

Home for Living: an adaptive model for life out of the wheelchair

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Abstract

It is now technologically possible for rapid prototyping of architectural environments building human movement directly into a digital design, opening the possibility for mass customization in architectural design and building. This project leverages that technology in collaboration with the medical profession to begin the process of responding to and incorporating physical requirements into the design of spaces used in everyday life, especially for clients with “special needs.” Urban mobility with a wheelchair shapes a body in particular ways often overworking the same body parts and muscles. The privacy of the home affords a variety of movement (including dragging, suspending, stretching). The wheelchair-dependent population is not at the forefront of architectural attention. Therefore design for this population tends to be standard, based on ADA requirements, not responsive to wheelchair users’ typically strong upper bodies and their heavier, immobilized torsos. This proposed kitchen design increases the use of the range of motion and muscles used by a person ordinarily confined to a wheelchair, out of their chair.

Working Method: The range of motion of Murray Siple will be mapped using the Vicon 3D motion capture system. Transferring this data to the animation software, Alias Wavefront Maya, will reveal extreme moments of bodily stress where Murray may need aid (through architectural response) to continue movement in a particular direction. Once mapped, these discrete points in space are programmed to act/react in a virtual environment using Maya Embedded Language (MEL) scripting, which uses spatial/relational algorithms to trace and anticipate the interaction of the virtual body part with its domestic prosthetic. For example, when the marker is a certain distance from a surface, the surface responds spatially and topologically. (Commercial 3D motion-capture system, Vicon 8, primarily designed for animation purposes or biomechanics studies, www.vicon.com)