

ME DEPARTMENTAL SEMINAR

Friday, December 8, 2006

2:00pm – 3:00pm

2211 GG BROWN

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“That Which Does Not Stabilize, Will Only Make Us Stronger”

Abstract:

In October 2003, the first functional load-bearing and energetically autonomous exoskeleton, called the Berkeley Lower Extremity Exoskeleton (BLEEX) was demonstrated, walking at the average speed of two miles per hour while carrying 75 pounds of load. BLEEX augments human strength and endurance during locomotion; it is comprised of two powered anthropomorphic legs, a power unit, and a backpack-like frame on which a variety of heavy loads can be mounted. The project tackled four technologies: the exoskeleton architectural design, a control algorithm, a body LAN to host the control algorithm, and an on-board power unit to power the actuators, sensors and the computers.

BLEEX2, completed in 2005, is able to carry 150 pounds at the speed of 5 miles per hour. Its unique design offers an ergonomic, highly maneuverable, robust, lightweight, and durable outfit to transcend typical human limitations. The controller almost destabilizes the system since it leads to an overall loop gain slightly smaller than unity and results in a large sensitivity to all wearer's forces and torques thereby allowing the exoskeleton to shadow its wearer. Couple of these exoskeletons was experimentally evaluated in Flat Iron Mountains in Colorado for its effectiveness.

BLEEX2 has numerous applications: it can provide soldiers, disaster relief workers, wildfire fighters, and other emergency personnel the ability to carry major loads such as food, rescue equipment, first-aid supplies, communications gear, and weaponry without the strain typically associated with demanding labor. The technologies and the prototypes developed in this project can be adapted for design of rehabilitation devices, prostheses and orthoses. This seminar gives a summary of the technical challenges on the control algorithm; biomimetic design; power source, and actuation system.