Augmented Cognition to enhance human sensory awareness, cognitive functioning and psychic functioning: a research proposal in two phases

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Overview and objectives

Augmented cognition (AC) is a specialized area in human factors engineering that employs brain-computer interface (BCI) and human-computer interface (HCI) technologies to enhance human awareness and cognitive functioning. By translating subtle "non-conscious" information into conscious awareness emerging AC technologies will enhance human "intuition." **Phase I** of this research proposal is directed at developing optimal AC technologies and protocols for enhancing normal human sensory functioning, "intuition," and select cognitive capabilities aimed at improving adaptive responding in day-to-day situations. Based on Phase I results, research in **Phase II** will characterize AC technologies and protocols that may be conducive of Psi capabilities in gifted humans or provide reliable methods for training Psi-naïve humans in various areas of Psi including possibly remote viewing, telepathy, precognition and PK. Goals of Phase I research include:

- Increasing the acuity of "ordinary" sensory perception in humans
- Converting non-conscious perceptual data into conscious awareness. This is equivalent to "translating" subliminal light, sound, EMF, other sensory inputs into information that is accessible to humans
- Augmenting existing human senses with novel sensory capacities with the goal of providing access to information in the environment that will enhance or modify ordinary states of awareness
- Enhancing the speed and accuracy of human decision-making responding to subtle or non-conscious sensory information. This is equivalent to enhancing human "intuition."
- Improving the quality and speed of adaptive responding to time-critical or potentially threatening situations
- Enhancing ordinary cognitive capabilities or training humans to achieve novel kinds of cognitive capabilities including, eg, problem-solving, spatial reasoning, memory and imagination

Background

Brain-computer interface (BCI) and human-computer interface (HCI) technologies based on advanced sensor designs and emerging findings from neuroscience and consciousness research are rapidly leading to machines capable of amplifying non-conscious (subliminal) information including subtle EMF (possibly including biophoton emissions), acoustical or other stimuli (possibly including simple QM-level events or phenomena associated with quantum fields), into consciously perceived information that humans can be trained to interpret accurately and respond to in adaptive ways in real-time or time-critical situations. In addition to "amplifying" or "enhancing" non-conscious stimuli detectable by existing human sensory capabilities, future BCI/HCI technologies will permit humans to detect kinds of information about the environment and directly experience phenomena that are currently not accessible to ordinary human sensory awareness. Examples include extending vision to near-IR range or U.V. range, enhancing color acuity, color discrimination and depth perception, increasing visual sensitivity to permit conscious perception of ultra-weak biophotons emitted from humans, animals, plants, and physical structures (and, via BCI/HCI technologies) making accurate judgments about intensity spectra and coherence in "perceived" biophotons, improving auditory discrimination including extending the normal hearing range to very low decibel or high frequency sounds, etc. Reviews of conceptual foundations and research progress in augmented cognition (AC), brain-computer interface (BCI) and human-computer interface (HCI) include Schmorrow, Estabrooke & Grootjen (2011), Tan & Nijholt (2010), Berger & Chapin (2010).

Machines that permit adaptive modifications of human sensory capabilities based on non-invasive BCI/HCI technologies will enhance human perceptual awareness of events, objects or other humans in the environment resulting in improvements in the speed and accuracy of cognitive processes associated with decision-making based on limited or (currently) "non-conscious" information, which in turn will enhance adaptive cognitive and behavioral responses in day-to-day situations as well as time-critical or potentially threatening contexts. Successful implementation of any AC protocol requires maintaining an effective, ideally real-time interface including feedback linking critical information from relevant sensory inputs with BCI/HCI technologies in ways that optimize human performance with respect to discrete sensory capabilities or cognitive tasks.

