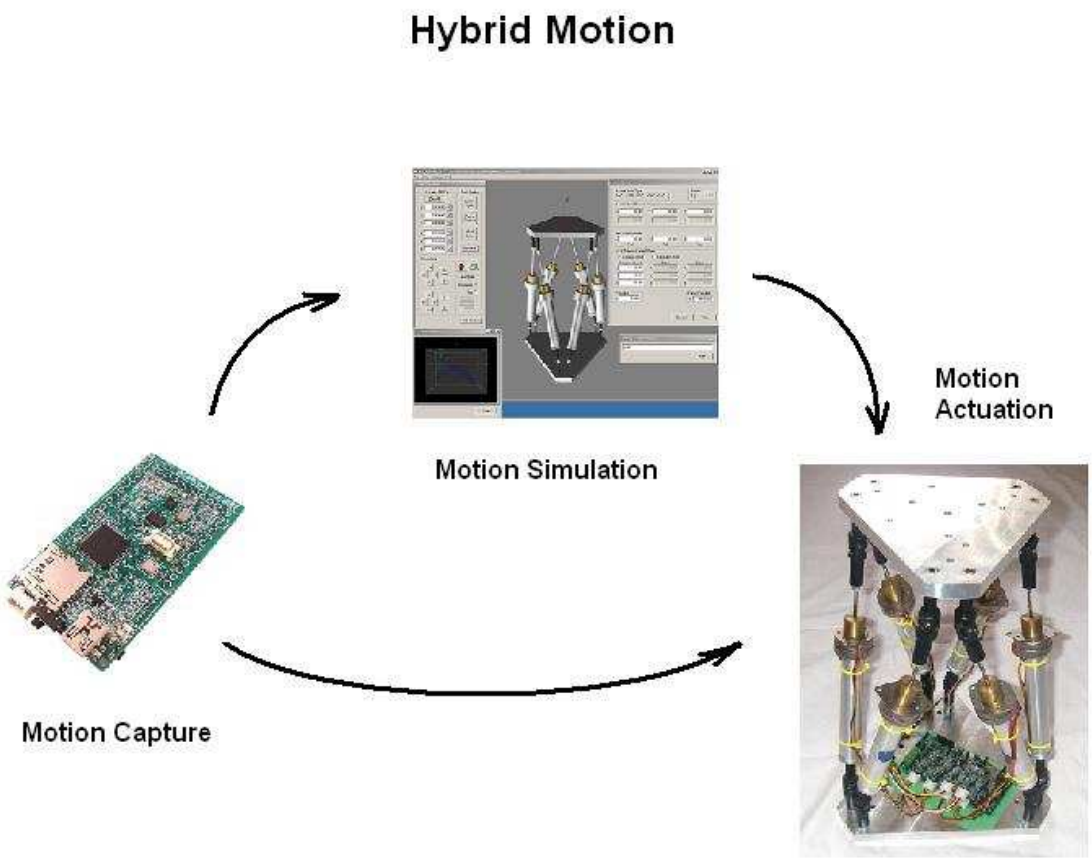
# Linear/Rotary Hexapod Actuators

with

IMU8420 Motion Capture and Real Time Simulator Tools

Preliminary Overview




**www.soc-robotics.com**



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# Introducing a low-cost MR damper reinforced hexapod platform

SOC Robotics recently completed the development of a high performance parallel actuator called a hexapod. This project was collaboration between the company and researchers at Simon Fraser University. A hexapod is capable of moving with 6 degrees of freedom (DOF) – three translation and three rotation axis - at the same time. The original goal of this project was the design and fabrication of a family of low-cost and low profile hexapod that is accurate enough for a wide range of applications. This was achieved by employing low-cost actuators equipped with currently available accurate and cheap sensors/electronics. The finished hexapod is a medium size robot that will target a wide range of industrial sectors and civil applications that are not dealing with high payloads. This unit will be scalable and can be customized based on the market demands. An MR damper will be incorporated to the original design of hexapods to increase the payload capacity that is typically small because of the small size of our linear actuators. This configuration brings high stiffness, speed, load capability, in addition to low inertia and positional errors compared to their serial counterparts. Existing Hexapods are very precise, however, they are expensive (>$40,000) and require dedicated controllers. A significant market exists for a Hexapod that has enough precision for most of the robotic applications, costs in the $5-$10,000 range and has an integrated controller.

