

Jack takes the design of crew stations to a new level

Jack provides invaluable visual displays of humans interacting with proposed crew station environments

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► Issues:

Create an easy-to-use crew station design tool for engineers with and without human factors experience

Incorporate visual tools for evaluating human interactions with the crew station

► Approach:

Incorporate Tecnomatix™ Jack human modeling software for 3D simulations and graphical displays of human motion

Tap Jack's wealth of anthropometric data to simulate a wide range of user populations

Employ Jack for ergonomic analyses

► Results:

Jack reduced development time for the Crew Station Design Tool

Visual display of human interactions helps optimize crew stations

Jack is a selling point for the new software

MICRO ANALYSIS & DESIGN

- Micro Analysis & Design was asked to create software that would help engineers with and without human factors experience design efficient, ergonomically correct military and commercial crew stations.

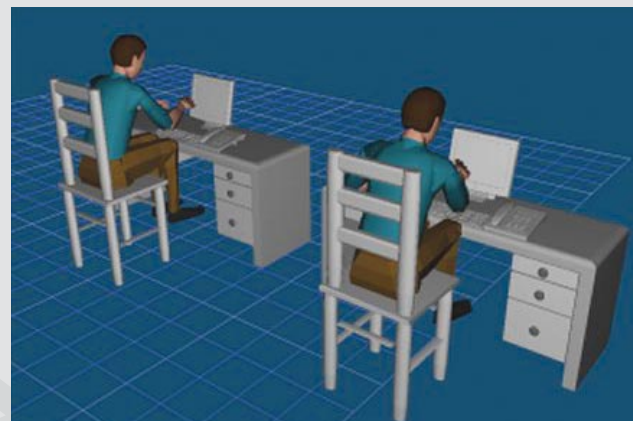
Helping the military modernize

Micro Analysis & Design is a consulting services and software products company that provides expertise in the following areas: human-systems integration, human factors engineering, computer simulation and modeling and custom software development. Its client list includes many branches of the Department of Defense, prestigious universities and large private companies.

One of Micro Analysis & Design's recent projects, done for the U.S. Army Research Laboratory Human Research and Engineering Directorate, involved creating software that would facilitate the design of crew stations. Crew stations are the areas in which operators function within armored vehicles, aircraft, passenger vehicles, ground control systems and so on. It is where all the displays and controls are located. Engineers must juggle the sometimes conflicting issues of crew station size, operators' sizes and the many tasks the operators must perform. Yet, engineers who design crew stations often do not have human factors experience. Micro Analysis & Design's goal was to create software, the Crew Station Design Tool (CSDT), that would help these engineers.

Off-the-shelf solution adds much functionality

One option would have been to create the entire CSDT from scratch. But the software's developers knew they wanted to include such a high level of human figure modeling, and the programming expenditure for that component would have been prohibitive. Instead they chose to provide this functionality through the human modeling software, Jack, a Tecnomatix solution from UGS. "We could have done some of what Jack provides in-house, but we would not have



Solutions/Services

Tecnomatix Jack

Client's primary business

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Client location

Boulder, Colorado
United States

"Jack adds so much to the Crew Station Design Tool that it really helps get buy-in."

*Brett Walters
Principal Human Factors Engineer
Micro Analysis & Design*

been able to recreate all its functionality, especially all the anthropometric data, in the time we had allotted for the project," says Brett Walters, a Principal Human Factors Engineer at Micro Analysis & Design.

In the CSDT, Jack imports a 3D CAD model of the crew station shell, an initial position for each display and control and a script (automatically translated from a discrete event simulation model) that animates the human figures as they use the controls and displays. Jack then simulates the physical behavior of humans interacting in that 3D environment. "With Jack, the CSDT gains the ability to populate the virtual crew station environment with biomechanically accurate human figures," Walters explains. "Designers can assign tasks to these virtual humans and obtain information about their behavior. They can visualize the feasibility of certain tasks, obtain information about strength capabilities and generate 'possible' and 'comfortable' reach envelopes." When the user has finished viewing the Jack simulation, he can return to other components of the CSDT to make adjustments to his design.

Benefits for users and developers

The inclusion of Jack in the CSDT application makes it a much more powerful tool, says Walters. "Just the visualization aspect alone helps tremendously," he says. "Without Jack, you could still get some of the information about whether or not a person could reach the controls, but Jack makes it more real."

Jack goes beyond that, however, to provide invaluable ergonomic feedback based on its wealth of anthropometric data. "Jack lets you determine things like whether the human population working in the crew station is strong enough to handle certain tasks," Walters adds. "It provides that extra information that makes the crew station design more efficient and ergonomically sound."

Jack not only benefits CSDT users. From Micro Analysis & Design's point of view, the inclusion of Jack was a wise decision for several reasons. First, it made it possible to incorporate powerful human figure modeling tools within the CSDT that they would not have had time to include otherwise. Second, Jack's functionality is a big selling point for the CSDT. "Jack adds so much to the results," says Walters. "It definitely helps get buy-in. In particular, the graphics showing humans interacting in the crew station help convince people that this is a valuable tool."

In this situation, Jack was a win-win proposition. The users of the CSDT win because they gain highly valuable, visual feedback about their crew station designs. Micro Analysis & Design wins because Jack's simulations provide powerful and graphic demonstrations of the capabilities of their software.

Acknowledgement

The views and conclusions contained in this article should not be interpreted as presenting the official policies or position, either expressed or implied, of the U.S. Army Research Laboratory or the U.S. Government.

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