes are attached to the scalp of a human to record the voltage signals generated by the neural electric sources associated with underlying mental activities. An inverse algorithm will be used to reconstruct the neural source distributions in the different parts of the brain, which then serve as the neural signatures for these activities. As the humans in the social network can move around, a wireless mobile network of BMIs will be considered in this project. The servers in the information network can dynamically query the nodes (humans) of interest and request EEG signals sent through the Battlespace mobile communication network to designated processors for neural signature extraction. The neural signatures for all the humans can then be used collectively to perform C3 functions.

By studying the neural signatures for experimental subjects performing activities in response to inputs from an information network, we will better understand how humans make decisions in a social environment. The results can be used to design information systems that are more adapted to the human decision process. We use pattern recognition techniques to extract spatial-temporal features from the neural signatures, which the information network can then use as "precursors" to predict future conditions, e.g., fear, overloading. This will allow the information network to more adaptively and autonomously transform data to understand the human network, without overloading the latter one. We also consider using the neural signatures as part of a biometrics system to enhance the trust in the human network.