SOC Robotics has innovated a new control processor technology that converts standard G Code used by the CNC industry into the signals necessary to control the six legs of the hexapod. This feature allows the hexapod to directly mimic the motion of existing cartesian robots and milling machines. The firm has also developed a real time motion capture technology using low cost 10DOF mems sensors to simplify the capture of complex motions which can then be mimic by the hexapod.

SOC Robotics has created an end to end eco system of motion capture, simulation and real time physical control

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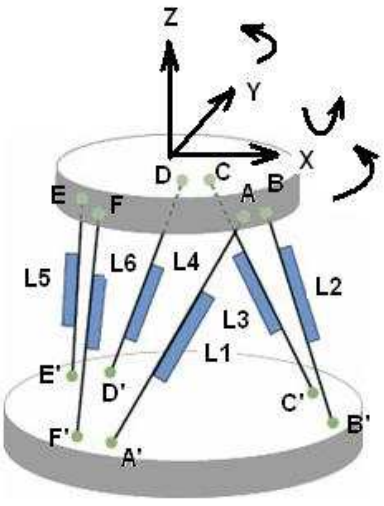
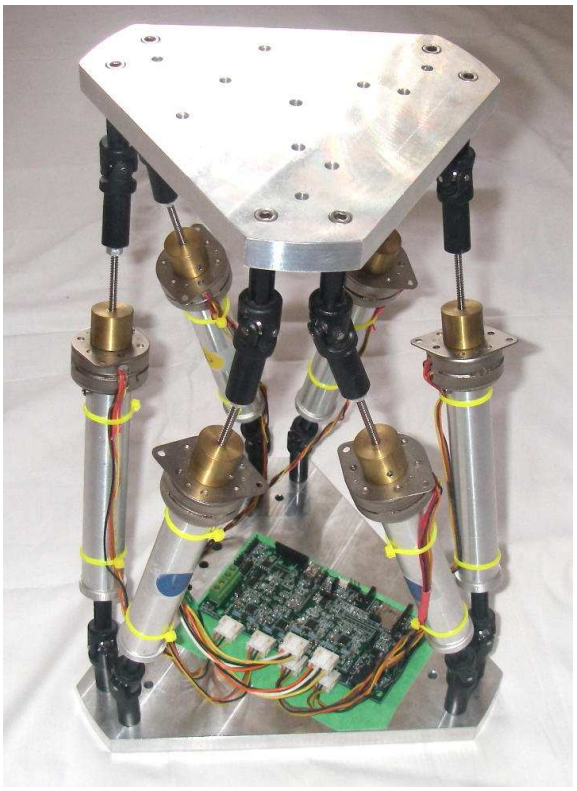
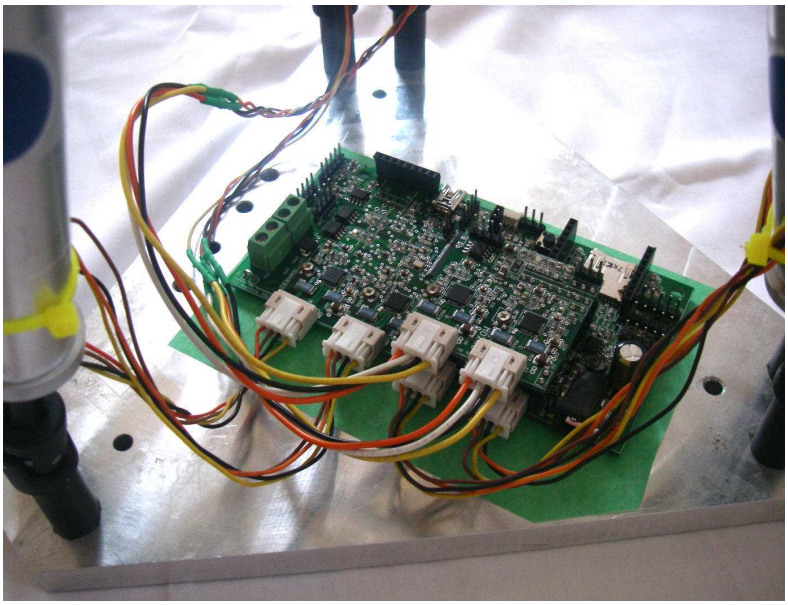
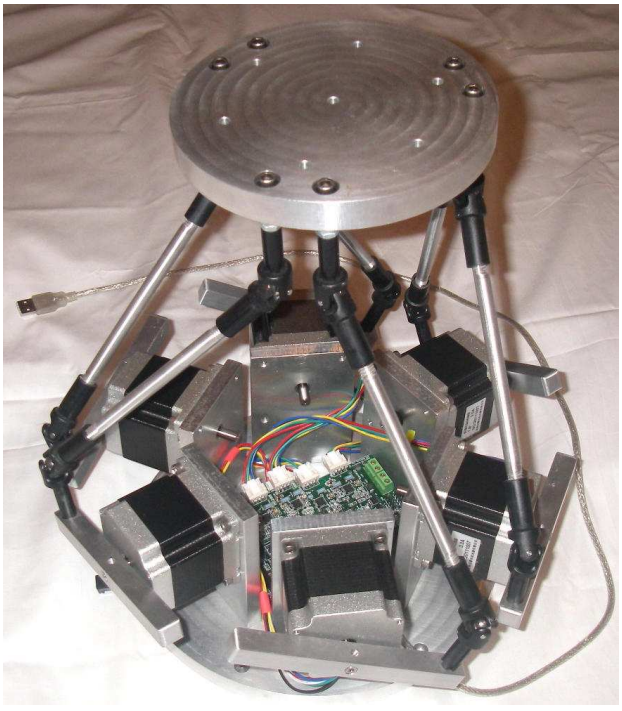


