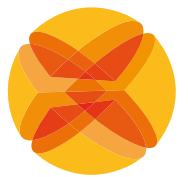


MVN

INERTIAL MOTION CAPTURE



xsens

MVN is a flexible, camera-less full-body human motion capture solution. This portable system can be used indoors and outdoors. The results of a MVN mocap session needs minimal fine-tuning as there is no occlusion or lost markers. MVN is a cost efficient MoCap system based on state-of-the-art miniature inertial sensors, biomechanical models and sensor fusion algorithms. MVN is created by Xsens, a leading expert in inertial sensor technology.

"The flexibility and short turnaround time of the MVN system is unparalleled. With the MVN system, Xsens is changing the rules of the motion capture game: we're saving time and money."

Ted Price, CEO of Insomniac Games

PRODUCT OVERVIEW

MVN mocap suit

- Full body 6DOF tracking
- 17 MTx inertial trackers
- Wireless operation
- Comfortable lycra suit with embedded cabling
- Extra prop / backup sensor

MVN Studio

- Record motion capture data with ease
- Advanced human body model provides output of 23 body segments
- Export to popular motion capture file formats, such as .BVH and .FBX
- Real-time visualization, playback and editing
- Intuitive editing interface
- Plug-in for seamless real-time integration with Autodesk MotionBuilder® (optional)

PRODUCT ADVANTAGES

- Flexibility
- Quick turn around times
- Unlimited capture volume
- Real-time, On-set previsualization
- Saves up to 80% post-processing time
- Clean and smooth data

FEATURES

Ease of use

- No limitation in measurement range (up to 500 ft wireless)
- Use anywhere, outside, in your office, no studio required
- No occlusion or line-of-sight restrictions
- Minimal fine-tuning, filtering or post-processing needed
- Portable and can be worn under normal clothing
- Very short setup time (approx. 10 minutes)
- Ready-made pipelines for Autodesk MotionBuilder®, 3DS Max®, Maya® and Softimage|XSI®

Fidelity and immunity

- Highly sensitive MEMS inertial sensors capture every twitch and deliver incredibly smooth data
- Use under any lighting condition
- No sensitivity to EM-fields

APPLICATIONS

- 3D character animation (in game, film, TV, advertising)
- Training and simulation, live events
- Sports science, After Action Review
- Rehabilitation, biomechanics research, human factors

MVN TECHNICAL SPECIFICATIONS

MVN MOCAP SUIT

Number of trackers

- Full body configuration 17 MTx inertial trackers
- Lower body configuration 7 MTx inertial trackers
- Upper body configuration 11 MTx inertial trackers
- Extra prop / backup sensor 1 MTx inertial tracker

Full body suit:

Light weight revolutionary stretch fabric with cable guides, 2 fabric sensor pockets and 10 TPE Dryflex sensor holders

- Sizes: S, M, L (standard), XL, XXL

Accessories (included)

- 2 gloves with tracker pocket
- 1 head band with tracker pocket
- 2 foot mounts

On body cabling

For data communication and power
Only 1 cable needed on each arm/leg,
trackers daisy-chained

Power supply

- Power/data control unit 2 Xbus Masters (XM)
- Power (each XM)
 - Battery (incl.)
 - 8 AA NiMH rechargeables
(of which 4 spare)
 - Power adapter (incl.)
 - EU/US/UK Power adapter
110-240VAC/12VDC 1A
 - Input voltage range 4 - 14V
- Operating time (typical) 3 hours
- Battery charger (incl.) For 8 AA NiMH batteries

Communication

- Interface
 - Wireless or high-speed RS-232/USB
- Wireless range radius (typical)
 - Outdoor 150 meters (492 ft.)
 - Indoor open space 150 meters (492 ft.)
 - Indoor office 50 meters (164 ft.)

Wireless receiver units

- All configurations 2 Wireless Receivers (incl.)
Bluetooth 2.0
(optimized, class 1)
USB 1.1 or 2.0
- RF technology
- Interface

PHYSICAL

Dimensions

- MTx inertial tracker 38 x 53 x 21 mm
(1.5" x 2.1" x 0.8")
- Xbus Master 100 x 150 x 40 mm
(3.9" x 5.9" x 1.6")
- MVN suitcase 559 x 351 x 229 mm
(22" x 13" x 9")

Suitcase with wheels & extendable handle
Strong, durable & waterproof
Suitable as hand-luggage

Weight

- MTx inertial tracker 30 g (1 oz.)
- Xbus Master 200 g (0.4 lbs)
- MVN Suit (excl. trackers) 360 g (0.80 lbs)
- Total on-body system
(with batteries and cables) 1930 g (4.2 lbs)
- Shipping weight (incl. suitcase) 11 kg (24 lbs)

Operation environment

- -20... +55 deg Celcius, non-wet

Setup time

Less than 10 minutes



PERFORMANCE

MTx inertial trackers¹

- 3D orientation accuracy <math><0.5 \text{ deg}^2</math>
- Resolution 0.05 deg
- Accelerometer range $\pm 180 \text{ m/s}^2$ (18 g)
- Gyroscope range 1200 deg/s

MVN human model

- MVN uses a 23 segment biomechanical model with 22 joints.
- Each joint is specified by statistical parameters for 6DOF joint laxity. An advanced spine and shoulder model is used that computes the kinematics of the spine and shoulder blades.