There are currently two general areas of research in augmented cognition. A large DARPA-funded initiative is aimed primarily at increasing performance of military personnel in time-critical situations, including fighter pilots and the special forces. In parallel with the DARPA project a private sector initiative is taking place primarily within the computer games industry and is aimed at enhancing the subjective "experience" of human-computer interface for the average civilian user. BCI and HCI concepts and technologies involved in both military and civilian applications are similar however important goals of these two initiatives are divergent. Furthermore, the DARPA initiative is at the stage of basic research and prototype development and is not concerned with cost. In contrast, cost is an important issue in BCI/HCI research programs aimed at commercial game applications. For this reason basic technology and design breakthroughs will probably take place first in the DARPA initiative and be transferred to the commercial sector after desirable performance enhancement goals have been achieved, and high manufacturing volumes needed for military applications permit reductions in critical component costs of products appropriate for commercial use.

Currently available BCI/HCI technologies could be easily adapted to a research program in augmented cognition aimed at enhancing cognitive performance in numerous domains including enhancing or extending human sensory capabilities, enhancing "intuition," and increasing speed and accuracy of decision-making. A research program in augmented cognition addressing these issues will focus on these general problems:

- optimizing sensor performance
- designing, testing and deploying "personalized" multi-modal BCI/HCI technologies
- obtaining data on reliable correlations between discrete CNS and somatic physiologic markers and cognitive tasks critical for enhancing "intuition" and human decision-making
- optimizing the speed and accuracy of BCI/HCI-brain feedback and feed-forward loops that enhance or accelerate human decision-making
- testing and evaluating BCI/HCI technologies in both simulated and field conditions

Phase I: Using AC technologies to optimize human sensory capabilities and "intuition"

Keeping in mind the above general issues and considerations **Phase I** goals include:

- Reviewing the cognitive neuroscience literature on perception and decision making including functional brain imaging studies on perception and somatic stress responses during decision making including EEG, fMRI, MEG, heart rate variability (HRV), GSR and others.
- Identifying promising neuropsychological models of human decision making including the "somatic marker hypothesis" and others and implications for designing BCI/HCI technologies aimed at augmenting human perceptual capabilities and enhancing speed and accuracy of decision making
- Designing prototype portable non-invasive BCI devices using advanced sensor and biofeedback technologies for detecting CNS and somatic information correlated with discrete cognitive states involved in critical perceptual or high-value decision-making tasks, or predicting near-term changes in the environment that may pose risks or threats to the user. Prototypes would include technologies capable of capturing physiological information in real-time, filtering out extraneous data, "translating" data into information relevant to the operator at a high bit-rate in easily accessible formats (eg, visual or tactile cues) facilitating time-critical decision-making and response to environmental cues or threats.

- The prototypes will ideally “translate” physiological measures of non-conscious perception of important objects or events into useful conscious information and feed back this information to the operator using an unambiguous format at high bit rates (ie, in “real-time”).
- Testing prototypes for performance in virtual and real environments, and optimizing system design until trained operators achieve consistently low error rates in measures of “intuition” or time-critical decision-making tasks that carry over into measurable performance enhancements in simulated situations. This phase of the work constitutes a “proof of concept” for the basic BCI/HCI design which will then be field tested in real environments permitting performance comparisons between BCI-trained vs naïve individuals in a range of situations calling for “intuitive” responses to ambiguous information or critical decision-making tasks in potentially threatening situations. Field studies will include “competing” groups working within variable parameters including differences in fatigue level, environmental conditions, cognitive work load and other performance-decrementing or performance-enhancing factors.
- Field testing in simulated and potentially threatening situations will determine minimum training needed to achieve performance enhancement goals. Results of this phase of the work will strive to optimize accuracy and speed of “intuitive” responses to ambiguous information or critical decision-making performance using customized BCI/HCI technologies.

Phase II: Optimizing AC technologies and protocols to enhance Psi functioning

Enhancing or adding “novel” perceptual abilities and cognitive performance capabilities identified in Phase I to “normal” human capabilities may permit humans to function in ways that approximate or—in some cases are indistinguishable from—postulated Psi capabilities. Selectively modifying or augmenting ordinary human sensory functioning using BCI/HCI technologies may be associated with enhanced Psi functioning in cases where *subtle* information unavailable to “ordinary” human sensory awareness becomes perceptible resulting in more adaptive responses to ambiguous or potentially threatening situations . Further, some information or “signals” that are sub-threshold with respect to “ordinary” human perception may contain useful information, including for example, subtle biophoton emissions and associated intensity, coherence, etc. characteristics, or sub-perceptible vibratory or acoustic information (both kinds of energy-information have been detected when gifted psychics or energy healers claim to “sense” subtle aspects of the human body, the human “bio-field,” or surroundings, “emit” healing “energy,” or mediate other Psi “effects in the environment.