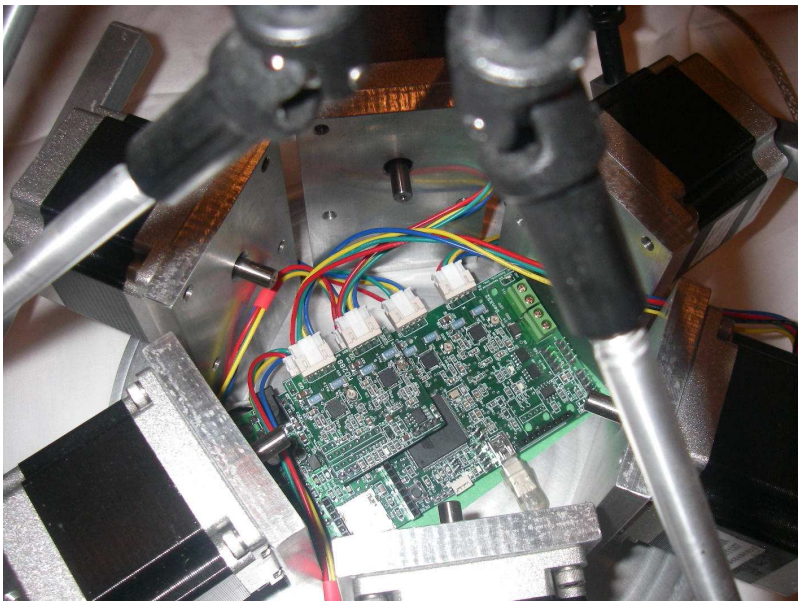
## HA610 Prototype Linear Hexapod and GenX32 Controller



