Robot brings 3D to study of joints

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A new robot developed by Flinders University engineers is poised to revolutionise the way we study the performance of normal and diseased joints and their artificial replacements by simulating joint motion.

The Hexapod Robot (pictured) – the most advanced of its kind in the world and the only one of its kind in Australia – was launched at Flinders University on Tuesday 27 September.

The device, developed over two years by a team led by Flinders Biomechanical Engineer Dr. John Costi and including researchers from The University of Adelaide's School of Mechanical Engineering, can study complex joint motions in 3D to help design and develop improved joint replacements.

This complements other capabilities within Flinders Medical Devices and Technologies, an area of research strength in the University.

Based on the Stewart Platform – a classic, proven design for six degree of freedom position and motion control, widely used in flight simulators and theme park rides – the Hexapod Robot allows for improved understanding of how bones, joints and components function and why they fail.

“The Hexapod Robot very precisely simulates people walking, bending, twisting and lifting to within fractions of a millimetre, which allows researchers to determine the force placed on joints from repeated movements or actions,” Dr. Costi said.

“We are well-advanced in using the robot to examine the strains in spinal discs that may be a cause of slipped discs and lower back pain during complex manual handling/lifting movements in the workplace,” he said.

“We can apply the same principle to test any number of synthetic materials, to see how they respond to twisting, pulling and pushing with up to two tonnes of force.”

However, as Dr. Costi points out, in addition to medical applications, potential users of the Hexapod Robot include car part manufacturers and workplace designers.

“The robot could help in the design of a new vehicle shock-absorber, for example, or to improve manual handling guidelines in the workplace to minimise spinal injury,” Dr. Costi said.

“Specialist health providers such as orthopaedic surgeons from The Royal Adelaide Hospital and SportsMed.SA have already expressed interest in using the robot, and a number of research projects are underway.

“The potential is enormous.”

Provided by Flinders University