Currently available HCI and BCI technologies could be easily adapted to Psi research paradigms with the goals of:

- Providing feedback/training for both spontaneous Psi and forced-choice tasks (including eg DMILS, PK, RV, other)

- Optimizing stimulus configurations associated with facilitated Psi performance
- Increasing ITR (information transfer rate)/bit rate of Psi data acquisition to bring these applications to the level of practical utility

The following conceptual problems and practical goals will be addressed in Phase II in order to achieve AC technologies and research protocols that may potentially enhance Psi performance:

- Literature review to identify Psi phenomena in which correlations may exist between discrete physiological, neurophysiological or "energetic" markers (eg, EEG, fMRI, GSR, REG, biophoton emission spectra, etc) and Psi performance. This may lead to testable hypotheses of particular Psi capabilities and complex neurophysiological,biophysical or "energetic" correlates (eg, correlative EEG X fMRI patterns in above-chance RV performance, or correlative REGXEEG patterns in above-chance forced choice telepathy, or correlative EEGxbiophoton emission intensity and PK).
- Developing BCI/HCI technologies that reliably detect specific signal types (or patterns of 2 or more signals) that may be correlated with a particular spontaneous or forced choice Psi capability, including technologies capable of changing data into a more accessible form (eg, visual, auditory or tactile cues). This step would involve testing for replicability and optimizing system design.
- Developing BCI/HCI technologies that "translate/transduce" non-conscious information into conscious information. BCI technologies could then be developed for training humans to consciously perceive information unavailable to "normal" human senses. Does enhancement in non-consciousness awareness result in improved Psi performance?
- Developing BCI/HCI biofeedback technologies and protocols with goal of training enhanced Psi performance (including both receptive and active tasks) using best evidence from Psi research and using signal amplification (ie, of EEG, biophotonic spectra analysis, other neural correlations of "anomalous" perception), reward paradigm, etc. (consider neurofeedback, GSR, other).
- Developing technologies aimed at optimizing signal "bit-rate" aimed at achieving practical applications of select Psi capabilities (eg RV, telepathy, HI, PK, other)
- Optimizing HCI design elements by decreasing false positive and false negative responses at HCI interface.

Summary

Augmented cognition protocols using advanced BCI/HCI technologies will enhance human performance by amplifying existing sensory or cognitive capabilities as well as by adding "novel" capabilities to existing "natural" ones. Enhancements in in perception and cognitive performance will broaden human awareness of energy and information in the environment that is currently "non-conscious" or ambiguous to ordinary human sensory awareness. A research program employing advanced BCI/HCI technologies aimed at modifying and enhancing human perception and optimizing cognitive processes associated with attention and awareness will translate into substantial—perhaps qualitative—enhancements in the accuracy of human "intuition," improvements in speed and accuracy of cognitive tasks involved in decision-making on the basis of limited or ambiguous information in complex, rapidly changing, or potentially threatening environments and situations. Enhancements in the nature, accuracy, and speed of perceptual awareness, "intuition," decision making, prediction accuracy and adaptive behavioral response to ambiguous situation, will permit humans to achieve performance levels in a range of disciplines that are currently regarded as impossible or in the realm of science fiction. Further optimization of BCI/HCI technologies and protocols that enhance intuition, "guessing," and "predicting" in ambiguous contexts may yield technologies that permit humans to develop perceptual and cognitive performance capabilities currently regarded as unattainable and consistent with claims of Psi. According to this scenario technologies for training humans using select BCI/HCI protocols would be equivalent to "Psi training" technologies.

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