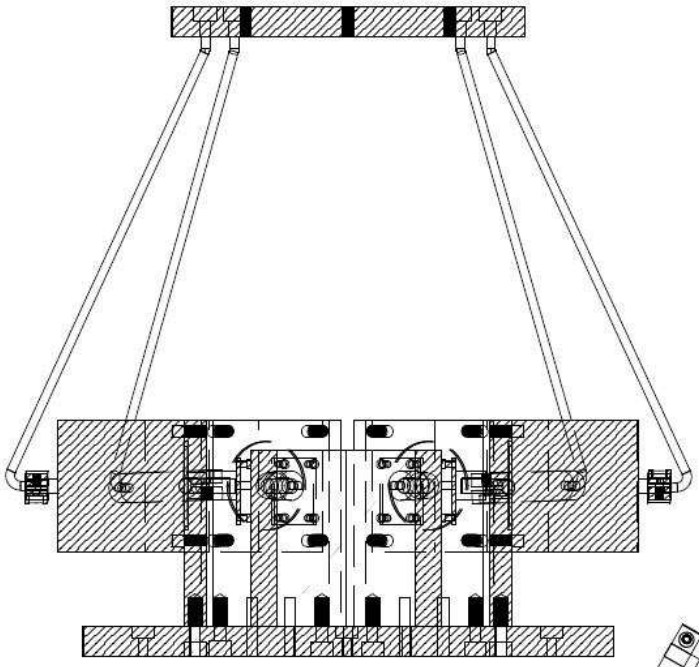


## HR610 Prototype Rotary Hexapod and GenX32 Controller

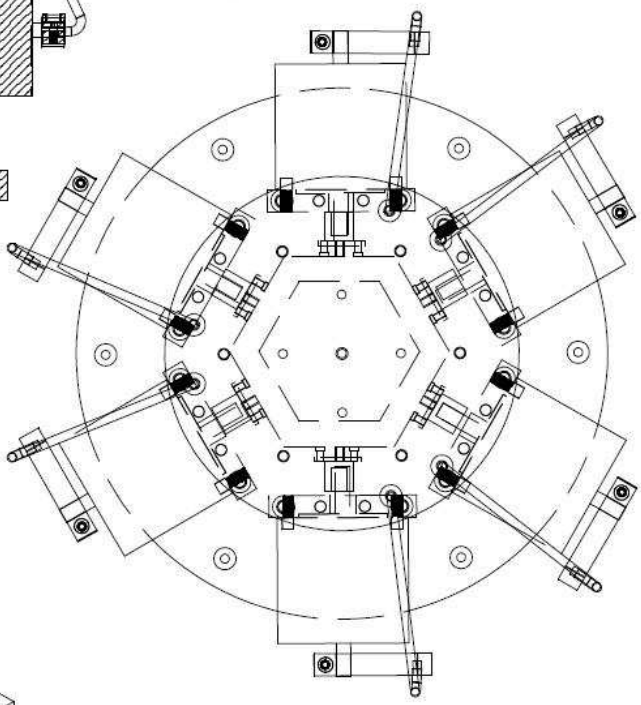




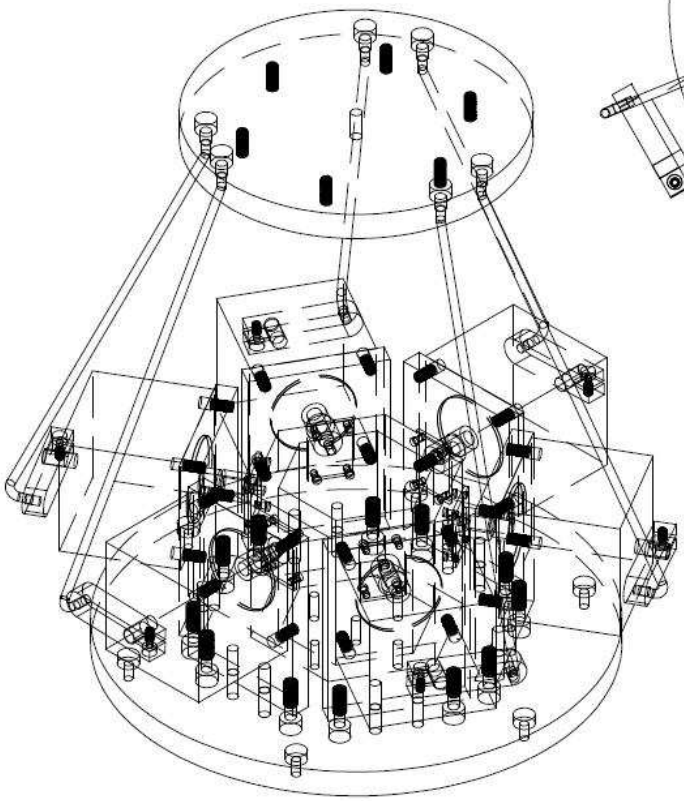
Sectional Front View:



