SPORT TECHNOLOGY AND THE ENTERTAINMENT SECTOR
Objectives

Encircle the context of technology, sports and entertainment

Encompass where technology has assisted sports disciplines

Learn how sports technology has impacted entertainment (industry)

Where technology has led to 'new' leisure activities

Extrapolate future perspectives and possibilities
Contents

1. Technology and leisure activities
2. Defining Entertainment
3. Sports Technology –
   3.a. From Entertainment to Sports Technology
   3.b. From Sports Technology to Entertainment

Examples
Orientation
Backward projection

Analog compass
→ Digital compass
Altitude & Orientation

Analog altimeter

Digital altimeter
cont’d readjustment required

GPS
GPS project developed in 1973 to overcome the limitations of previous navigation systems → 24 satellites

Fully operational in 1994

2000 GPS III authorized (USA)

Principle: time synchronized signals from known satellite positions

→ 4 needed
Limitations

• Batteries charged?
• Reliability of systems?
• False sense of security
• ... (any others?)

Applications

• Geocaching
• Geotracking
• Geospotting
Bread and circuses

'panem et circenses'

(Juvenal 100 AD)

Creation of political support by provision comfort and diversion

Vespasian/Titus (76 – 80 AD)

Julius Cæsar

(50 - ... BC)
What entertainment is?

provides a diversion or permits people to amuse themselves in their leisure time. Entertainment is generally passive, such as watching opera or a movie. Active forms of amusement, such as sports, are more often considered to be recreation ...
Entertainment industry

The traditional entertainment industry, i.e., film, music, television, theatre, dance, etc.,
The 'Entertainer'

Technology has contributed to a societal decrease of physical activity → impacts on health care, health insurance, structure of society, ...

The TV era: began with Braun's tube (late 1900's)

Functional around 1940 and widely accessible after 1950

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PCs in households: 8% in 1984 → 45% in 1998
Obesity development in USA

1985

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Time spent (2003)

50% of our leisure time is spent on using media, 8% on sporting activities, 18% on social life.

From our leisure activities we gain
- Social identity
- Personal identity
From the arena to the sofa

sportsTV - where it all began?

First live report on a sports competition broadcasted in 1921 - box fight, baseball match (US)
1927 - Rugby Union match (UK)

First TV events: 1937 - international soccer match (UK)
1939 - college baseball game (US)
Assessing movement

Eadweard Muybridge
(1830 - 1904)
Check out a few 'muybridges'
Check out a few 'muybridges'
Check out a few 'muybridges'
Multiple exposure & viewpoints
Reconstruction principle - 2 cameras
3D reconstruction

Possible with any camera orientation

If camera positions are known
Calibration using a 3D reference object

DLT (direct linear transformation)

\[
X_{ij} = \frac{a_{1j} x_i + a_{2j} y_i + a_{3j} z_i + a_{4j}}{a_{9j} x_i + a_{10j} y_i + a_{11j} z_i + 1}
\]

\[
Y_{ij} = \frac{a_{5j} x_i + a_{6j} y_i + a_{7j} z_i + a_{8j}}{a_{9j} x_i + a_{10j} y_i + a_{11j} z_i + 1}
\]

For \(i = 1, \ldots, m\) Markers; \(j = 1, \ldots, n\) Cameras

\(x/y_{ij}\) = coordinate of marker \(i\) in camera \(j\)
Biomechanics and the movie industry

Retroreflection

Glass Bead Principal:

Cube Corner Principal:
Least-squares algorithm for driving rigid body models with 'noisy' marker data

Animation

Setting up a rigid body skeleton with fixed joints and fixed marker positions

Calculate the skeleton position with minimum distance of skeleton and 'real' markers frame by frame

Export of HTR file which can be used to drive an animation character
Marker capture

C:\Uwe_work\Animations\TV2_101104

C:\Uwe_work\Animations\DigiPost100806

C:\Uwe_work\Animations\Demos4Lab
Video games/computer games

First analog devices 1947/48
- Tennis for 2
- OXO (tic tac toe)
- Spacewar (1961)

→ this is not sport; pure entertainment
Chess computer

From 1970 commercially available

David Levy, Garry Kasparov

1996 - 1997

From 1998: advanced chess - two human players play with ‘help’ from a chess computer
Animated computer games

Interactive

Classical:
- Keyboard
- Joystick
... and ‘relatives’
A pathway back, to the basics?

Inertia sensors
Balance platform/dance mats
Camera-infrared sensor combination

The curse of the virtual world?
- They are used in scientific studies
- They are criticized for pretending to improve fitness
Possible relationships

From early in history we were spectators

Motivation is excitement driven (thriving for the spectacular)

Media simulates us being a part of it at 'no cost'

Active video games allow participation in elite/high risk/high skill sports environment at 'no risk'

There may be an opportunity in using such a relationship
From the literature

Active video games produce higher heart rates than conventional games 
(Unnithan et al. 2006, Graves et al. 2007)

However, ACSM standards not met 
(Pate et al., 1995)

Not many studies relate limb movement, i.e., upper vs. Lower body to physiological parameters 
(ongoing research)
The other side

Our modern computer network and communication facilities allow for more pro-active developments

Reactive vs. Proactive recruitment

8% in 1984 to 45% in 1998 PCs in households

Leisure theory: how can viewing motivate for doing?  
(Jeffries 2003)

Fitness and training CDs/DVDs

DrKoop.com, HealthCentral.com, Intellihealth, Medscape, and WebMD
The scope

How can more pro-active strategies be developed on an internet base?

Are there new studies on using video games/virtual reality environments in clinical rehabilitation?

What needs to be fulfilled/done to make active video games a suitable 'training tool'?

Is it a positive trend that video games get require activity?
Components of entertainment and sport technology

- Movie production
- Animated video games
- Sports rules/refereeing
- Active interaction games
- Orientation technology
- Interactive computer games