GPS-analysis: Revolution for analysis of technique in the sport of orienteering

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Orienteering: How to get as fast as possible from A to B?
Before GPS: "A-B split time" analysis

70's Manual splits

80's "Orienteering watch"

90's Electronic split times

GPS-analysis: Revolution for analysis of technique in the sport of orienteering
With GPS: "Analysis of segments"
With GPS: "Replay what happened"

**World Champs Middle 2010**
- All 45 runners with GPS

**Simulated mass start**
- Route choice leg 6 to 7
- Who would arrive first if all had started together?
- Most used approach for GPS analysis of group of runners

Sample: WOC 2010 Middle, Men
GPS-analysis: Revolution for analysis of technique in the sport of orienteering
Use of GPS in Orienteering (analysis)

2001 - First World Champs with live GPS Tracking - Finland

2004 - GPS used for analysis to some extent (e.g., Frwd)

2006 - Available GPS watches/units for "everybody"

2007 - Sufficient accuracy at affordable price (Garmin / Frwd / Suunto etc.)

2008 - Extended use of live GPS Tracking - Finland

2010 - "Perfect" analysis tool for one-runner analysis

2011 - Use of live GPS Tracking from events: Most elite orienteers use GPS for analysis to some extent - still a lot to learn related to systematic analysis for groups of runners

Available tools not easily applicable to analysis for many runners in 2009/2010

.... but a lot to gain from analysis!

GPS-analysis: Revolution for analysis of technique in the sport of orienteering
Project: GPS analysis and development of technique in orienteering

- **Starting point:**
  - No systematic GPS analysis in Team Norway
  - Available tools not easily applicable to analysis of o-technique for groups
  - Too little knowledge about systematic analysis for large groups of runners

- **Goals**
  - Develop efficient workflow and tools for analysis
  - Develop methods for systematic analysis of o-technique with GPS
  - Buy/identify necessary equipment
  - Apply results to preparations for WOC 2010 Trondheim & 2011 France
  - Be ahead of the others

- With funding from ”Olympiatoppen”
Results 2010 (1)

- Equipment, tools & workflow: Established
  - Good workflow - analysis live/right after runners return from forest
  - Different workflow for Norway/France due to GPRS coverage/SIM-cards
- Methods for systematic analysis of o-technique
  - Methods continuously developed and applied at 4 training camps
  - More than 20 sessions x 15-35 athletes

France 2010: Where are the time losses?
Sample 1 - WOC 2010 training camp

- Direction mistake under pressure – simulated mass start
Sample 2 - WOC 2010 training camp

- Accurate map reading around cliffs – simulated mass start
Results 2010 (2)

- Findings specific to WOC 2010 Trondheim
  - Optimal route choices identified
  - Identified main reasons for time losses – and techniques to avoid them:
    - Example 1: Direction off by >10° surprisingly widespread among runners
    - Example 2: Time losses due to inaccurate map reading in areas with cliffs
    - Example 3: Often micro routechoice more important than overall route choice
    - Example 4: Running with "uncertainty" reason for many timeloses
  - Tactical issues
    - High quality of analysis sessions -> improved learning process

- Findings specific to WOC 2011 France
  - “Unknown” terrain -> more to learn from GPS analysis
  - Still internal to the National Team

- Summarized in 60 page report
Evaluation Team Norway athletes 2010

Do you think the GPS project improved the results of Team Norway in WOC in Trondheim in 2010?

- Yes: 35%
- No: 65%
- Uncertain: 0%

Do you think the GPS project will improve the results of Team Norway in WOC in France 2011?

- Yes: 100%
- No: 0%

What did you learn from the GPS project?

- Strategy in terrain type: 80%
- Understand own mistakes: 80%
- Understand typical mistakes: 80%
- Optimal route choice: 80%
- Micro route choice: 60%
Future (1): Visualization sample - WOC 2010 middle

Sample: WOC 2010 Middle, Men

World Champs 2010 - All routes compared - Color according to split time

Which alternatives were fastest?

Route colored by total time on leg (green = fast)

Faster

Slower
Future (2): Visualization sample - WOC 2010 middle

Mapping of max running speed from GPS data

Sample: WOC 2010 Middle, Men

4:30 min/km

8:30 min/km
Future (3): Visualization sample - WOC 2010 middle

What is the optimum route?

Optimal route theoretically calculated from GPS speed data

Key for athletes: "Understand how to make optimal choices for similar o-technical problems"

Sample: WOC 2010 Middle, Men
Future (4): Analysis applied to other sports

- Done to some extent in several other sports since 2005
  - Cross country skiing, Mountainbiking, Nordic combined etc.
  - Now: Advanced analysis / live tracking gives interesting analysis possibilities
- Example: Cross country skiing – comparing uphill/downhill

Future (5): Future analysis for orienteering

- Interesting development on ”Automatic map reading detection” using accelerometer
- Could be good complement to GPS for optimalization of o-technique

Images from http://www.mapmania.ch
Summary

- Workflow, tools & equipment established
- WOC France & beyond: GPS analysis important to stay on top
  - To be applied at 3-4 WOC training camps in 2011