Top View:



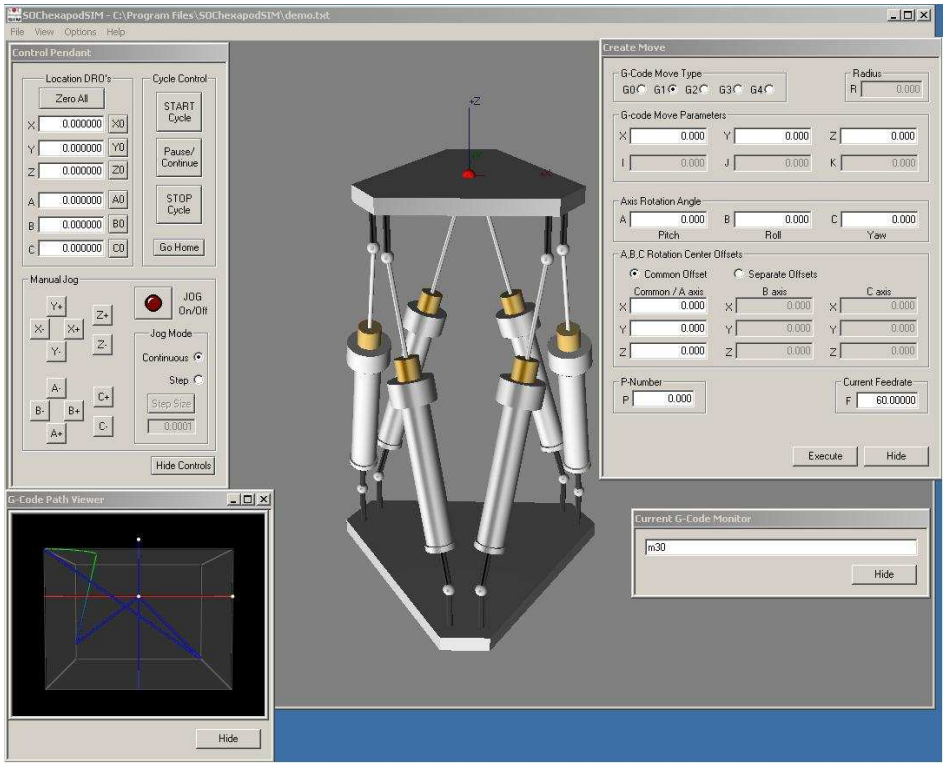
Isometric View:



