

Most accurate robotic legs mimic human walking gait (w/ Video)

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A group of US researchers has produced a robotic set of legs which they believe is the first to fully model walking in a biologically accurate manner.

The neural architecture, musculoskeletal architecture and [sensory feedback](#) pathways in humans have been simplified and built into the robot, giving it a remarkably human-like walking gait that can be viewed in this video:

The biological accuracy of this robot, which has been presented today, Friday 6 July, in the [Journal of Neural Engineering](#), has allowed the researchers to investigate the processes underlying walking in humans and may bolster theories of how babies learn to walk, as well as helping to understand how spinal-cord-injury patients can recover the ability to walk.

A key component of the human walking system is the [central pattern generator](#) (CPG). The CPG is a [neural network](#) in the lumbar region of the spinal cord that generates rhythmic muscle signals. The CPG produces, and then controls, these signals by [gathering information](#) from different parts of the body that are responding to the environment. This is what allows people to walk without needing to think about it.

The simplest form of a CPG is a half-centre, which consists of just two neurons that fire signals alternatively, producing a rhythm. The robot contains an artificial half-centre as well as sensors that deliver

information back to the half-centre, including load sensors that sense force in the limb when the leg is pressed against a stepping surface.

Co-author of the study, Dr Theresa Klein, said: "Interestingly, we were able to produce a walking gait, without balance, which mimicked human walking with only a simple half-centre controlling the hips and a set of reflex responses controlling the [lower limb](#)."

The researchers, from the University of Arizona, hypothesize that babies start off with a simple half-centre, similar to the one developed in this robot, and over time they 'learn' a network for a more complex walking pattern. This could explain why babies have been seen to exhibit a simple walking pattern when placed on a treadmill even before they have learnt to walk – a simple half-centre is already in place.

"This underlying network may also form the core of the CPG and may explain how people with spinal cord injuries can regain [walking](#) ability if properly stimulated in the months after the injury," Dr Klein continued.

More information: "A physical model of sensorimotor interaction during locomotion", Klein et al. 2012 *J. Neural Eng.* 9 046011
iopscience.iop.org/1741-2552/9/4/046011

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