Mathematical, Computational, and Perceptual Foundations for Interactive Cyber-Physical Systems

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Goal:

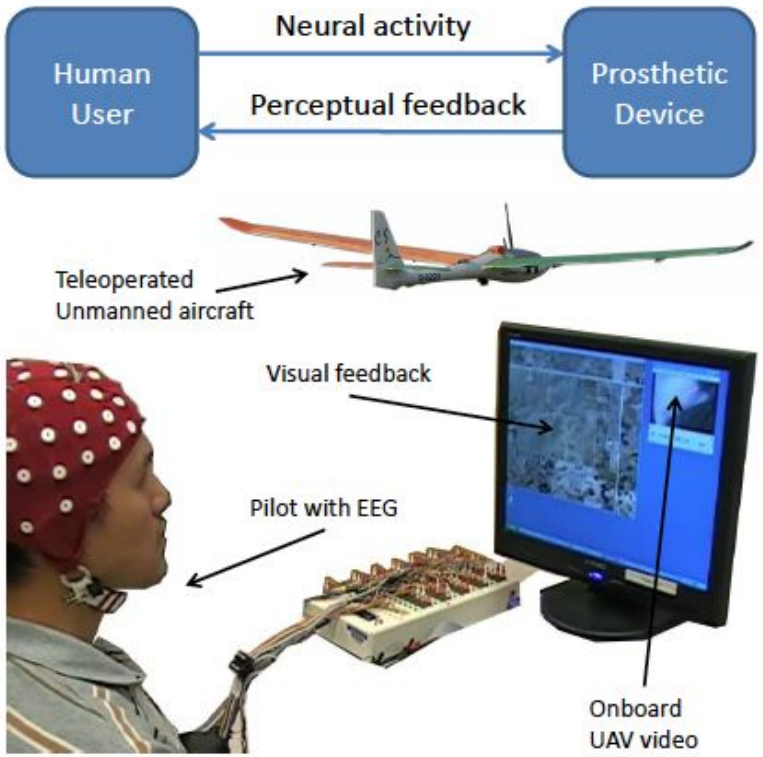
- Create interfaces that enable people with impaired sensory-motor function to control interactive cyber-physical systems such as artificial limbs, wheelchairs, automobiles, and aircraft

Key Idea:

- Enhance performance merely by changing the **perceptual feedback** given to the human user

Approach:

- Encode local performance criteria (e.g., stability and collision avoidance) by potential functions, and use gradients of these functions to modify feedback
- Encode global performance criteria (e.g., optimal navigation) by conditional probabilities on a language of motion primitives, and use metric embeddings of these probabilities to modify feedback



Example: By careful choice of visual feedback, we have enabled a human pilot to fly an unmanned aircraft with input only from an electroencephalograph (EEG)