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Adapting C2 to the 21st Century

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Crossfire - an IDE for Modeling C2 Scenarios

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ABSTRACT

The CROSSFIRE IDE (Integrated Development Environment) is a new product that is being developed by MÄK Technologies together with CFACC (Combined Force Air Component Commander) Ace, an operational-level air campaign simulation. CFACC Ace is designed to address the cognitive readiness challenges of senior Air Force leaders in a modern joint or coalition air campaign. The focus is on the personal decisions at the operational level, leaving the simulation to function as the campaign leader's staff and also as a variety of other individuals, organizations, events, and factors influencing the campaign. We will use the CROSSFIRE IDE to build this training system, as well as future training systems, such as a Joint Task Force (JTF) staff trainer for JFCOM, to fill a training gap for operational-level decision makers. CROSSFIRE will drive simulations featuring a turn-based approach required for the length of campaigns or event scenarios (days, weeks, months) required to address operational issues.

INTRODUCTION

As a system for developing cognitive-readiness trainers, CROSSFIRE is not a Virtual Reality (VR) system and will never try to be one. It is turn-based, and it does not attempt to create highly realistic 3D renderings like VR. There is a reason for this. VR demands extraordinary amounts of resources; labor to develop the system and hardware to run it. On the other hand, "appropriate fidelity for training" may not require this, and it may indeed be a distraction. For cognitive readiness training, the resources are better spent on better modeling of the application domain (e.g. staff processes), greater behavioral realism of simulated players in the domain (some staff members are genuinely helpful, others lazy, others hostile), better models of the cognitive skills to be trained, creating scenarios that will enable "teachable moments" for each such skill, and applying measures of effectiveness, leveraging adult learning principles, to evaluate the trainee's performance and give feedback.

The CROSSFIRE IDE uses an architecture for distributed computation based on Intelligent Agents. Communication between agents is strictly structured. No communication is allowed during a turn. At the end of a turn, the state of all agents is posted to a distributed "blackboard" (specifically, JavaSpaces). This allows any agent to read the state of another, but only at the end of a turn.

The intelligent agent model design enables a basic capability to learn and adapt based on the actions or inactions of the user / trainee within a scenario or vignette. The simulation will begin with an assumption or input of the general competency of the trainee and competency and within the constraints of the training time available. By the use of rules and procedures within many of the intelligent agents that interact directly or indirectly with the trainee and the environment, the model can make adjustments to the difficulty of the problem presented within the scenario or vignette to more closely match the training to the actual competency of the trainee.

In developing a Cognitive Readiness trainer, the focus is on the higher cognitive skill sets and the operational-level of decision making. The development process involves some conventional programming activity, plus scripting activity, and importing or editing non-code resources like media files, scenario definitions, configuring sets of parameters, etc. MÄK's vision is to develop a new scripting language ("Nimble") that is well-suited for scripting cognitive readiness trainers and an IDE ("CROSSFIRE") designed specifically to support such development. Our choice of Eclipse makes this feasible. CROSSFIRE and Nimble are being developed together with their first application, CFACC ACE. We have also proposed to use CROSSFIRE to develop a JTF staff training system for JFCOM.