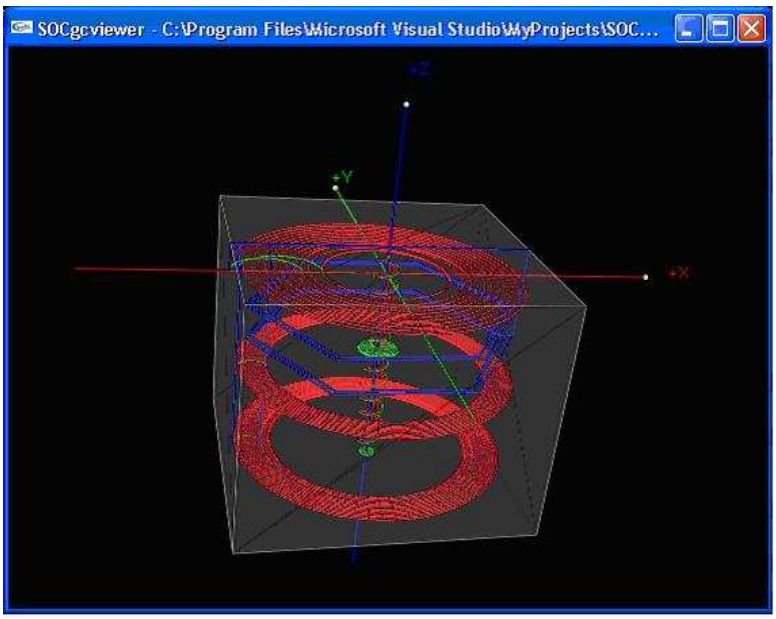
SOC Robotics Inc.
Hexapod Assembly

## SOC Robotics Hexapod Simulator Desktop Application

The Hexapod Simulator is a real timed desktop hexapod motion simulator that accepts six axis motion G Code (X, Y, X, roll, pitch and yaw). to drive the actuator. The simulator supports real time joystick and IMU8420 sensor input. The simulator can also output G Code directly to the GenX32 Hexapod controller for real time physical control of the rotary or linear hexapods.

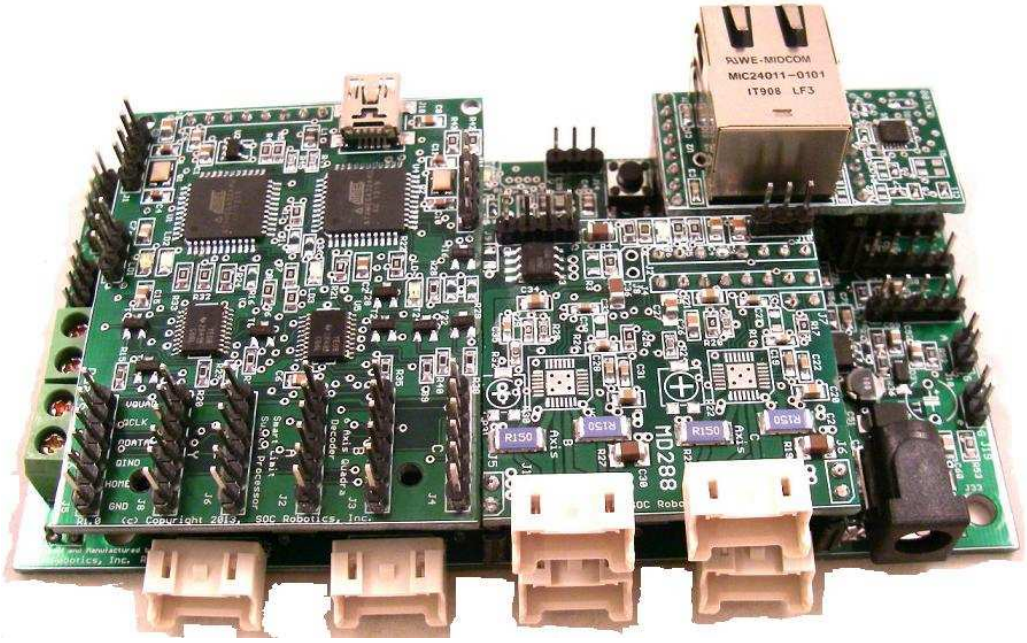



## SOC Robotics G Code Visual Viewer

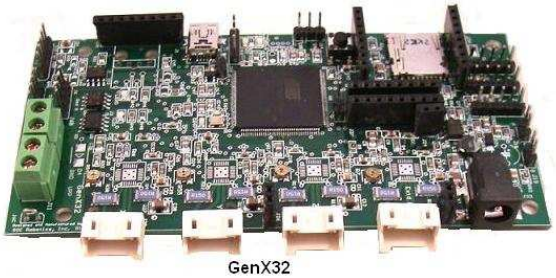


## GenX32 - Linear/Rotary Hexapod high performance G Code Controller

The GenX32 motion controller is a 32bit high performance system with 6-axis control, 100BaseT and USB 2.0 interface, 6 quadrature decoding channels and smart limit switch support. The controller converts G Code commands consisting of X, Y, Z, Roll, Pitch and Yaw into the step/direction signals sent to each linear axis stepper motor. The quadrature decoding subsystem measures the position of each hexapod leg position in real time and allows the GenX32 to make any necessary real time position adjustments to maintain the precise length of each leg.




