Virtual Puckster –
Behavior Generation for Army Small Team Training and Mission Rehearsal

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1. Introduction

With the advent of the Global War on Terrorism, Operation Iraqi Freedom, and other recent conflicts, the Army’s requirements for training and mission rehearsal exercises in deployed environments have changed. They involve smaller groups, often platoons or squads, are asymmetric, more urban, and must be performed on shorter notice with fewer and less-experienced support personnel. In this environment, provision for embedded training and mission rehearsal for small groups is critical (Dyer, 2007).

Unfortunately, current applications are not optimal for this kind of exercise. Traditionally, synthetic exercises are focused on large force-on-force problems, and may involve heavyweight scenarios requiring large numbers of pucksters (human controllers of non-trainee virtual characters). But the number of personnel available to serve as pucksters is limited, often to one, and in today’s embedded environments, those that are available may not have the specialized training necessary to operate SAF applications. In these environments, control of realistic, coordinated actions of small synthetic teams—by a single operator—is not possible, yet for platoon and company-size exercises, this control is exactly what is required.

Virtual Puckster (VP) is a Phase II Small Business Innovative Research (SBIR) project being developed for the Army by Aptima and Total Immersion Software. The goal of the project is to develop an application that will allow intuitive, real-time control of small groups of synthetic forces, that will offload the human puckster from the details of the coordination of group behaviors, and that will allow the puckster to make rapid adjustments to team behavior as circumstances dictate. VP is being implemented in RealWorld; a four year DARPA program focused on low-cost, game-based rapid mission rehearsal and embedded virtual training environments.

2. Virtual Puckster

VP enables group behavior control in military domains similar to control that is possible in the Madden series of football simulation games. In these football simulations, the user selects a pre-planned play, and then two teams of 11 players execute the play, with opportunities for the user to control key personnel. For example, the user can select the receiver to pass the football to or can exercise another control option and give the ball to the running back.

Military exercises are considerably more complex because, for example, the terrain varies, the rules and teams are not always clear, the size and composition of the opponent is not always known and combat is usually asymmetric. Nevertheless, there is a useful analogy: military operators select the next “play” from a library of plays, adapt it to the current environment, and control key aspects of how the “play” unfolds. VP allows a single operator to control one or more teams of coordinated enemy combatants to create specific and detailed training or mission rehearsal situations for training soldiers.

The VP system is shown in Figure 1. It consists of a graphical user interface (GUI), Group Behavior Engine (GBE) and a Group Behavior “Play” library. The VP GUI is used to control the VP system, gather group control inputs from the human puckster and give the user team level information. The GBE generates coordinated group behaviors based on a specified play, the current conditions of the simulation environment and the control inputs from the human puckster. The

1The Madden series of football games are created by Electronic Arts Software.
GBE provides a library of coordinated group behaviors (plays), and provides a variety of group controls for the human puckster. Behaviors in this library are different from conventional behavior scripts because they provide the human puckster with real-time controls to be used during the mission, such that he or she is able to make adjustments to the play or to members of the team when unexpected developments arise, such as surprising trainee behavior or equipment failure. Further, the same play can be executed in different terrains at different times without any need to modify either the play or the terrain.

3. Plays and Teams

Table 1 shows an example of Virtual Puckster play. In this case, the human puckster is controlling the team leader and the rest of the team is automatically controlled by VP. The play has the team move in formation until it is fired upon. Then it switches to a React-to-Fire play where the team divides up into two sub-teams, each team searches for cover and then performs a coordinated bounding move towards the attacker, alternating supplying cover fire and moving. If the attacker is killed, the entire team reforms and resumes the team move play.

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<th>Puckster Control Inputs</th>
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The team behavior is described by a set of plays. A play defines a set of tasks, their transition conditions and coordination points with other events. A play uses a set of primitive actions (such as move and fire) which are supported by the game simulation environment. VP takes event inputs from either other characters or the human puckster to transition between states. VP can manage a set of parallel executing plays and coordination activities between them using coordination points such as one task will wait until an event generate by another task occurs.

In sum, Virtual Puckster is focused on generating realistic team behaviors to support small team training and mission rehearsal with a single human controller who is expert in the training domain, not the simulation system. It uses a sports team metaphor to generate a flexible, mixed-initiative approach that keys the actions of synthetic team members off the human’s actions and allows the human to change roles to provide detailed control of individual team members when necessary. We believe Virtual Puckster will dramatically expand opportunities for embedded training and mission rehearsal in circumstances that have historically proved difficult.

4. References

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