

Intelligent TEAM TUTOR TASK.

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Abstract

Interactive digital tutors have proven useful in a variety of fields. Using automated programs to convey information and promote skill transfer is often more cost-effective than using human tutors, and as such research has been done to see if the same sort of tutor can be created for a group in a team task environment. We attempt to realize that research, constructing a three-person multi-role task to be monitored and advised by an intelligent tutoring system.

To accomplish this, we created a search-and-destroy mission involving a military vehicle. The roles involved are those of a pilot, a gunner, and an intelligence officer. As teamwork is a rather nebulous skill to measure, we designed our task to evaluate participants on coordination, communication, adaptability, participational awareness, decision-making and backup behavior, skills that prior research has determined to be important aspects of teamwork. We also used various principles of skill transfer to attempt to ensure smooth transition from our virtual task to the real world.

To conclude, we discuss the future of our task, when we hope to run formal trials using our tutored team task to further investigate its efficacy. We also discuss the potential to expand the task to accommodate an increased number of participants.

Overview

We developed a search-and-destroy mission using a simulated helicopter with three unique roles. Communication between the roles is accomplished via preset notifications and triggered by keystrokes.

Our task has a real-world basis in actual military "search-and-destroy" missions. The roles were modeled after the pilot and co-pilot/gunner of an Apache AH-64 attack copter and an Aerial Intelligence Officer or AIO (e.g., interpreting drone footage); however, parts of tasks were simplified to accommodate virtual setting's constraints.

Our Task

✓ Pilot



Drage, Karl. View from an Apache WAH-64D cockpit. Digital image. Global Aviation Resource. N.p., 15 June 2010. Web. 28 June 2016.

- Navigates the aircraft through three-dimensional space
- Brings vehicle closer to enemy locations (pointed out by AIO)
- Confirms or denies Gunner requests to keep a target in range
- Alerts Gunner and Air Intelligence Officer about OPFOR locations

✓ Gunner



Main, Graeme. A View Through the Monocular Eyepiece Attached to the Helmet of a WAH64 Apache Helicopter Gunner. Wikimedia Foundation, 3 Dec. 2004. Web. 28 June 2016.

- Located at command post
- Has multiple views from different parts of the field
- Signals information to Pilot and Gunner via map (displayed to others as minimap)
- Amalgamation of imagery intelligence and communication roles

