Motion capture technology, commonly known as MoCap, has evolved from its origins in entertainment to become an indispensable tool in many more different fields, like astronaut training. These systems digitally record and translate physical movements into three-dimensional models using specialized cameras, markers, and sensors, that track movement with millimeter precision.

For astronauts preparing for space environments, MoCap serves a critical purpose in its main training camps, which are underwater simulation environments. As a quick explanation, the ESA implements these underwater training protocols, where astronauts prepare for spacewalks wearing full-scale spacesuits while working on replicas of their future spacecraft modules.

MoCap transformed this environment when integrating waterproof sensors attached to key points of the astronaut´s suit, which capture every movement and provide instructors with comprehensive data that could reveal little inefficiencies that could be invisible to the human eye.

Unlike traditional observational assessment, MoCap quantifies metrics on movement patterns or joint angles, crucial aspects when operating in the vacuum of space. This gives instructors great information about the details of every astronaut, helping to make personalized training programs that are adapted to their specific movement patterns. Furthermore, this data plays a significant role in the job of Engineers, who can refine the ergonomics of the tools or the modules.

Muscle atrophy is still one of the main challenges in space environments. Medical teams use the biomechanical data extracted from the sensors to study the behavior of the muscles in prolonged space environments and develop countermeasures to combat this condition.

Other tools in astronaut training that are influenced by MoCap are “floating” chairs that mimic zero-gravity conditions. By integrating motion tracking with these systems, the simulation can respond dynamically to the astronaut´s actions.

Nowadays, MoCap is an essential bridge between terrestrial training and space environments. Other applications in space exploration are the ones designed by Draper Laboratory in collaboration with NASA, for motion-tracking their astronauts on the International Space Station (ISS).

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