



Image credit: NASA

Information Technology and Software

Interior Layout Optimization Software

Software tool to optimize the interior layout of highly constrained, highly integrated, and/or confined spaces

NASA has developed a new software tool for optimizing interior layout designs of highly constrained, highly integrated, and/or confined spaces, such as space habitats. This tool will automatically generate or evaluate interior layout options while taking into account multiple end-user objectives. Development and evaluation of interior layouts is often ignored during conceptual design because of the subjectivity and long times required using current evaluation methods (e.g., human-in-the-loop mockup tests and in-depth CAD evaluations). The NASA tool will allow for early, more objective assessment that will prevent expensive design changes, which can increase vehicle mass and compromise functionality.

BENEFITS

- ➔ Provides a comprehensive and timely method to measure the effectiveness of an interior layout, particularly at conceptual design
- ➔ Enables trade studies, including understanding the impact to the habitat configuration when trading various requirements, managerial preferences (weightings), choice of subsystems, and different component geometry shapes
- ➔ Enables automation of layout interior designs
- ➔ Provides more configuration design coverage and documentation, leading to the discovery of better alternatives

APPLICATIONS

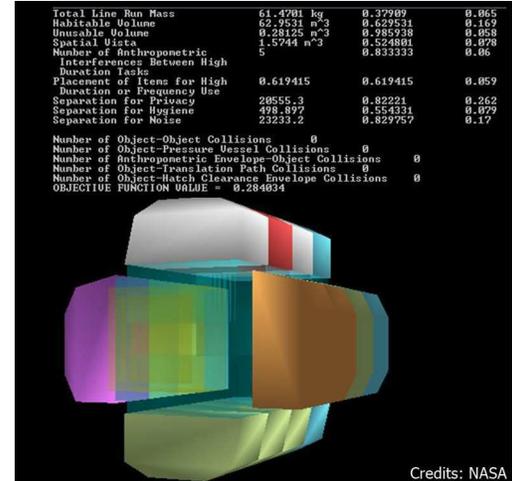
- ➔ Layout design for highly constrained, highly integrated, and/or confined spaces, including:
 - space habitats,
 - submarines and ships,
 - aircraft,
 - recreational vehicles, and
 - small residences

technology solution



THE TECHNOLOGY

The technology is a method and associated software tool for (1) evaluating interior layouts of constrained human living/working spaces against multiple objectives and constraints, and/or (2) automatically generating feasible layout alternatives that perform well across these objectives. The method uses geometric modeling and a multi-criteria objective function to assess layout alternatives in seconds, enabling optimization of layouts based on designer preferences. For spacecraft, or similar designs, this innovation will allow for the early determination (in the conceptual phase) of the adequacy of habitat size and the identification of potential design issues related to layouts. The tool will generate higher fidelity conceptual designs, leading to mass and cost savings. Although the technology has been implemented for conceptual space habitat applications, it is also relevant to other highly constrained human systems (e.g., submarines, naval vessels, aircraft, recreational vehicles [RVs], small terrestrial residences, some factories, workstation design, etc.).



OpenGL Output of Layout Evaluation Tool.

PUBLICATIONS

Patent Pending

Simon, Matthew, and Wilhite, Alan W., "A Tool for Automated Design and Evaluation of Habitat Interior Layouts", AIAA SPACE 2013 Conference and Exposition. Available at <http://ntrs.nasa.gov/search.jsp?R=20140002738>.

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