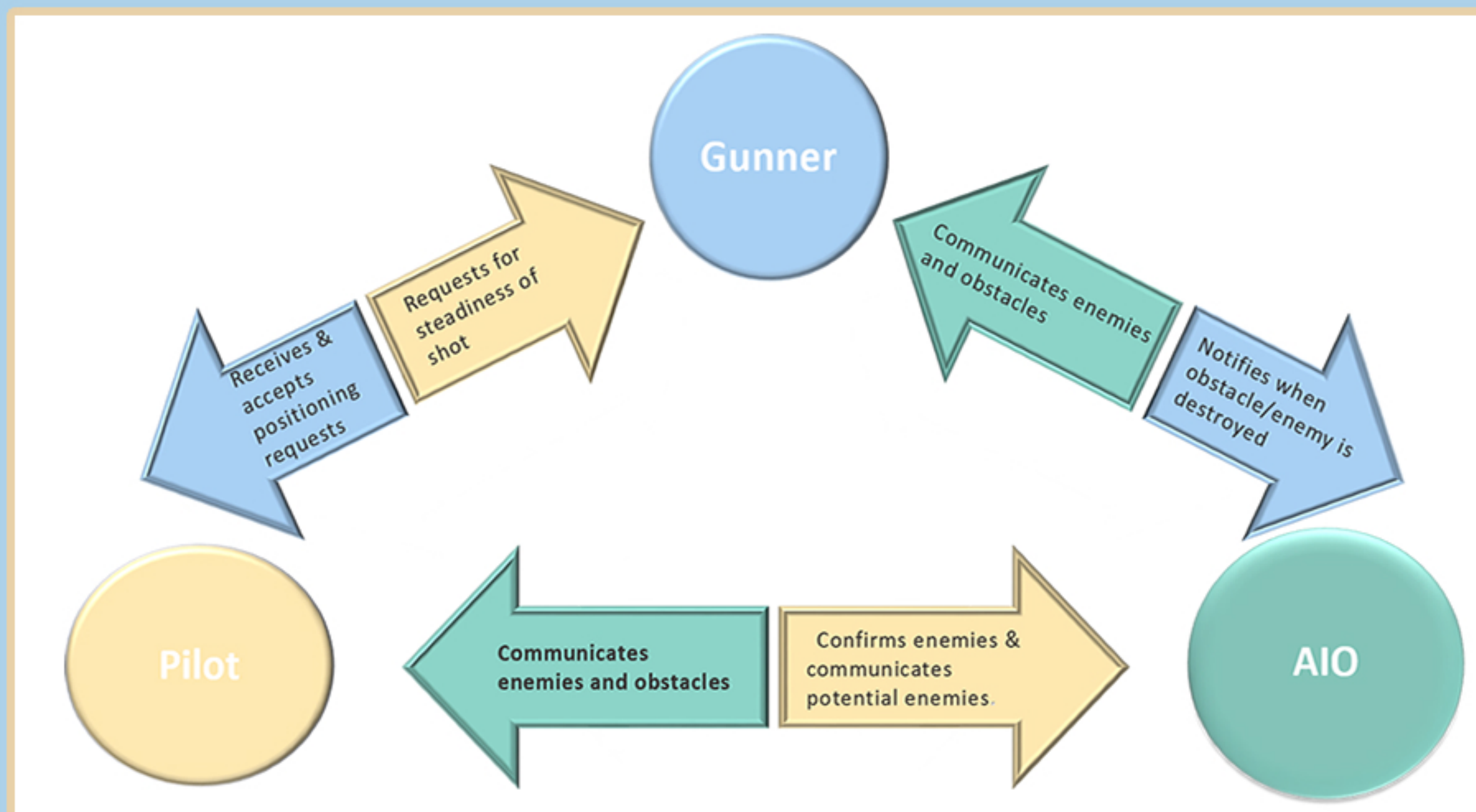
✓ AIO



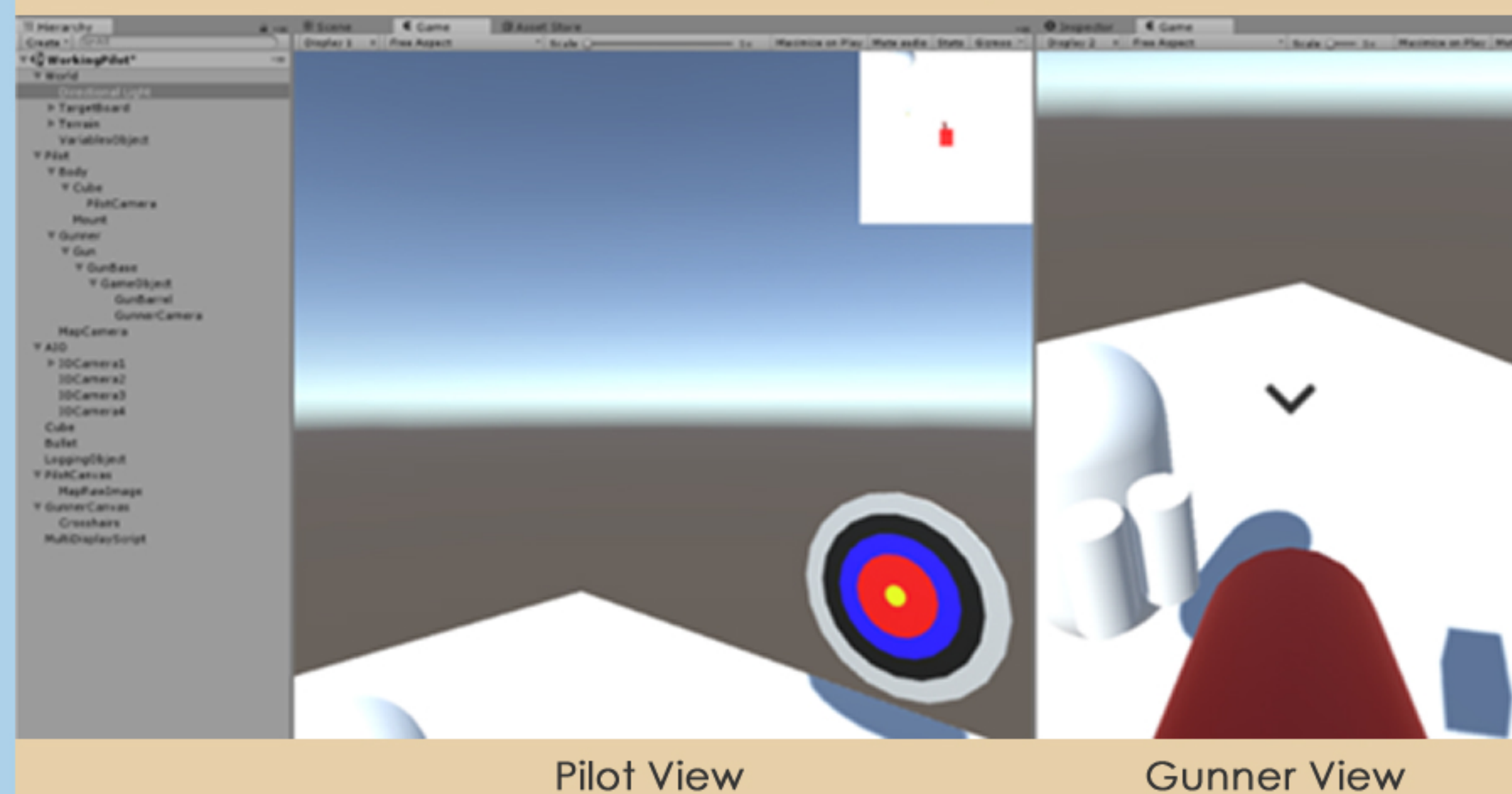
Screenshot from Insurgent Strike (BF2 enhanced realism mod)

