HELPING AMPUTEES TO WALK NATURALLY

TECHNOLOGY IS IMPROVING THE DESIGN OF ARTIFICIAL LEGS BUT THEIR USERS NEED MORE SOPHISTICATED CONTROL SYSTEMS TO WALK NATURALLY. THE LATEST ENGINEERING TECHNIQUES ARE KEY TO HELPING AMPUTEES RE-LEARN HOW TO WALK NATURALLY.

PhD student Graham Webb is exploring innovative ways of giving them accurate knowledge of the precise movements and positioning of their prosthesis. Better spatial awareness could result in more confidence while they are walking.

He has already designed and built a device that provides feedback to amputees, which uses electrodes placed around the leg to deliver an electrical sensation. The next step is to combine this with a motion capture system so that the sensation corresponds with the way the amputee walks.

PROMOTING NATURAL MOVEMENT

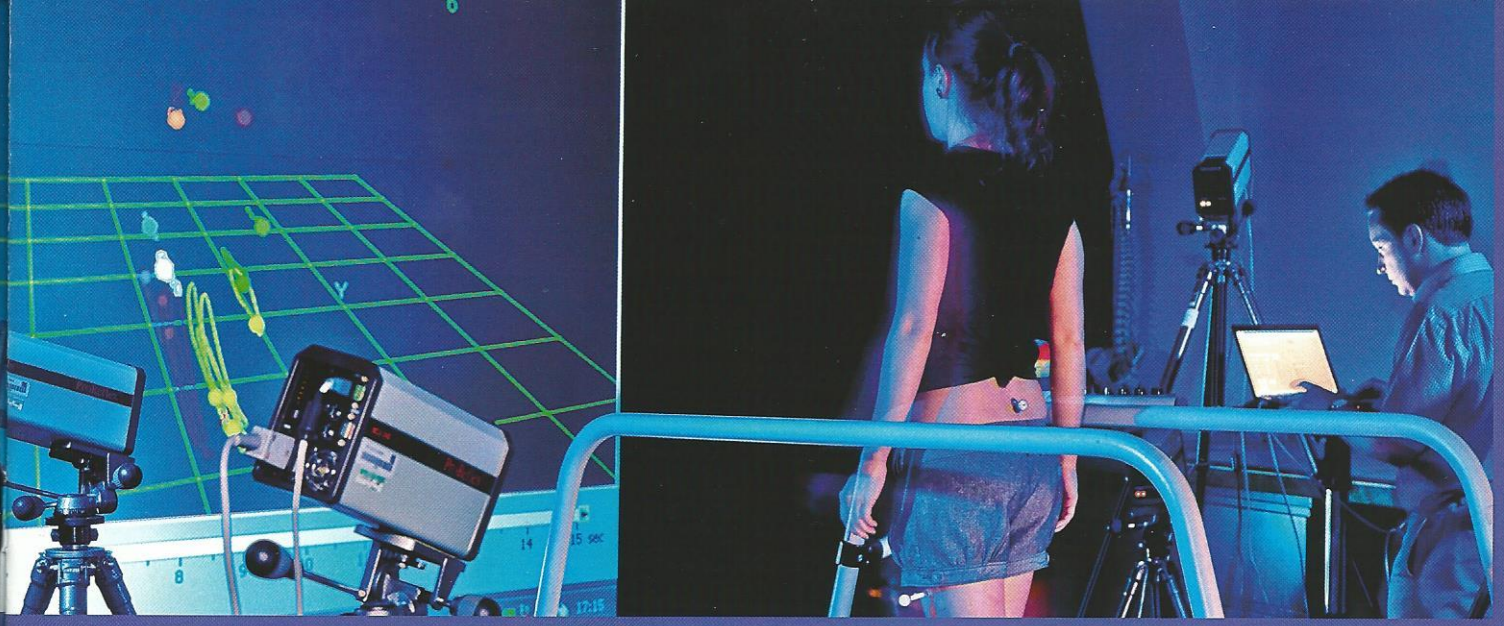
About 5,000 people have a limb amputated every year in the UK, the result of either a serious accident such as a car crash or bone cancer, diabetes and vascular diseases. Technological advances are improving the design of artificial legs but users continue to experience problems.

"After an amputation, patients are given a prosthesis and physiotherapists train them how to walk with it," says Graham. "But, away from the hospital, people sometimes find it difficult to manage and they can get into bad habits and walk awkwardly. This can lead to back problems. However, if amputees have greater awareness of how their limbs move, it could become easier for them to walk more naturally."

LINKING ENGINEERING AND HEALTHCARE

Graham, who is funded by the Engineering and Physical Sciences Research Council (EPSRC), has considerable experience in using his knowledge of engineering and computer science in healthcare. During his master's degree in Biomedical Engineering from the University of Surrey, he undertook clinical training at Queen Mary's Hospital, Roehampton. He also has a BEng in Robotics from the University of Plymouth.

He began his thesis at Surrey by carrying out a detailed study of the technology available that could solve this problem and set about designing his own biofeedback system. Motion capture cameras in the University's movement laboratory then gave him a comprehensive picture of exactly how people walk and stand.



HARNESSING ELECTRONICS TO HELP AMPUTEES TO WALK NATURALLY

Graham is now incorporating the motion capture system with his device and using electrodes placed on an individual's upper leg above the site of the amputation; Stimulation then gives them biofeedback about the movement of the limb so they can learn to use the prosthesis with more confidence. Ultimately, these electrodes could be incorporated inside future designs of artificial leg. Trials are now underway with student volunteers; Graham also plans to test his ideas with patients and hopes to work with injured servicemen and women.

While his studies are progressing well, Graham counsels against too much optimism: "This is early stage research and much work remains to be done. But I would estimate, if everything goes to plan, this technology could be incorporated into artificial legs in the next five to ten years."