Research in Hands-Free Control of Digtal Photogrammetric 3D Measurements

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Nowadays computer technology is developing multiple novel ways of interaction between human and computer systems. These human-computer interaction (HCI) innovations include, but not limited to: voice recognition, eye-gaze-tracking, gesture, haptic and electro-encephalograms of brain (EEG) computer control systems. Major challenge of the integration of such cognitive sciences elements with various domain computer environments is at the first stage establishing a faster and more efficient control and on the second stage creating intelligent agents that till certain degree will automatically emulate human-operator behavior. Overall practical goal of such a research is to establish an optimal human-computer symbiosis, where operations that can be performed better by human brain are delegated to human operator, and operations where computer is superior to human are performed automatically. Specifically in geospatial data processing domain cognitively enforced systems can find applications in natural and man-made disasters response, autonomous robotic platforms navigation and control, military and intelligence application scenarios.

Researchers of Michigan Technological and Moscow State Geodesy Universities started experiments on integration Emotiv EEG device with PHOTOMOD softcopy photogrammetric workstation. Our efforts were concentrated on connection of 3D model pan and move functions of PHOTOMOD with head movements sensed by the Emotiv gyroscope along with controlling stereoscopic cursor commands by mental "Pull" and "Push" Emotiv Cognitive suite. Thus photogrammetric 3D measurements can be performed hands-free. We have a plan to research various facial expressions (such as for example "Smile"– record point or Left/Right Wink – left or right mouse buttons) as a possible alternative controls. Another obvious development we are planning is integration of inexpensive eye-tracker and capability of collaborative measurements. Since Emotiv system can support multiple EEG headsets we are considering building based on PHOTOMOD some didactic tool to teach students photogrammetric 3D measurements.

Our experiments are focused on identification of potential productivity and accuracy of the cognitively controlled photogrammetric measurements. To this end, we are preparing test datasets that will be measured in standard and EEG-controlled mode. Error statistics will be computed based on spatial measurements results of experiments participants. Standard NASA Task Load Index (TLX) methodology will be applied to estimate numerically new method from human-factors science standpoint.