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SPECIAL SHOES MOVEMENT



ISPO 6TH CENTRAL EUROPEAN REGIONAL CONFERENCE

25-27 AUGUST 2011

NYÍREGYHÁZA, HUNGARY

A small, easy to use, portable motion analysis system, for supporting orthopaedic decisions. Dr. Enrique Montiel, INESCOP, Spain.





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SSHOES

SPECIAL SHOES MOVEMENT

Grant Agreement NMP2-SE-2009-229261

NMP-2008-4.0-7 Integration of new technologies and materials for
differentiated consumer-centred product capability





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FACTSHEET

- Project acronym: **SSHOES**
- Full title of project: **SPECIAL SHOES MOVEMENT**
- G.A. Ref.: **NMP2-SE-2009-229261**
- Start Date: **1st July 2009**
- Duration: **36 months**
- Total Budget: **4,874.025€**
- EU Contribution: **3,509.000€**
- No. of Partners: **11**
- Website: www.sshoes.eu





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Project Coordinator



INESCOP

INSTITUTO TECNOLÓGICO
DEL CALZADO Y CONEXAS

Beneficiaries



University of Salford
A Greater Manchester University



**Deutsche
Sporthochschule Köln**
German Sport University Cologne

ITIA 
Istituto di Tecnologie Industriali e Automazione

A & CN
AUTOMÁTICA Y CONTROL
NUMÉRICO S.L.



T
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TODO PARA
SUS PIES

duna[®]
THERAPEUTIC SHOES INDUSTRY


Soletec SYSTEMS LIMITED[®]

KOPITARNA[®]
S I N C E 1 8 8 6

C2i2

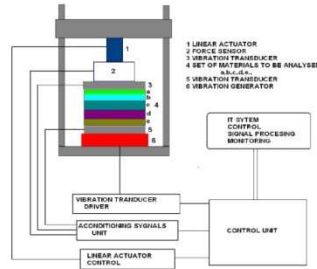
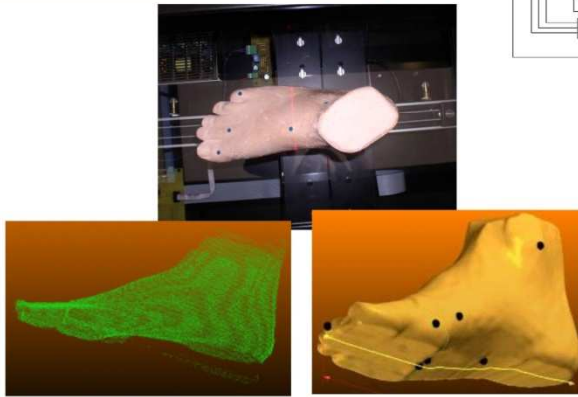


PROBLEMS ADDRESSED

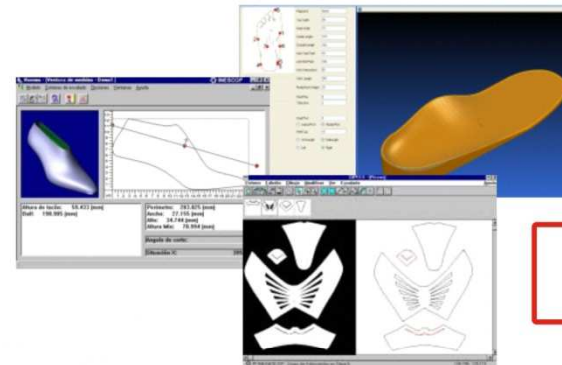
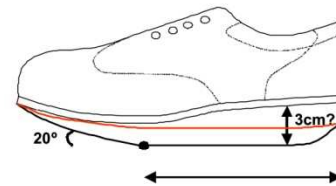
- 1. Health care problems (biomechanical and biomedical aspects)**
- 2. Footwear design problems (new design technologies)**
- 3. Footwear product problems (comfort, health welfare and service to customers)**
- 4. Footwear components and materials problem (eco-sustainability and high performing materials)**
- 5. Footwear manufacture problems (adaptive production processes and engineering framework)**

Sustainable, consumer-centred production of footwear and insoles

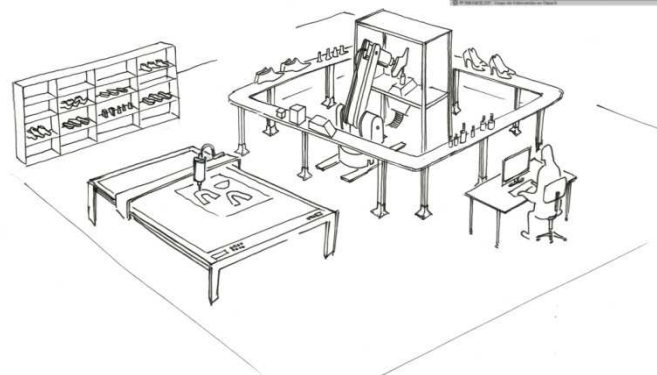
MATERIAL TESTING & DEVELOPMENT



SIMULATION



KB-CAD/CAM



BIOMECHANICS





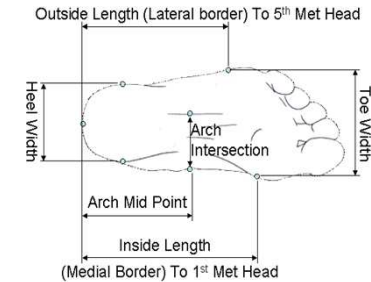
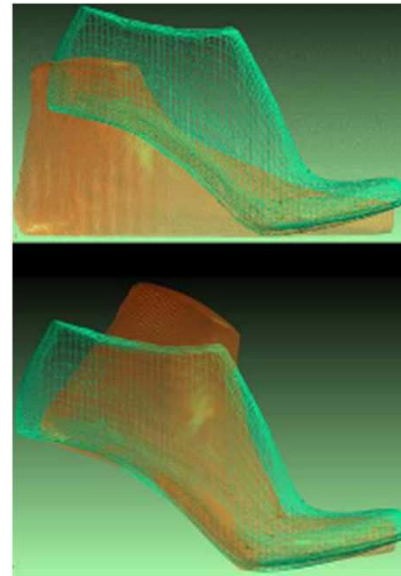
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3D CAD system using biomechanical data

Rocker Shoe Design

Parametric bio-mechanical design



Last Rectification

Modelling and fitting
final last

Foot Deformation

Fitting flat foot to shank
last curve

Critical measures for
insole design





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PORTABLE GAIT LAB

TARGET:

- Portability
- Easy setup
- Easy to use





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PORTABLE GAIT LAB

TECHNICAL SPECIFICATIONS

Cameras: 4 Gigabit Ethernet progressive scan CCD cameras
Digital color camera
Resolution 656 * 494 pixel
90 full frames per second

Lens: 4 fix focal lenses $f=4,2$, $F\# 1,6$

Lighting: 4 high power LED illumination - 15W each





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PORTABLE GAIT LAB

TECHNICAL SPECIFICATIONS

Force plate: Kistler Multi component force plate with built-in charge amplifier, 600x500 mm

System frame: Composite material based frame with integrated electronic



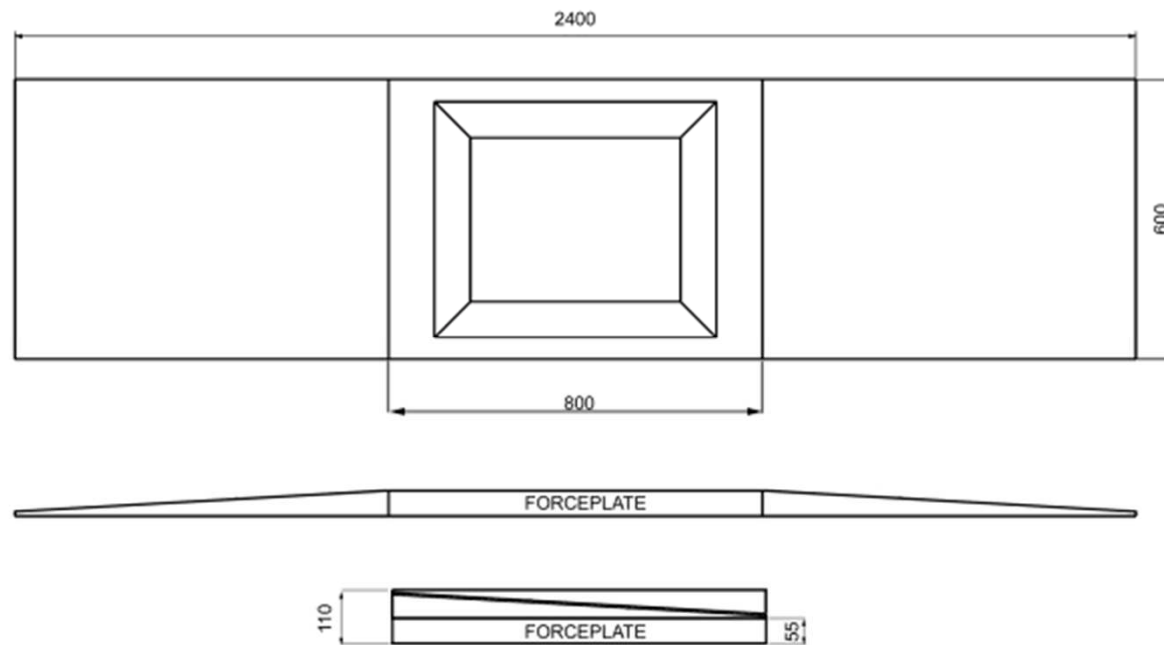


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PORTABLE GAIT LAB

TARGET: Portability





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PORTABLE GAIT LAB

TARGET: Easy setup



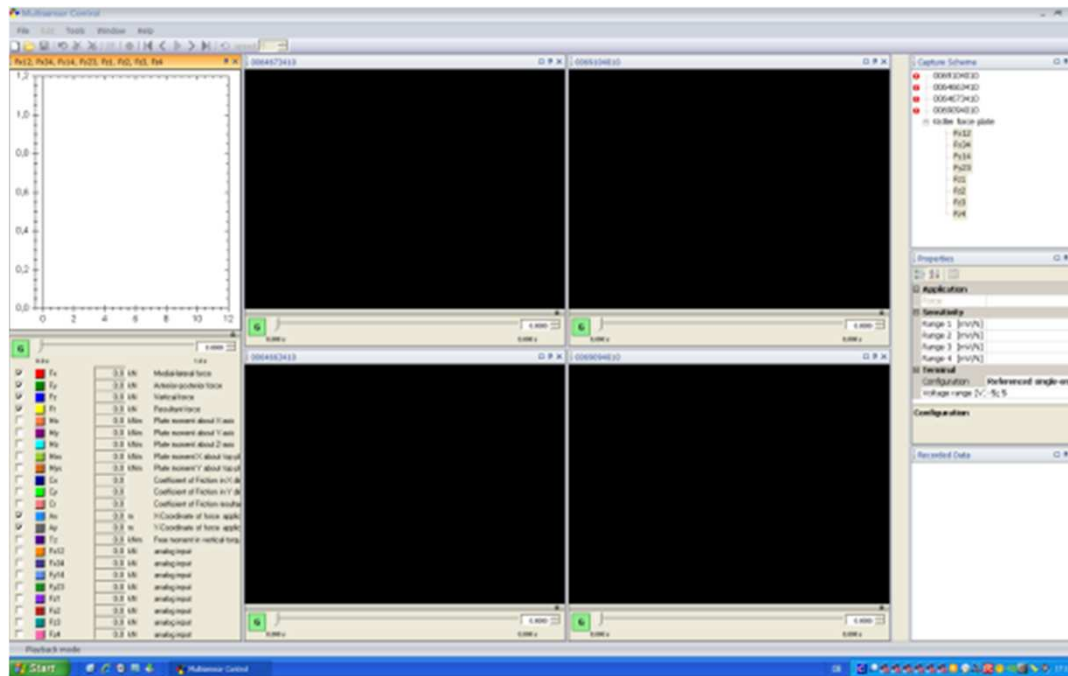


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PORTABLE GAIT LAB

TARGET: Easy to use 1/6



Project software for
synchronous
acquisition of video
and forces &
walking velocity

Predefined sensor
configuration for the
application





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PORTABLE GAIT LAB

TARGET: Easy to use 2/6



Easy calibration

- Lens calibration done at manufacturing
- Extrinsic calibration in the capture software
- Object: Checkboard

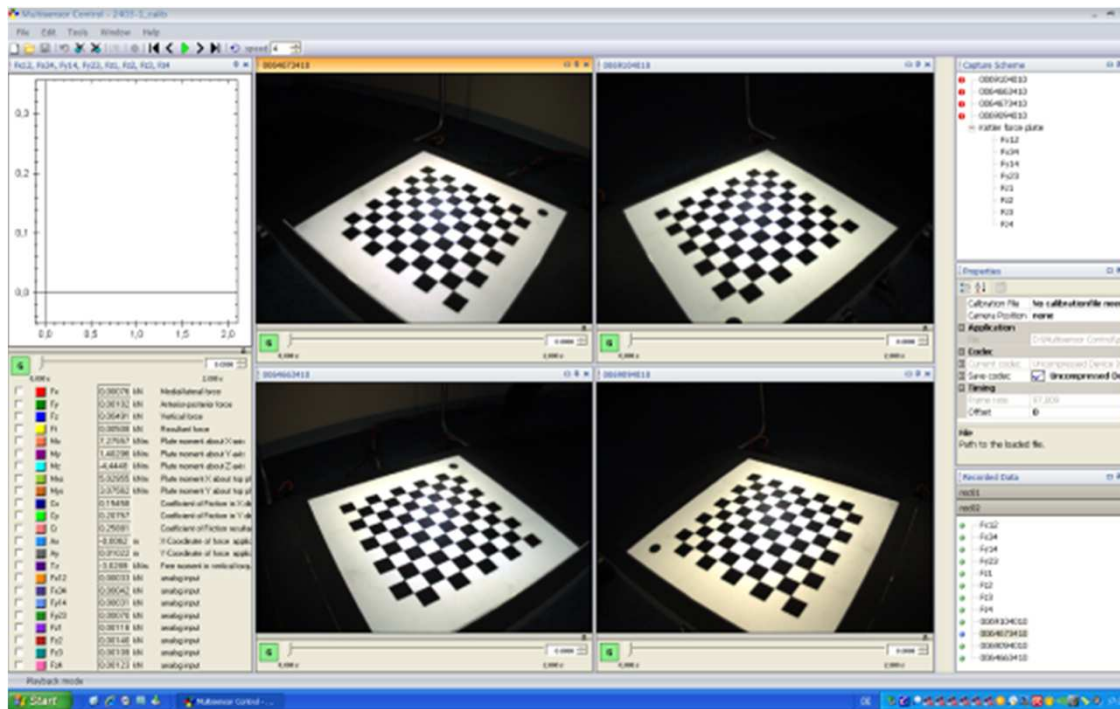


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PORTABLE GAIT LAB

TARGET: Easy to use 3/6



Easy calibration

- Lens calibration done at manufacturing
- Extrinsic calibration in the capture software
- Object: Checkboard

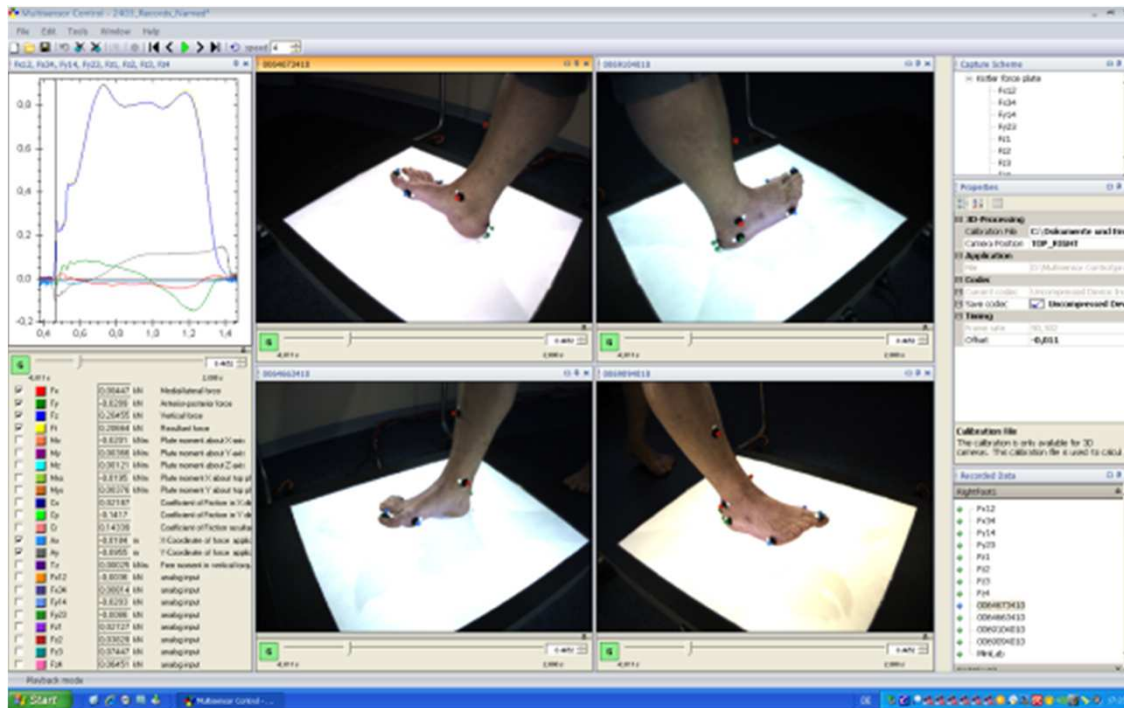


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TARGET: Easy to use 4/6



Easy capture

- Colour coded markers are attached to the Client's/Patient's leg
- Client/Patient walks over the plate

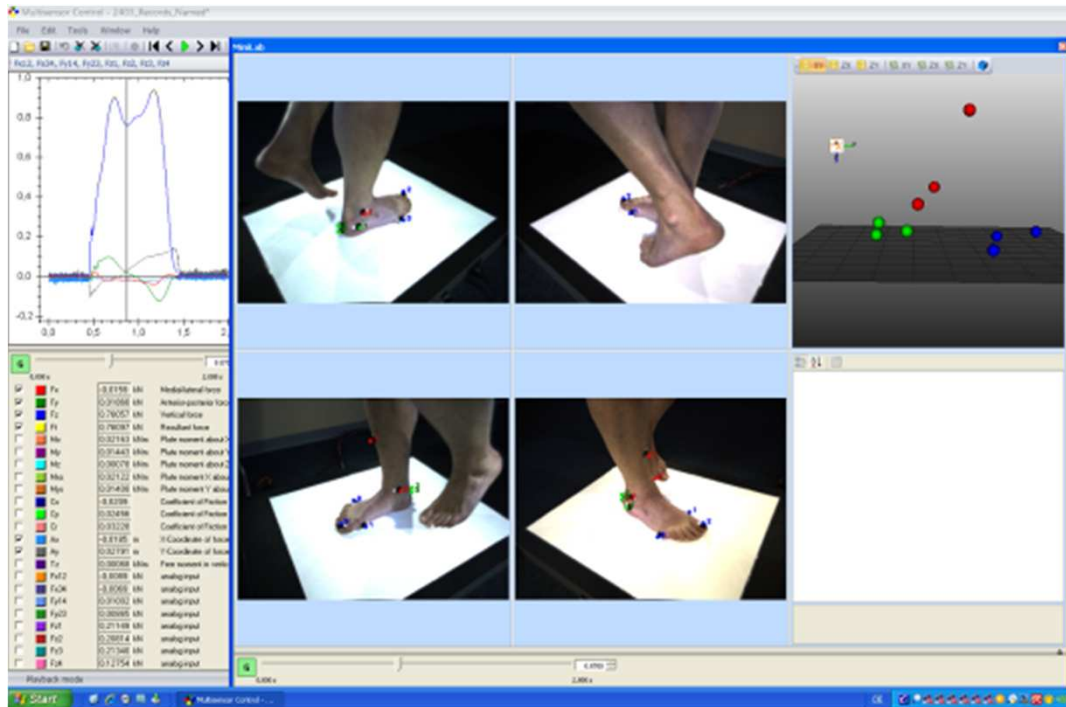


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PORTABLE GAIT LAB

TARGET: Easy to use 5/6



Easy analysis

- Automatic marker detection & recognition
- 3D visualisation



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TARGET: Easy to use 6/6

14	Time	Fx12	Fx34	Fy14	Fy23	Fz1	Fz2	Fz3	Fz4	Fx	Fy	Fz	Ft	Mx	My	Mz	Mx1	Mx2	Mx3	Mx4	My1	My2	My3	My4	Mz1	Mz2	Mz3	Mz4	
15	0.00042207	0.0011814	-0.00060826	0.0015359	0.00109731	0.00136469	0.00079152	0.01193229	0.00075933	0.00092764	0.00444581	0.0046046	0.0001315	-0.0002334	0.00005672	0.0													
16	0.00111111	-0.00040149	0.00120195	-0.0006907	0.00167833	0.00101112	0.00123467	0.0010484	0.00114891	0.00080046	0.00098762	0.00444319	0.00462148	0.00001335	-0.00002152	0.00002637	-0.0												
17	0.00222222	-0.00038091	0.00120195	-0.00062807	0.00151556	0.00105425	0.00140803	0.00069308	0.00123566	0.00082104	0.00088669	0.00436103	0.00452536	0.00015497	-0.00003829	0.00006001	0.0												
18	0.00333333	-0.00038091	0.00103755	-0.00073192	0.00161729	0.00152783	0.00123467	0.00096277	0.00110554	0.00065663	0.00088536	0.00483081	0.00495497	0.0001909	-0.00007629	-0.00002104	0.0												
19	0.00444444	-0.00042207	0.00111975	-0.00054643	0.00157659	0.00096815	0.00136469	0.00053464	0.00114891	0.00069768	0.00103017	0.0040164	0.0042047	0.00017855	-0.0000381	0.00005247	0.0												
20	0.00555556	-0.00042207	0.00132525	-0.00075253	0.00151556	0.00114036	0.00114799	0.00079152	0.01193229	0.00090919	0.00078302	0.00427216	0.00443275	0.00008375	-0.0000688	0.0000836	0.0												
21	0.00666667	-0.00046322	0.00120195	-0.00064948	0.00159894	0.00105425	0.00121435	0.00079152	0.00118239	0.00077473	0.00097746	0.00418942	0.00452194	0.00017774	-0.00003239	0.00006816	0.0												
22	0.00777778	-0.00042207	0.00120195	-0.00071912	0.00161729	0.00096815	0.00121315	0.00062027	0.00119329	0.00077988	0.00088536	0.00410206	0.00426837	0.00013116	-0.00003829	0.00003549	0.0												
23	0.00888889	-0.00042207	0.00124305	-0.00071912	0.00159894	0.00105425	0.00127801	0.00096277	0.00136579	0.00082098	0.00088502	0.00466083	0.00481098	0.0000102	-0.00003137	0.00005036	-0.0												
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25	0.01111111	-0.00048838	0.00124305	-0.00071131	0.00157659	0.00105425	0.00127801	0.00062027	0.00127904	0.00075925	0.00088528	0.00423157	0.00438536	0.00011906	-0.00007613	0.0000745	0.0												
26	0.01222222	-0.00044264	0.00120195	-0.00067009	0.00165798	0.00118341	0.00123467	0.00079152	0.00123566	0.00075931	0.00098789	0.00444527	0.00461659	0.0001075	-0.00006875	0.00004485	0.0												
27	0.01333333	-0.00050437	0.00128415	-0.0006907	0.00163763	0.00096815	0.00136469	0.00091996	0.00119329	0.00077978	0.00094693	0.00444509	0.00461124	0.00006066	-0.00002174	0.00008439	0.0												
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Data timelines ready for biomechanical analysis

- 3D coordinates of all markers
- 3D components of forces and moments



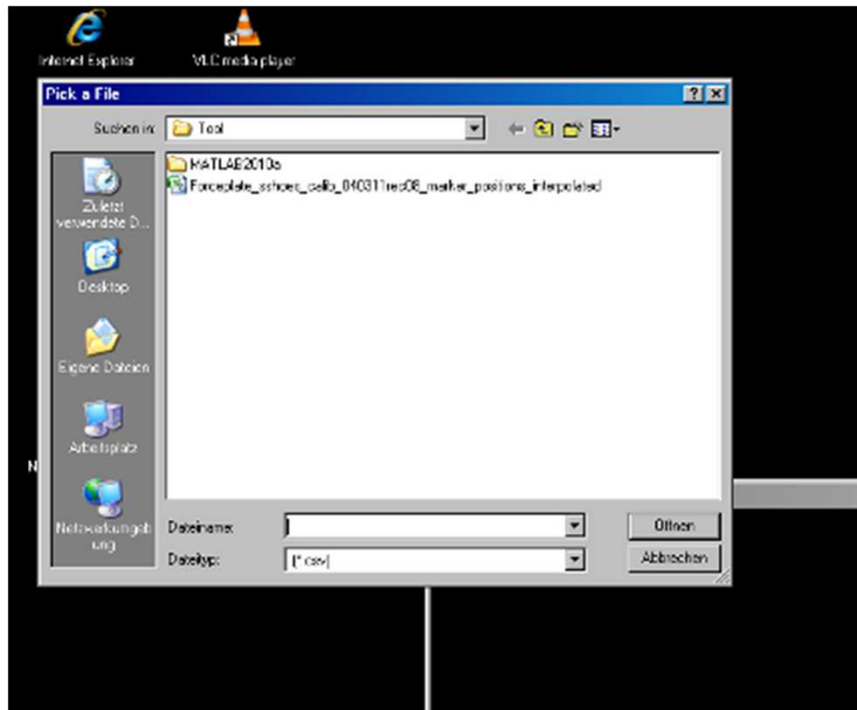
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PORTABLE GAIT LAB

TARGET: Easy to use 7/6

**Automatic read in of
raw data and
calculations.**



OUTPUT: Time series

- 3D Kinematics
- 3D components of joint forces and moments

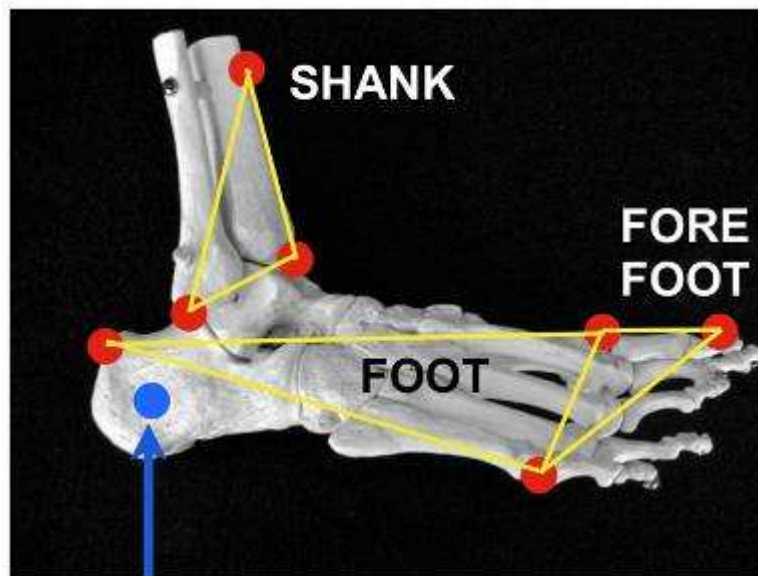


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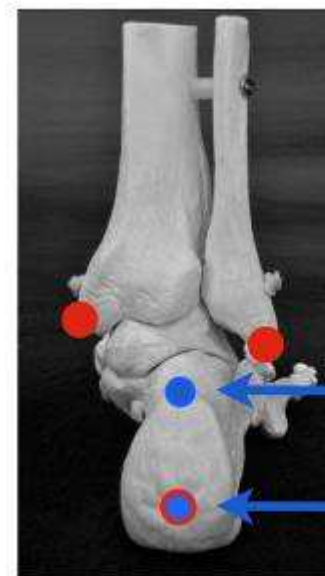
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TARGET: Easy to use 7/6



Local
Coordinate System
Marker 03



Local
Coordinate System
Marker 01

Local
Coordinate System
Marker 02





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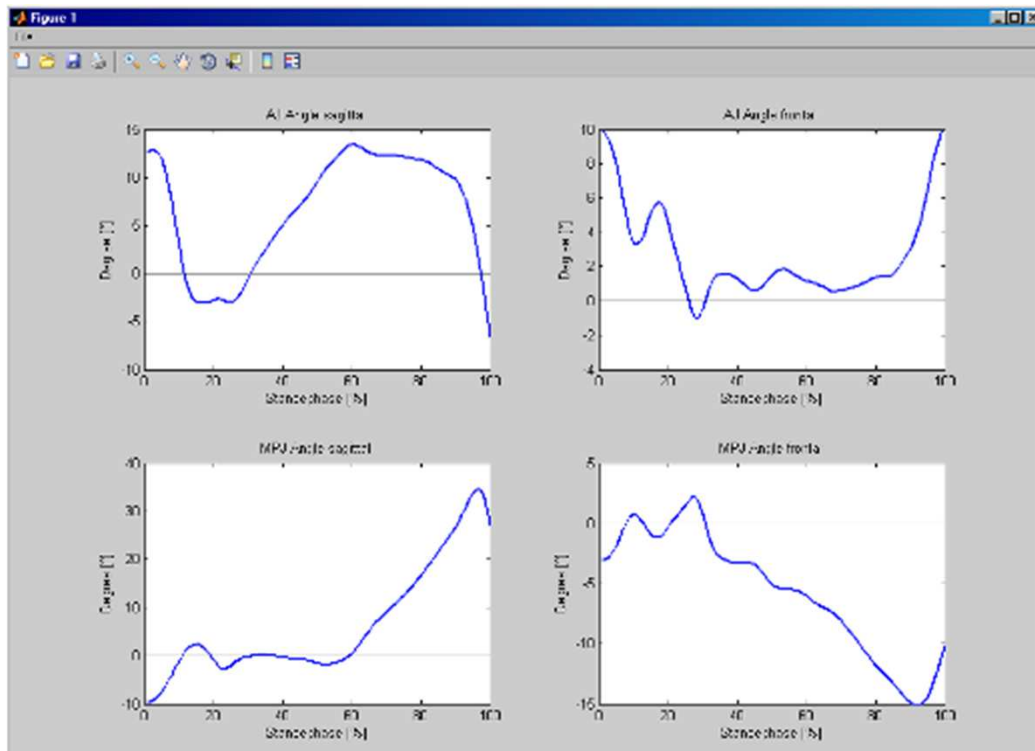
PORTABLE GAIT LAB

TARGET: Easy to use 7/6

**Automatic read in of
raw data and
calculations.**

OUTPUT: Time series

- 3D Kinematics
- 3D components of joint forces and moments





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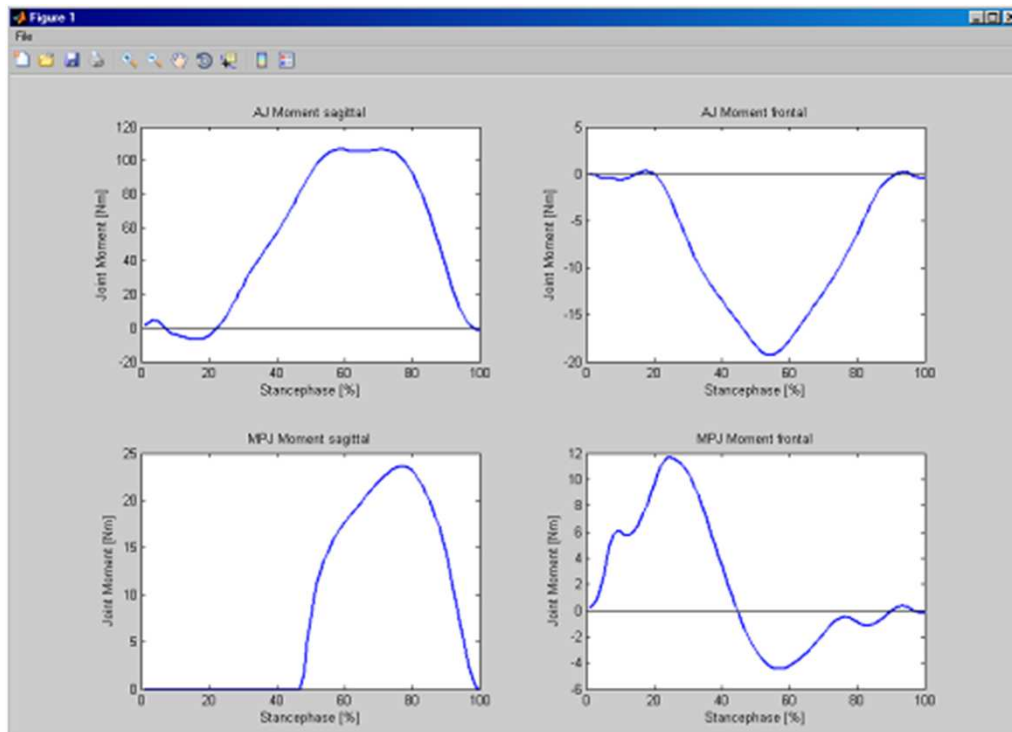
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PORTABLE GAIT LAB

TARGET: Easy to use 7/6

**Automatic read in of
raw data and
calculations.**

OUTPUT: Time series



- 3D Kinematics
- 3D components of joint moments

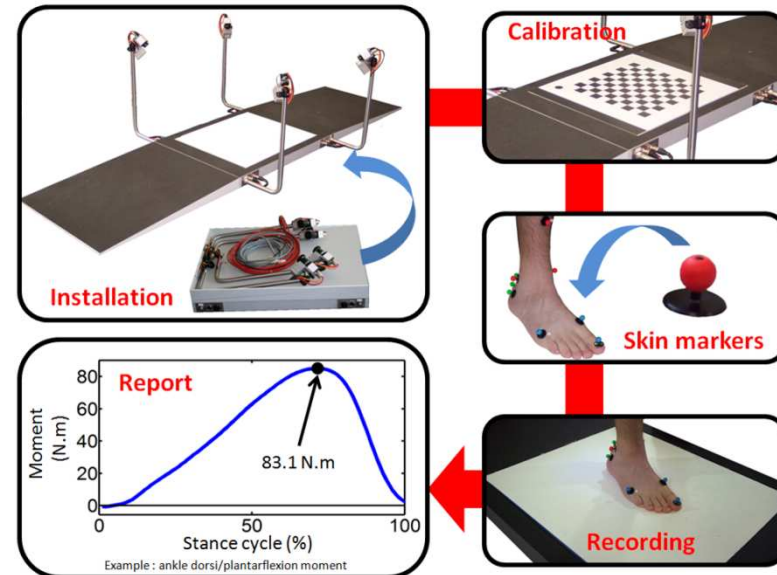


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The data supplied by MINILAB can be used for supporting:

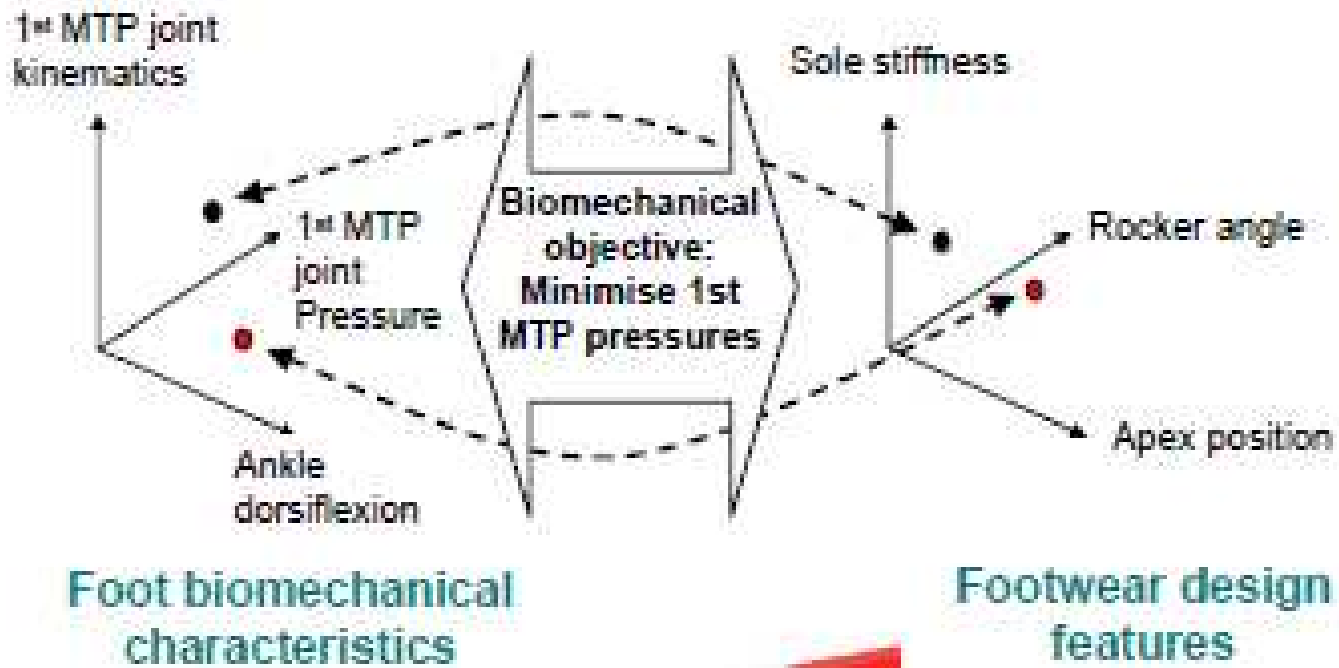
- Clinical diagnostic
- Treatment decisions
- Footwear or insole selection
- Input for footwear design





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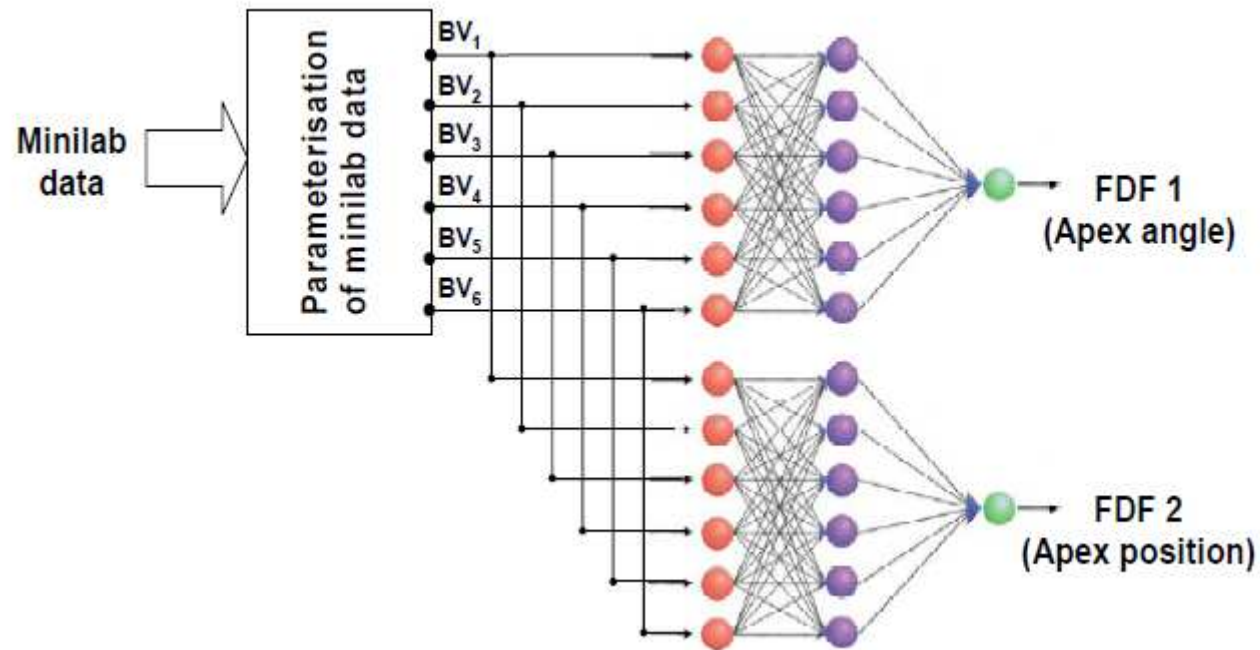




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USE OF MINILAB DATA: CUSTOM OUTSOLES

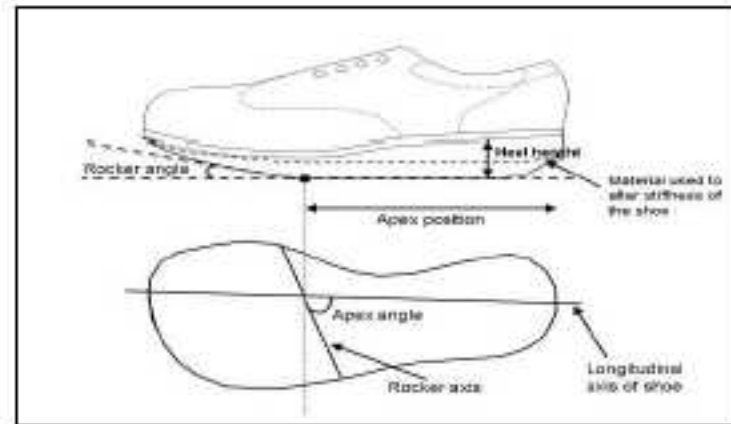
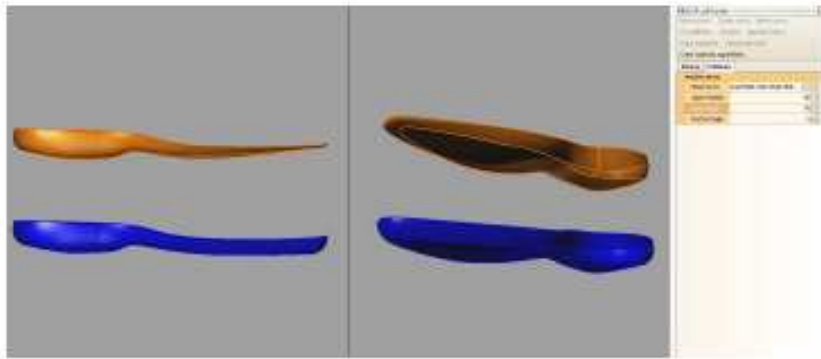




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CAD/CAM FOR CUSTOMISED OUTSOLE DESIGN BASED ON MINILAB PARAMETERS





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THANKS FOR YOUR ATTENTION

emontiel@inescop.es

