



WTSS Wearable Training & Security System



- Full body movement monitoring
- Absolute position if required
- Respiratory monitoring
- Heart rate monitoring

Based on patented technologies; ALERT and RIP

Marine

Ground troops

Special Forces



Wearable Training & Security System

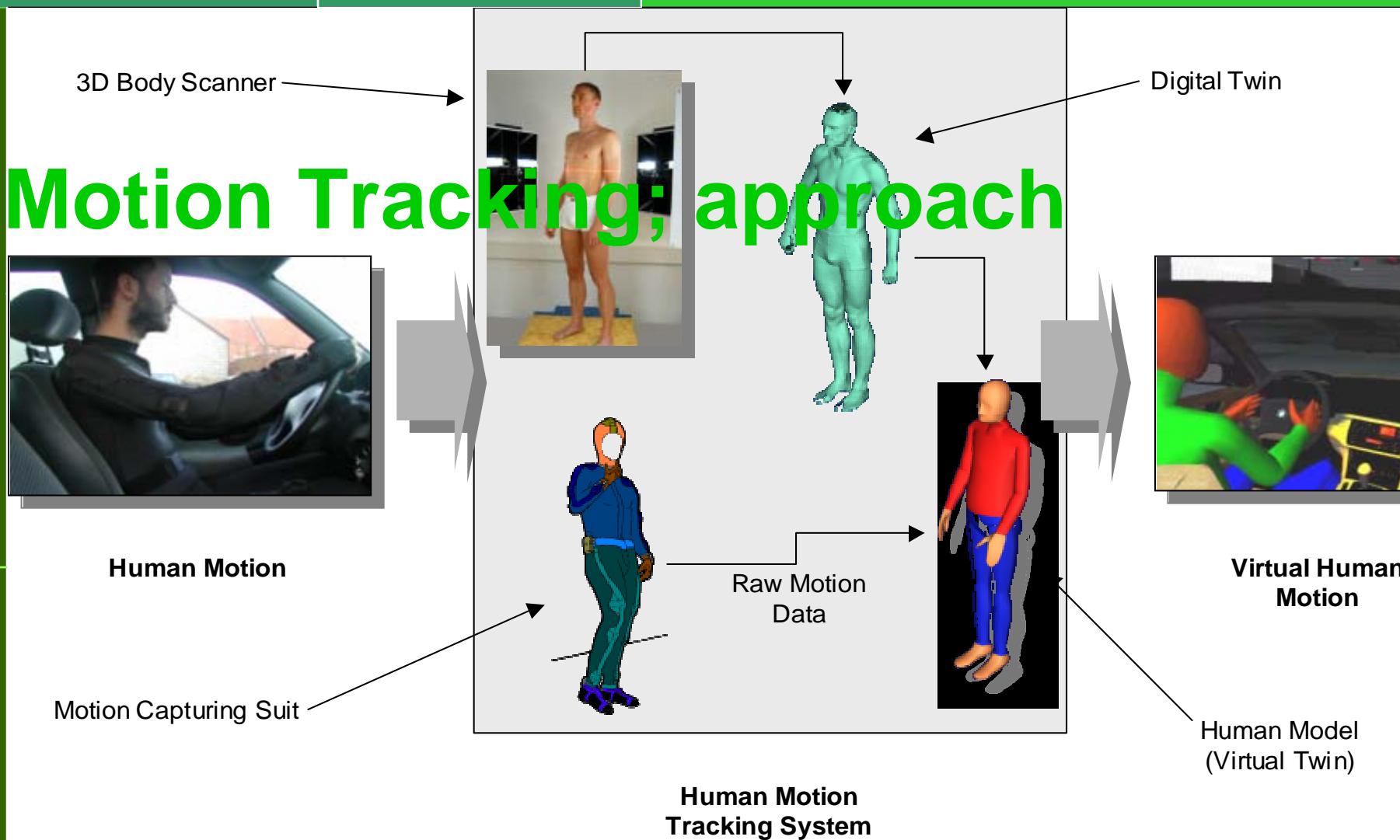
- Monitoring for Training and Security
 - Diving
 - Parachutists
 - Shooting stands
 - Armed troops
-
- By:
 - Human motion monitoring
 - Biofeedback (heart rate & breathing pattern)

