Assistive exoskeletons
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The concept of a wearable exoskeleton to augment human abilities has been around since at least the 1950's but only recently has the available technology begun to make these machines realizable.

Control systems are now capable of coordinating the complex motions needed for a robotic system to work in harmony with a human operator and while the power systems needed to operate them are generally too large for portable units there is widespread research being done in the area miniaturizing power sources for a myriad of applications. The difficulty most specific to exoskeletons, and robotics in general, comes in the form of the actuators used as "muscles" to move the mechanical units. These actuators tend to be inefficient and often bulky in relation to the amount of power that they deliver, which doesn't prove to be prohibitive to use in industry but becomes a limiting factor when designing systems to be mobile and effectively man-portable .

The main factors affecting the usefulness of an actuator for any given application are:

1) power/mass
2) power/volume
3) stress
4) strain
5) steady-state efficiency
6) power expended during load holding
7) bandwidth or tracking performance
8) auxiliary transmission system
9) auxiliary power modulation equipment
10) ease of controllability.

There are three main actuator types, which all have different pros and cons in each of these ten areas, being explored worldwide. Hydraulic actuators are being used widely at the University of Minnesota (http://www.me.umn.edu/~pli/fpcl/). Electromagnetic actuators are in use at the University of Washington (www.brl.ee.washington.edu) and the University of Tsukuba in Japan (http://sanlab.kz.tsukuba.ac.jp/indexE.html).
Pneumatic actuators are being used at the Oak Ridge National Laboratories (http://www.ornl.gov).

http://www.ee.washington.edu/research/arcs/reports/Kong_Wan_Summer_2002.pdf

http://ndeaa.jpl.nasa.gov/nasa-nde/lommas/eap/EAP-web.htm

http://ndeaa.jpl.nasa.gov/ndeaa-pub/SPIE-lieber-muscle-99.pdf

http://www.ornl.gov/~webworks/cpr/rpt/108469_.pdf