Reducing Cognitive Load of Unmanned Aerial Vehicle Soldier-Operators: A Novel Weapon-UAV Control Design

Jeff Putka, Luiz Cavalcanti, Nomaan Ahgharian, Anthony Faiola

Indiana University School of Informatics & Computing, IUPUI
jputka@iupui.edu, faiola@iupui.edu, nahghari@iupui.edu, luccaval@iupui.edu

Indiana University-Purdue University Indianapolis

During armed conflict, unexpected events are routinely encountered owing to the lack of battlefield information. This condition is heightened when fireteams (3-4-soldiers) on patrol are dependent on information-communication from unmanned-aerial-vehicle (UAV) operators, miles away within a safe zone. In this scenario, communications from operators to the fireteam is time consuming, i.e., fireteams must remain unengaged and waiting for central-control information. Consequences from this battlefield configuration include potential time loss from possible evasive action and communication breakdown through compromised telecommunications. This all adds to soldier anxiety and cognitive load. Research suggests that incongruity between fireteam expectations and battlefield conditions erode the interpretation of events, leading to further degradation of effective decision-making during armed conflict or reconnaissance.

In response to this problem we investigated how to improve soldier reconnaissance activities through a novel Situational-Aware UAV-Rifle[i] System (SURS)—an integrated technology that gives the fireteam soldier-user autonomous control of the UAV with no constriction to accessing the firearm controls. Six participants, with varying degrees of experience with flying or using UAV interface controls were recruited for this study. A usability test comparing SURS with standard UAV controls focused on time-on-task and error-rate, as well as ease-of-use.

Using the baseline results of the standard control interface from the UAV manufacturer, was it possible to demonstrate a significant improvement using SURS to execute complex UAV maneuver-agility tasks? The SURS system achieved positive usability results in performance and control capabilities. A comparative analysis of task speed and errors indicated a faster learning curve for the embedded SURS control interface, with a decrease in error by 30%. Besides performance benefits, an observed change in user-awareness levels (without performance loss), represents an optimum battlefield alternative for embedded controls.

[i] For our technology design we used a blue-orange Nurf-Gun in the place of a real Army regulation rifle.
Nerf-Gun: http://www.hasbro.com/en-us/product/nerf-rival-zeus-mxv-1200-blaster-blue:6DD16B76-5056-9047-F503-677F2F59CA1B
Drone: http://www.amazon.com/Parrot-AR-Drone-2-0-Elite-Quadcopter/dp/B00FS7SV1U/ref=sr_1_1?s=electronics&ie=UTF8&qid=1458569967&sr=1-1&keywords=parrot+ar+drone