Biofeedback & Human motion





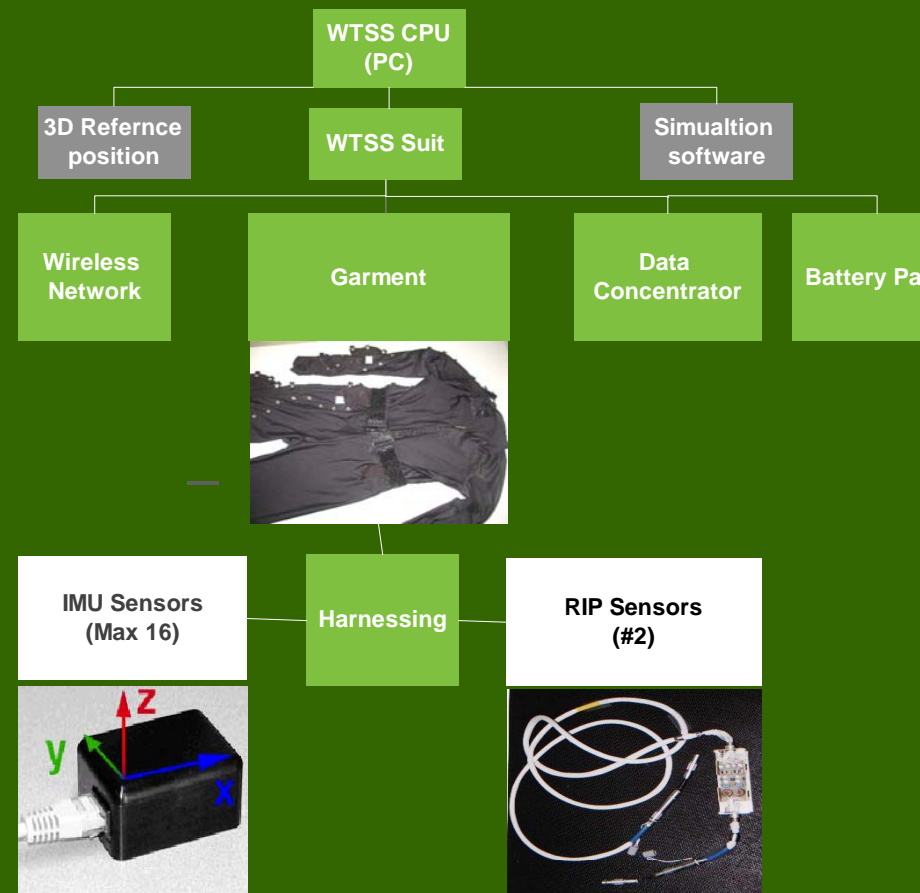
Human Motion Tracking; approach





System break down

- Sensors (IMU + RIP)
- Tissue
- Cabling
- Power systems
- Data concentrator
- Wireless network
- PC





Two models available

Two piece body suit

- Top + bottom part
- Increased modularity

Coolmax tissue provides optimal comfort

- Rapid moisture transport away from the skin
- Increased vapour permeability (breath ability) for better cooling
- Low moisture absorption (no clammy feeling)
- Soft
- Machine washable
- Extensible

Harnessing

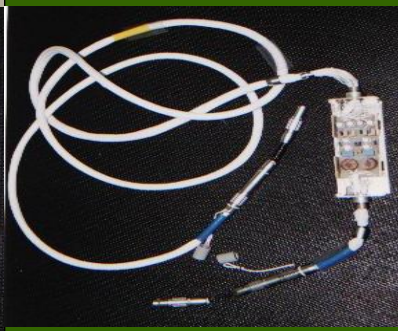
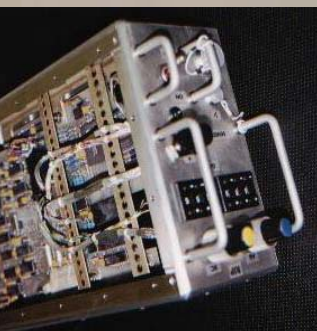
- Routing
 - Funnels
 - Push button closure
 - Velcro attachments





RIP Sensor (Respiratory Inductive Plethysmograph)

Monitors breathing properties of both the abdomen and ribcage part of man and heart rate.