System calibration

Flexible calibration scheme with instant feedback regarding the expected accuracy. Calibration can be done without assistance from a second person

- Basic calibration
 - 10 seconds
 - Basic calibration needs only subject length and foot length
- Advanced calibration
 - 10 - 30 seconds per additional step
 - Advanced subject specific calibration determines tracker alignment and/or subject specific dimensions. Calibration procedures for subjects with limited range of motion are possible.

3D translation capture

- Double integration of body segment accelerations allows for jumping/running (permanent floor contact is not needed)
- ~2% error in traveled distance
- Advanced external contact model detects body world contacts to enable crawling, sitting, cartwheels etc.
- Full control over external contact points

Props

- Support for one to three props

Magnetic environment

- Full immunity to temporary magnetic disturbances (~30 seconds)
- Visual warning of disturbed environment

Local, permanent disturbances

High degree of immunity, performance will depend on motion and environment

Soft tissue artifacts

Minimized to ~2 degrees RMS using redundancy in measurement and biomechanical constraints

Multiple person capture

Up to four person capturing on one PC

MVN FUSION ENGINE

Output

Full kinematics of each segment (position, velocity, acceleration, orientation, angular velocity and angular acceleration)

Update rate

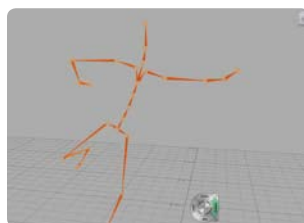
- Internal update rates 120, 100, 60 Hz
- Export frame rates 120, 100, 60, 50, 30, 25, 24 Hz

Warranty 2 year
Support & software updates 1 year



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¹ Please refer to MTx leaflet for detailed specifications
² Static accuracy in homogenous magnetic field



MVN STUDIO SOFTWARE

Functionality

- Easy and quick calibration
- Real time preview of motion capture
- Simultaneous recording/viewing
- Replaying previously recorded motion data

Supported export formats

- .BVH (Biovision Hierarchical Data)
- .FBX (FiLMBOX)
- .MVNX (MVN Open XML format)
Output 3D position, 3D orientation,
(optionally: 3D acceleration, 3D velocity,
3D angular rate, 3D angular acceleration)
- .MPG, .AVI and .MOV movie export

Streaming motion data

- Streaming motion data on local area network (UDP)
- MotionBuilder 2009 and 7.5
Ext2 @ compatible client plug-in available
- Client network monitor support in MVN Studio

Time Code and Remote Control plug-in

- Time code stored in MVN, MVNX (optional) and FBX
- Remote control of recordings in MVN Studio

Data rate

- 39 MB/min @ 60 Hz
- 66 MB/min @ 100 Hz
- 79 MB/min @ 120 Hz

RECOMMENDED COMPUTER SYSTEM

| | |
|-------------------|--|
| Operating system: | Windows XP (SP2) Windows Vista |
| Processor: | Dual core e.g. Core2 or AMD X2 (minimal Pentium 4 - 2.6 GHz) |
| Graphics card: | Any graphics card with DirectX 9 hardware acceleration |
| USB Ports: | 2x USB or hub per system |

MVN SOFTWARE DEVELOPMENT KIT

Functionality

- Easy integration with custom application software
- Provides real-time orientation and position data of body segments using dynamic link library (C interface)
- Provides interfaces to calibration routines and character definition routines
- Handles pre-recorded MVN files for post-processing
- MVN Fusion Engine handles 3D position aiding input, in real-time



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ABOUT XSENS TECHNOLOGIES

Xsens has strong expertise in biomechanics and inertial sensor technology. To date Xsens has invested more than 100 man years in sensor and software research and development. Tens of thousands of Xsens inertial motion sensors have already been deployed in challenging human and machine motion applications such as motion capture, training & simulation, biomechanics, marine technology and automotive. Xsens' customers include Sony Pictures Imageworks, Double Negative, Industrial Light & Magic, Electronic Arts, Sony Computer Entertainment, Daimler, Gearbox Software, THQ, 2K, The Third Floor, Syndicate, CG Sweden and others. The combination of expertise in human motion analysis and innovative inertial motion sensors makes Xsens a leader in inertial human motion capture solutions.

"Xsens MVN is innovating in exactly the space we are interested in: unencumbered capture that works in any shooting environment."

Rob Bredow, senior visual effects and creative technology supervisor for Sony Pictures Imageworks



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