



# TrackCam: A single camera human motion capture

## Method for Recreating 3D Human Posture and Movement from Standard 2D Single Camera Video

Using a single camera, human motion is captured and replicated into a full 3D human avatar (digital replica of the motion). This enabling technology provides capability to insert virtual human characters into virtual environments, promote rapid construction of virtual environment soldier scenarios, and achieve substantially more realistic representation of human behavior consistent with soldier performance in an Operational Environment.

This camera and software system addresses the need to capture and characterize the complex series of motion and behavior, i.e. critical characteristics of a Soldier, for example, conducting mission tasks within a given scenario, in a manner that can be readily introduced in any simulation environment. The ultimate objective of this program is to provide new functionality supporting substantively more realistic training of soldiers for improved on-the-ground mission effectiveness.



This novel and effective methodology was developed to capture and track soldier behavior, characteristic of extended and complex motion, using a Spatial Posture and Motion Identification (SPMI) method. Such capability enables creating a real-life scenario and implementation of extended motion sequences without a need for commensurately extended planning, experimentation and computational processing using other available state-of-the-art techniques. TrackCam is based on the utilization of a single mono camera, coupled with Iowa-developed deep-learning algorithms to capture behavior/motion, derive the 2D kinematics of the captured motion, and then impose the 2D kinematics to the 3D human model (SANTOS). This unique capability provides a powerful system to obtain 3D kinematics of the human body.

TrackCam takes a standard 2D video of human movement and estimates the kinematic motion & biomechanics on a 3D human model. Building on our strengths in optimization and a widely accepted mathematical human model, 3D motion can be estimated from just one stationary camera. First, machine learning algorithms identify and track 2D joint center positions on at least one person in the video input. These 2D joint positions are then used as input and drive the motion solver, which will predict the motion on a 3D human model as joint angles over time. These joint angles can be used with existing models for biomechanical analysis. The motion solver constitutes a unique process by which it estimates human motion from 2D screen positions over time. TrackCam can be used in the identification of patterns of life scenarios and in training simulation, where extended maneuvers can be rapidly created, characterized by much more realistic behavior. And the basic technology is highly applicable to utilization in and support of synthetic/immersive environments.