



Portfolio Client Showcase

Columbia College

Department of Defense Funded Research

Construct Collaboration Framework

Technologies Used

- .NET Framework 3.5 - C#
- SQL Server 2005
- Windows Presentation Foundation (WPF)
- XAML
- LINQ to SQL
- LINQ to XML
- Microsoft Blend
- Custom TCP Server – Connects with Serious Game

Project Overview

The “Construct” research project is developing software tools to both study small group behavior using multiplayer videogames and simulations and to enable machine learning systems to recognize complex human behavior as it emerges in these environments. The Construct architecture positions its data model and abstraction algorithms in the middle of two worlds: supporting a plurality of game engines and simulation “contexts” on the one hand and machine learning processes trained to recognize group behavior of interest on the other. Essentially, the research is investigating a software and system architecture that both supports the human study of complex group behaviors like “conflict” and “decision making” and can provide automated machine recognition of the same.

The research uses a collaborative, goal-oriented multiplayer videogame environment to render data about game status, game environment, player sensory data, player behavior and player communication, in real time, to a database and algorithms that then seek to derive “meaningful abstractions.” These data are also rendered in an elegant timeline-oriented software tool that seeks to reveal significant game milestones in each data dimension. The system also supports manual annotation of periods of play as being representative of one or more *behavioral states*. Finally, the architecture interacts with an

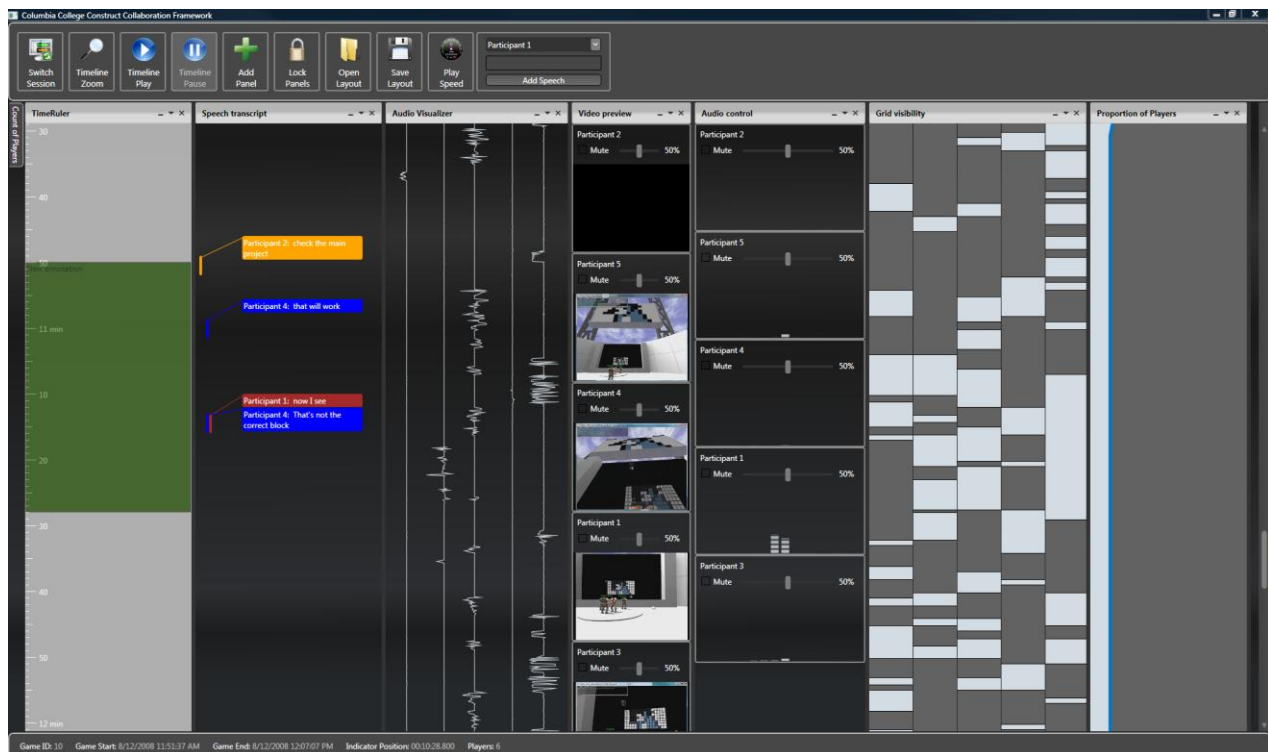
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established machine learning mechanism, seeking to leverage persisted data abstraction and human annotations of the same to train the machine learning mechanism to automatically recognize complex group behaviors in subsequent play.

Arrow Consulting & Design's roles in the project are to architect and develop the portions around the data, communication, data abstraction and visualization for researchers under the guidance of researchers at Columbia College. To achieve that, the team at Arrow developed communication protocol for the simulation and game engines to send action log information to the database in an abstracted way to allow for different game engines and platforms. Advanced SQL based procedures facilitate data abstractions rolling up to meaningful information in the data layer and then create abstractions of data that are meaningful to machine learning engines and researchers through a live and after action review tool.

While much of the hard work and heavy lifting of the data abstracting work is outside of the details for a portfolio case study, the screenshot of how that data is represented in the AVT gives a glimpse into how Arrow Consulting & Design is pushing the envelope with new technologies like Windows Presentation Foundation, LINQ and XAML. Taking advantage of the vector based UI base of WPF, features like timeline interval smooth zooming, custom graphing and video review of the simulation give researchers a powerful view into the data collected from the simulations and serious games.

Screen Shot of the WPF Tool for Visualizing Data



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