RIP Working principle

- 2 Spoelen
- Oscillator 7/2/3cm
- Frequency changes
- Analogue / digital convertor



IMU sensors (inertial measurement unit)

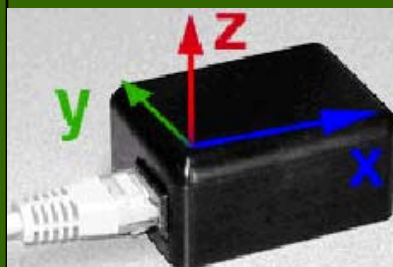
- Measure absolute 3D angular direction
- Resolution of 1° or better
- Operation without line-of-sight (e.g. inside car)
- Small and light (no obstruction during movements)
- Real-time operation (up to 100 samples per second)
- Good dynamic response
- Easy and fast calibration

IMU working principle

Use of gyroscopes

- Measure angular velocity
- Integration of angular velocity leads to angular direction

Accurate 3D measurement using 3 gyroscopes, 3 magnetometers and 3 accelerometers compensating drift and other environmental influences





IMU Sensor Fact Table

Dimensions	38 x 51 x 25 mm ³
Weight	42g
Power consumption	40mA/5.5V
Sampling speed	Up to 100Hz (quaternion output)
Max. angular velocity	900deg/s
Max. acceleration	20m/s ²
Accuracy	Inclination <1°, Heading <2°
Resolution (RMS)	Inclination <0.1°, Heading <0.4°
Drift	<1°, any direction over 30min
Line-of-sight	No



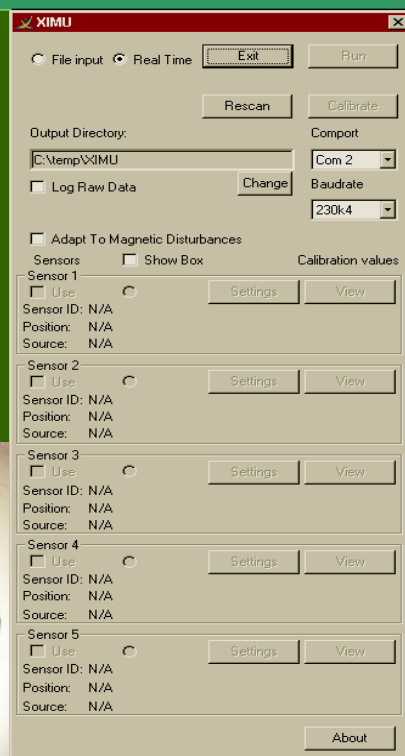
Positioning Sensor

To relate the motion of different limbs towards an absolute position one has to add a position sensor systems. Depending on the application, its specific requirements and environmental limitations different of the shelf systems can be implemented.

The WTSS system is an open platform, allowing to interface with most standards.

- GPS
- Optical Systems
- Acoustics





Data Concentrator

- Simultaneous data collection from up to 17 IMU's (@100 samples/IMU)
- Time stamping of IMU samples
- Direct input to human body model
- Synchronisation between IMU and 3D position tracking system
- Intermediate storage (off-line operation)
- Power management (battery operated)
- Battery pack can be attached to suit belt
- Integrated battery charger available (charge while in use) enhancing autonomy
- Several battery types available to comply with specific autonomy requirements
- Wireless link to PC available

Wireless network

- Bluetooth –100m
- GPRS + 100m

(Depending on distance and security level)



Unique features enhancing performance

- No obstruction to normal movements to obtain realistic data
- Accurate measurements by 'no-friction' sensor fixating system
- Modular set-up ranging from full body motion capture towards single joint analysis
- Comfortable and easy to wear suit (low weight, no transpiration, ...)
- Minimum number of sizes to fit 5-95 percentile of men and women
- Multiple actor motion capture
- No line-of-sight required enabling continuous data recording
- Minimum set-up time, simple calibration and no intensive post-processing required
- Can be used in a non-conditioned environment
- No limitations to the extent of the capture area
- Compatible with most commercial 3D tracking systems

