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OPTIMISING OPERATIONAL TRAINING WITH 'MATES': MULTI-AGENT TRAINING ENVIRONMENT SIMULATOR

Abstract

Operating a space mission requires human operators with specialised skills. These skills must be acquired beforehand and retained through the mission lifetime, which is commonly done today through staged simulation campaigns. They provide a successful way to train operators and maintain the team knowledge; however they requisition many key personnel and so are particularly costly. This is due to a number of limitations.

In the first part of this paper, we will describe these limitations. First, the training scenarios can only be manually orchestrated, usually by a simulation officer and his team controlling the simulator, following a procedure and injecting system failures or specific requests during the campaign. Second, because the simulation campaigns have to be as realistic as possible, all operators must be present in the control centre, making it impossible for trainees to practice off-line, on their own. Finally, only systems are simulated (spacecraft, ground stations, etc.); yet, just as the systems they work with, human operators can fail. They can also make mistakes and they are driven by their personal behaviour and personality. Within today's simulation campaigns, these aspects are neither repeatable nor controllable.

Our work in CGI in Darmstadt, Germany, focuses on the ground systems and the operations of space missions, for both public actors like ESA/ESOC and commercial organisations. To overcome some of the limitations in operator training, CGI decided to create MATES.

The second part of the paper will present this new tool, its features and the status of its development. MATES will provide a scenario planning tool for the simulation officer, a scenario library and a scenario execution engine, giving the possibility to pre-configure any kind of scenario and to run it autonomously: independently of any simulation or the availability of a simulation officer. MATES will also introduce virtual operators, and automate their behaviour as part of the scenario execution, using proven concepts and technologies such as the Belief-Desire-Intention model and the AgentSpeak language, which allow the computational representation of human behaviour.

Finally, the last part of the paper will give an overview of its benefits. With MATES, virtual training simulations can complement real training simulations, allowing operators to engage in custom simulations at any time of their choosing. Virtual scenarios can easily be repeated, which can support the operator certification process. To summarise, MATES will offer hands-on practice beside classical 'large-scale' simulation campaigns, improving the operational training and reduce its cost.