

Video tool could help active workers avoid injury

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Using just video of workers performing tasks such as assembling a manufactured part or packing boxes, a system developed by University of Wisconsin-Madison engineers might soon be able to automatically assess the likelihood that workers will develop common repetitive-motion injuries.

The research could help companies predict and alleviate the risk of injuries such as carpal [tunnel syndrome](#) or [tendonitis](#).

Led by Robert Radwin, a UW-Madison professor of industrial and [systems engineering](#) and [biomedical engineering](#), the researchers have developed a tool that automatically measures and analyzes repetitive tasks based solely on [video](#) recordings.

The journal [Human Factors](#) published details of the researchers' system online in late 2012.

Repeatedly performing the same motions and exertions can lead to injuries in which the body suffers strain from even tiny actions—for example, handling small parts, operating a machine or using a tool hundreds or thousands of times a day.

"Companies want to understand how much time people should spend doing certain kinds of jobs," Radwin says. "There's currently no convenient way to do that. Sometimes the way injuries come to the attention of the company is that someone gets injured, and then it's too

late."

Studying repetitive motion via video requires a careful quantitative measure of the motions a worker uses to complete a task. Researchers break the motion into cycles, measure its intensity and frequency, and how long the workers pause between [motions](#).

Analyzing video manually is a time-intensive process that's not practical for companies to undertake. Neither is it practical for companies to attach sensors to workers' limbs to measure kinematic data—essentially, the "geometry" of their motion. "Sensors interfere with the workers, and it's something companies have told us they do not want," Radwin says. "They can't, they don't have the time."

Radwin's new method simply relies on a computer to analyze videos of the workers' hand movements.

His efficient, automated tool could be a boon to occupational health and safety analysts, saving time and cost, Radwin says. U.S. food processors and manufacturing and service companies, as well as industries in countries still developing safety practices such as China and India, are ripe to benefit from the technology. "We can do these analyses for a very low cost, which should be really valuable for companies," Radwin says.

In their study, Radwin and his colleagues found that automated [video analysis](#) closely tracked manual observations of workers' motion cycles, particularly at higher levels of activity. The group, which in November received \$800,000 in grants from the National Institute for Occupational Safety and Health and the National Institutes of Health, now is refining and testing the tool.

As part of the project, Radwin's team will analyze more than 100 hours of video from University of California, San Francisco, UC Berkeley and

National Institute for Occupational Safety and Health studies. Those studies include several years' worth of video of several hundred workers, as well as data about how many workers developed specific injuries.

"A number of those employees ended up with carpal tunnel syndrome and other injuries," says Radwin. "Our video analysis method might translate those videos and health outcomes into a new kind of analysis that depends only on the videos to predict the risk of an injury."

Their translational research is moving work done by previous researchers into a new practical video tool that industry actually can use. "We're just scratching the surface of the data that's available," he says. "We can use that wealth of data to refine and validate our video analysis tool and accelerate its availability to companies who need it."

Initially, the team is assessing carpal tunnel syndrome, which is one of the most widely studied injuries, but also will study other common occupational injuries. Researchers also could adapt their video analysis to assess skills in specialized fields, such as surgery, and Radwin is working with surgeons at the UW-Madison School of Medicine and Public Health to extend his methods to evaluating and improving operating skills.

In the future, the tool could incorporate algorithms that enable companies to analyze video in real time. "One of our visions is to take an iPhone or camera-enabled hand-held device, hold it up, punch a few things on the screen, and then it works like a sound level meter to tell you the risk of the activity," says Radwin, who is commercializing the tool through his spin-off company, KineVid.

Provided by University of Wisconsin-Madison

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