GenX32 6 Axis High Performance Motion Controller with Quadrature Decoding



GenX32

EN100

100BaseT
Ethernet Port

Quad6X

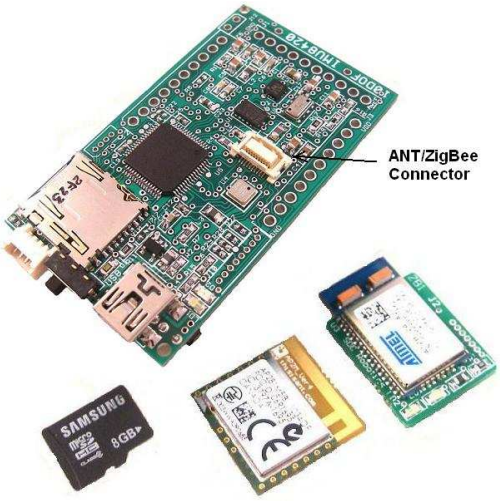
6-Axis Quadrature Decode

DM288

2-Axis Bipolar Driver

## IMU8420 Real Time 10DOF Motion Capture System

The IMU8420 is a real time 10DOF motion capture system capable of recording 3-axis acceleration, 3-axis gyro, 3-axis magnetometer and barometric pressure (height) in real time along with corrected roll, pitch and yaw using an Extended Kalman Filter EKF sensor fusion algorithm.

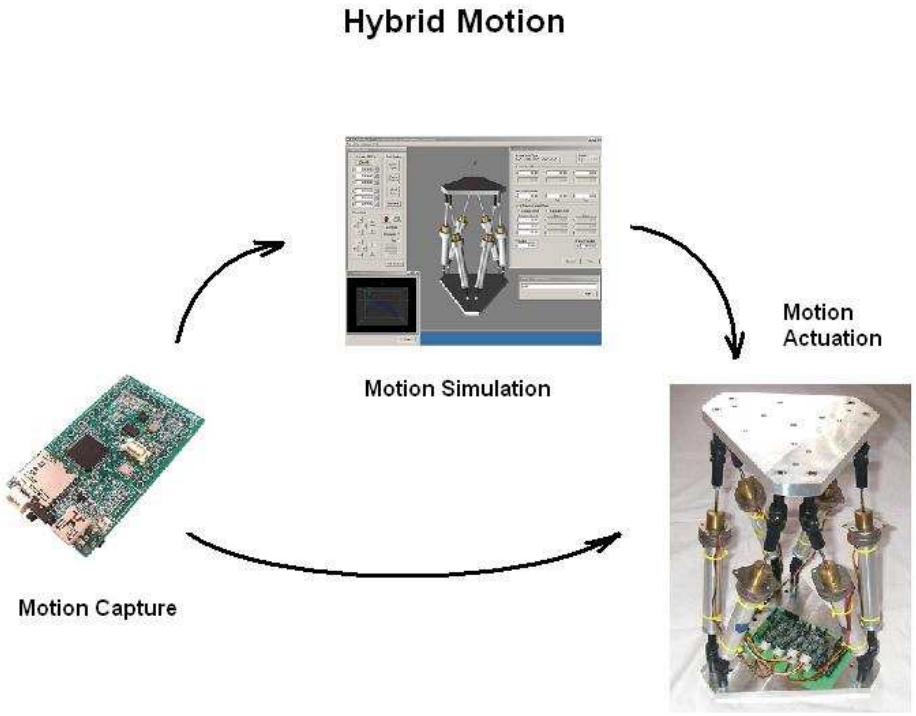




The output of the IMU8420 can be fed directly to either the Hexapod Simulator or the GenX32 Hexapod controller.

## Hybrid Motion Systems

By combining motion capture with motion simulation with motion actuation SOC Robotics makes it possible to rapidly create rich real world physical motion systems capable of complex actions.



# Notes: