



Interdisciplinary & Integrated R&D for Sport Surfaces

Biomedical & Sport Surface Measurement Equipment

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Production



Trends

Perception



Biomechanic

Inter

Groun

Foundation

SCIENCE?

Measuring



Attributes





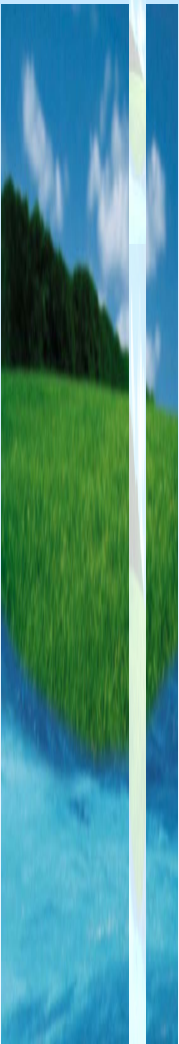
KNOWLEDGE

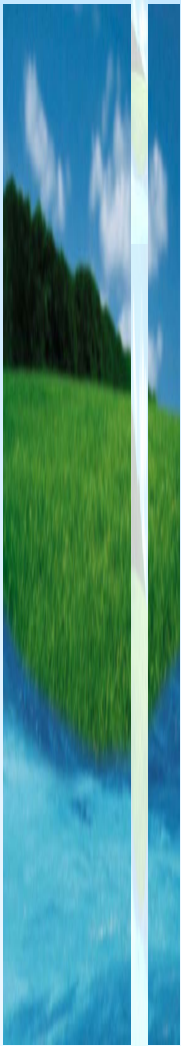
SPORT PROBLEMS

PRODUCT IDEAS

**INDUSTRY
&
PRODUCT**

Institute for
SPORT & LEISURE

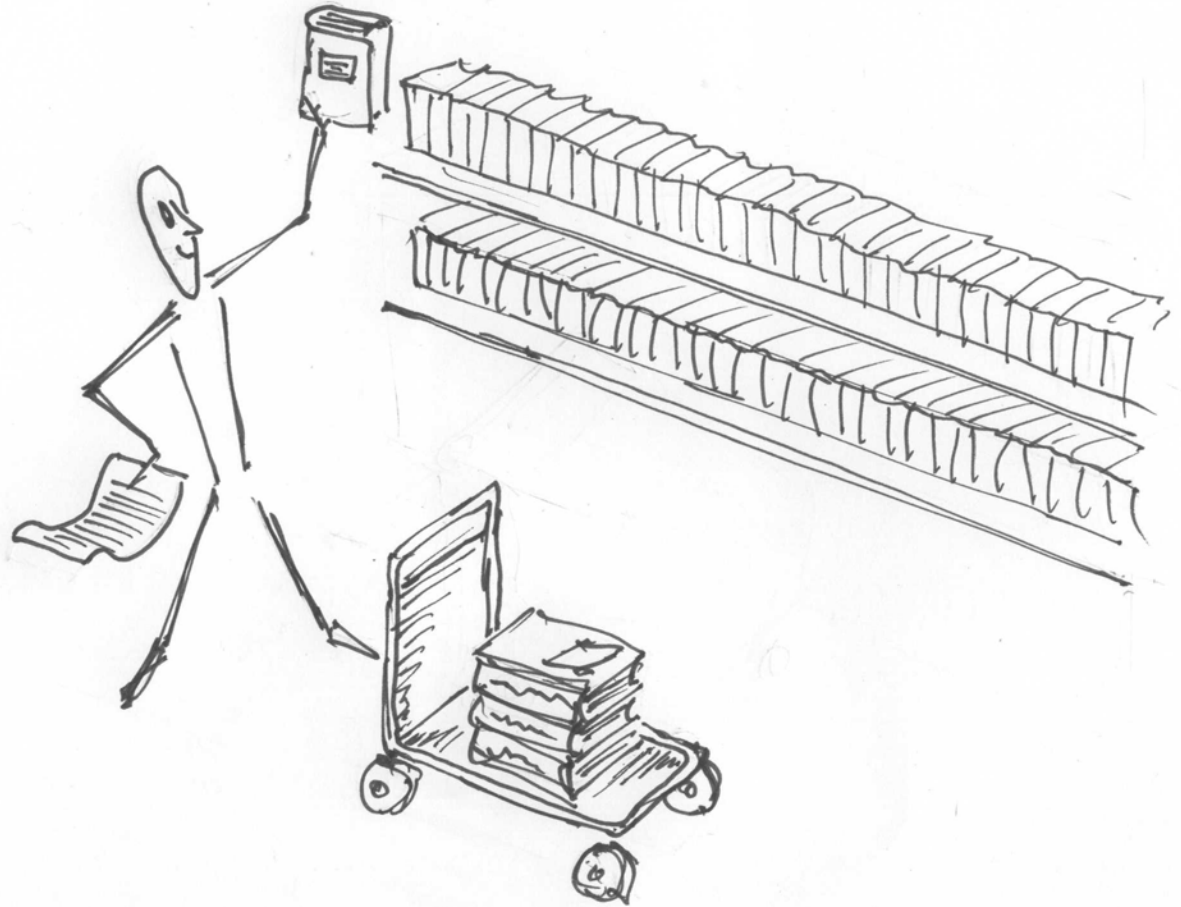




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Sport &
Leisure
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The movie

Measurement equipment for grass surfaces and foundations

Objectives of the grass measurement equipment:

- correlation with player perception
- reproducible results
- simulation of player movement

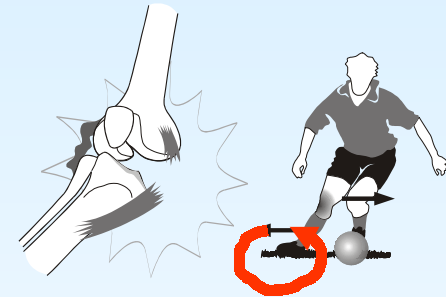
The results are used to develop better artificial grass systems

What to measure?

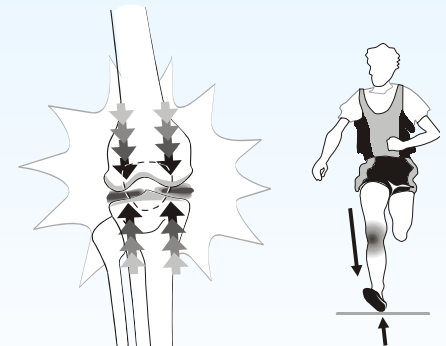
- **linear friction / grip**



- **rotational friction / fixation**



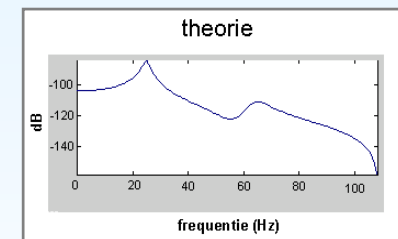
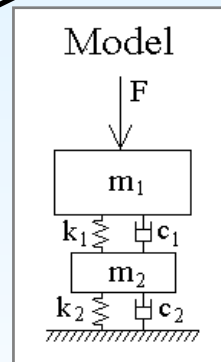
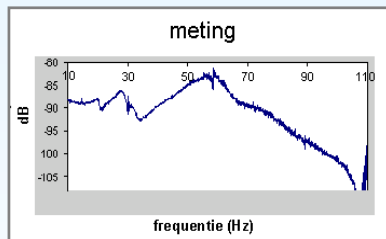
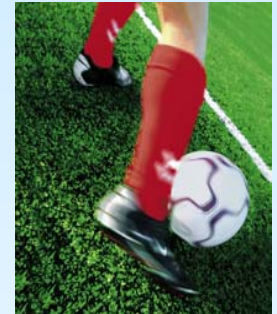
- **shock absorption**



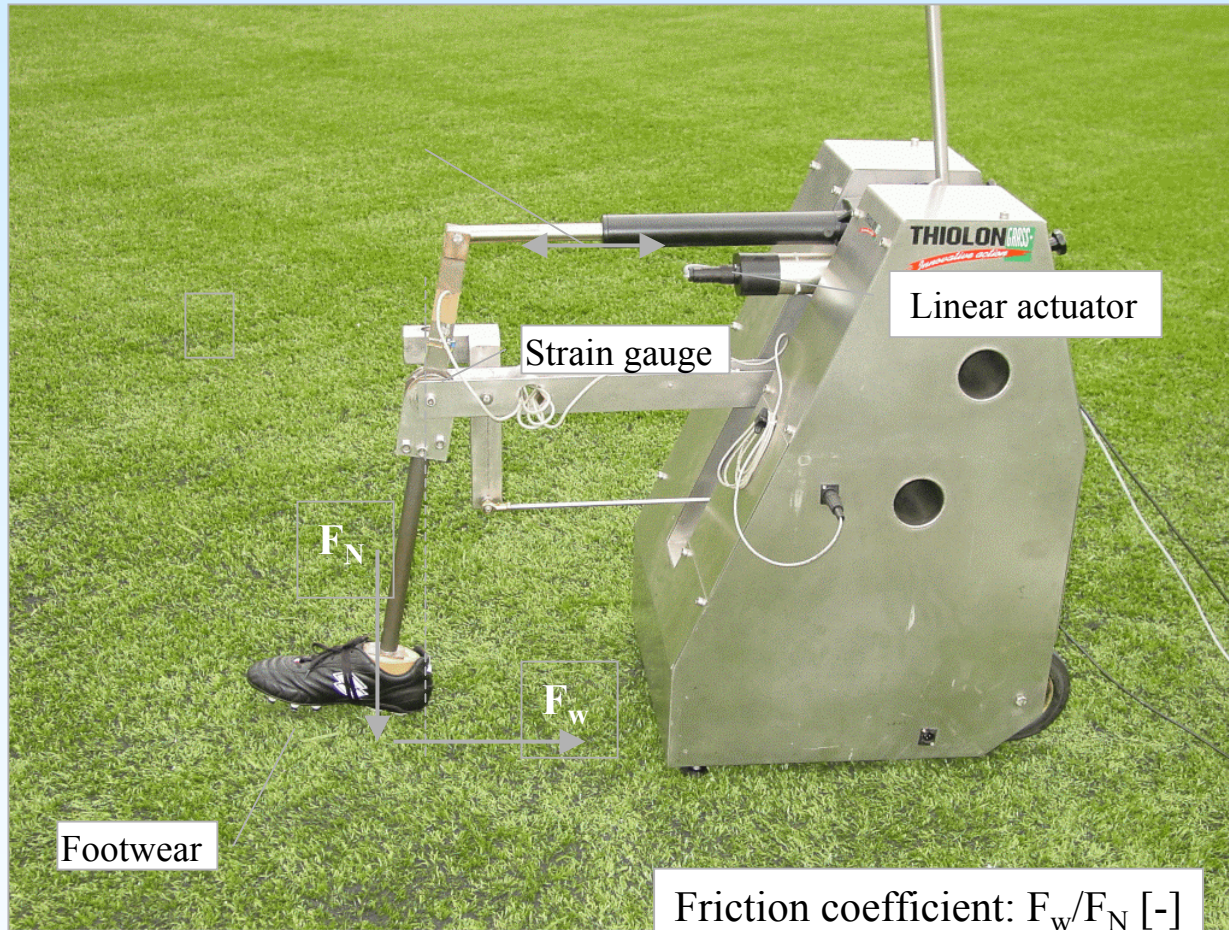
Subjective feelings → objective data

Interactie veld \Leftrightarrow Meetapparatuur

Interactie veld \Leftrightarrow gebruiker

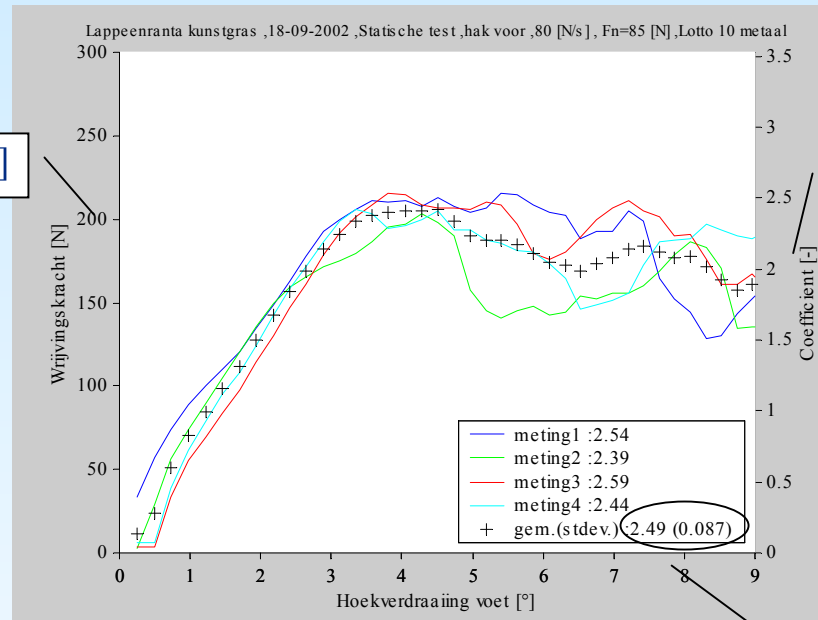


Linear friction / grip tester



Typical output linear friction / grip

Friction force F_w [N]



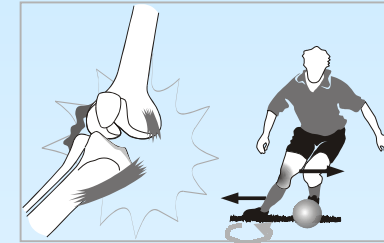
Friction force F_w / Normal force F_N

Leg rotation from vertical (degrees)

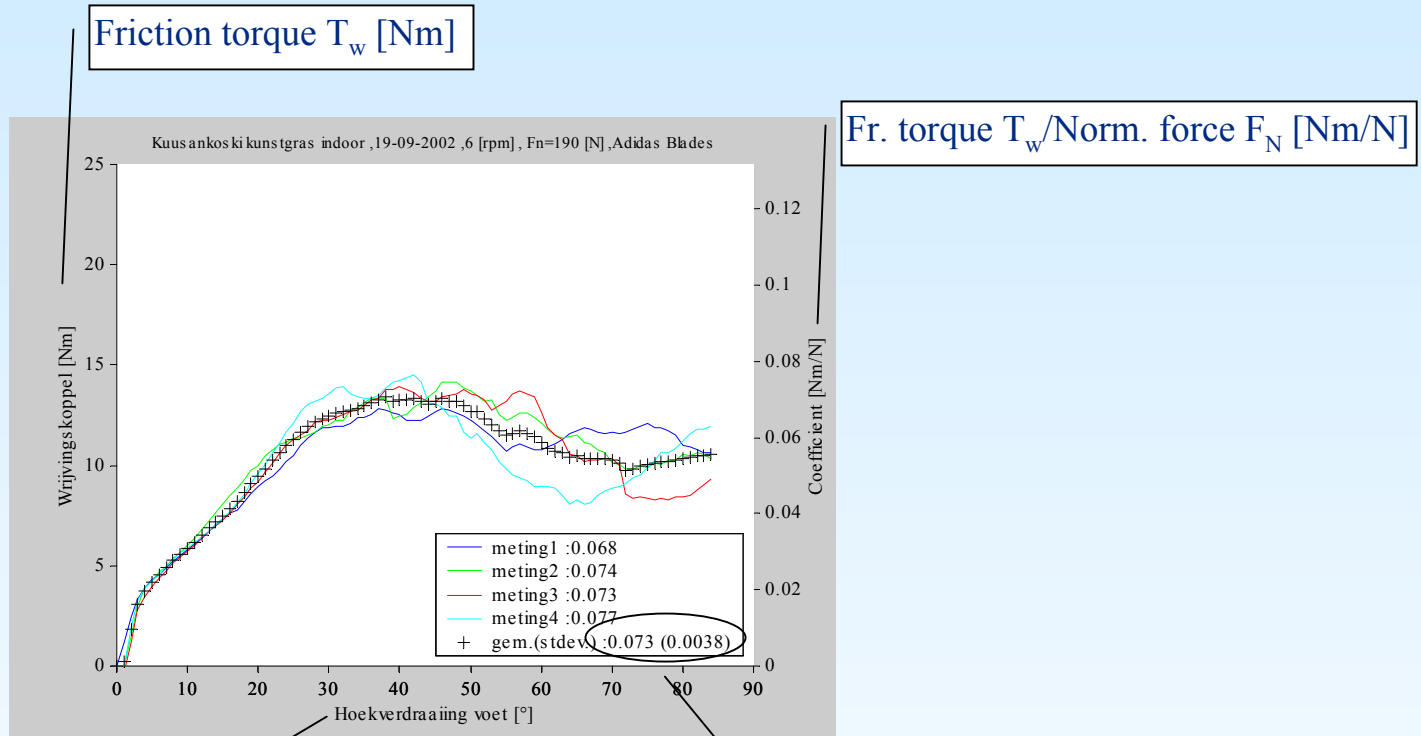
Friction coefficient $(F_w/F_N)_{max}$

Note: F_w is resultant of friction and grip

Rotational friction / fixation tester



Typical output rotational friction



Foot rotation (degrees)

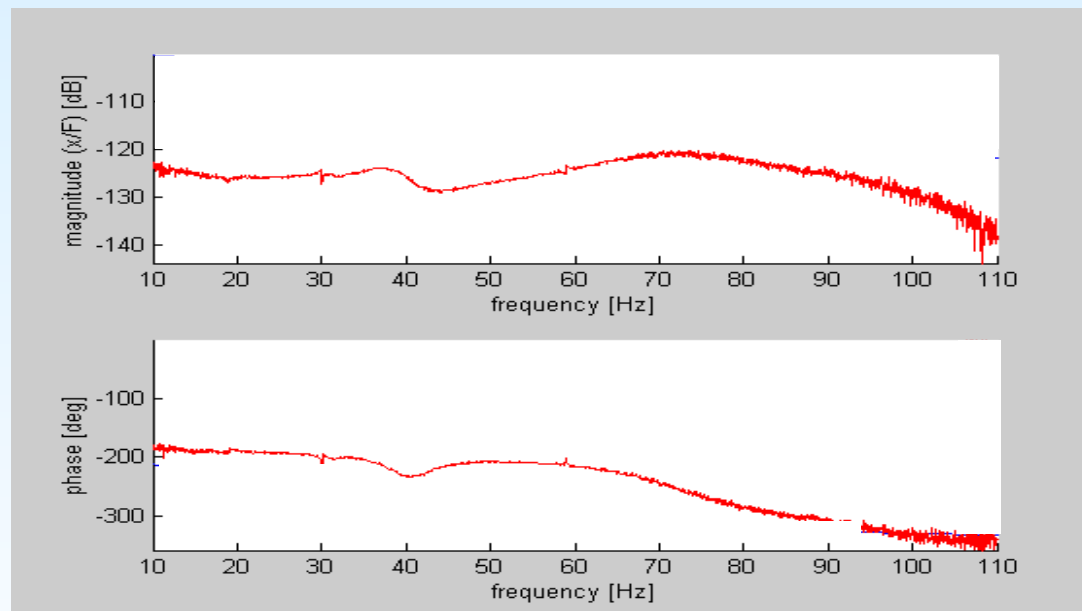
Friction coefficient (T_w/F_N)_{max}

Shock absorption tester



Principle of operation

- **excitator generates dynamic force via lower construction into field**
- **force sensor registers force input**
- **accelerometer registers reaction of the field**



characteristic response-diagram (x/F) of the field

Use of test results

- **correlation with player experiences**
- **correlation with other testing equipment**
- **comparison of different fields**
- **determining influences of field construction components**



- **design rules for better artificial grass and field construction**

Stability



Virtual Reality

Stability

Shoe Friction

Stumble Recover Strategy

Energy Consumption

Movement

Real Time Movement

Muscle Activity

Joint Moments

Forces



LOOKING FOR KNOWLEDGE?



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