- Responsible for eliminating obstacles and enemy OPFORs
- Signals Pilot about needing stability for shooting
- Signals Air Intelligence Officer once an OPFOR or obstacle is destroyed
- Based on Apache Co-Pilot/Gunner

Diagram of Team Interactions



Task Development



Pilot View

Gunner View

Discussion

Skill Transfer

An important aspect of many simulations is their ability to convey real-world abilities through participation in a virtual setting; accomplishing this is performing what is known as skill transfer. One of the most important factors in achieving skill transfer is the degree of similarity between the task being transferred from and the task being transferred to; this level of similarity is known as fidelity. We aim to achieve a variety of types of fidelity in our simulation. For physical fidelity, we are using the real-world helicopter and associated roles of the AH-64 Apache helicopter, and attempting to base the cockpit design, mechanics, and roles off of it. For functional fidelity, we are hoping to implement a head-mounted display as a substitute for the real-world helmet-mounted displays that Apache gunners would use.

Teamwork

We are developing a tutor-task system to improve dimensions of teamwork established by previous researchers. To properly understand which dimensions of teamwork to focus on, we performed cross-dimensional research in various areas such as the military, healthcare, and aviation where effective teamwork has been observed and measured. Our task will focus on enhancing overall task performance and team performance in the areas of coordination, adaptability, situational awareness, decision making, and backup behavior.

Intelligent Team Tutoring Systems

Our search-and-destroy team task will incorporate an Intelligent Tutoring System (ITS) known as the Generalized Intelligent Framework for Tutoring (GIFT). Previously, ITSs have been developed to facilitate teaching individuals in a learning environment. Previous teams worked on a Reconnaissance Task which incorporates two users with identical roles completing a reconnaissance task for a specified area. In contrast, our search-and-destroy task is a multi-role environment which incorporates a three person team in which all team members complete different sub-tasks with the main aim of eliminating the targets. Our task involves no hierarchical roles and all sub-tasks are interdependent.

Limitations

Although the efficacy of single-person tutors has been well-established, their effectiveness in training groups is less well-tested. Thus, although we are hopeful that our tutor will find success in training a group, and have created rules for said tutor to evaluate participants on, it is possible that we may run into unanticipated problems in the development of it.

Another challenge we face is the fact that the skill we are measuring is rather nebulous; teamwork is such an implicitly understood concept, though, that qualifying, let alone quantifying, it is an extremely difficult task. As such, we rely on a collection of more well-defined traits that previous research indicates to be important in teamwork; such traits still have a level of ambiguity, though, and our tasks we associate with them may not match well enough.