Introduction

The challenges with current commercial Global Positioning Systems (GPS) include the need for any hardware to see the ‘sky’ and the data capture rates (typically only 1Hz – one measurement every second). Although there are significant developments in the core location technology, which will also provide capabilities for tracking these performance variables when the ‘sky’ is not visible (usually masked by an urban environment), and at higher capture frequencies, the application to sport has yet to be realised or applied commercially.

The challenge of tracking ‘indoors’ has also been solved by other forms of technology, which are readily available and have been road tested in a sport environment to help provide similar data streams for the coach and athlete. Such opportunities can provide a coach with consistent use of the same system that can be used indoors and outdoors throughout the various phases of the training season.

The aim of this short article is to showcase one option that has emerged through professional football, is now applied in speed skating, and provides an opportunity for track events, especially the 400m.

The 400m challenge

Current physiology and technical aspects of the 400m are outlined in other articles throughout this edition. The purpose here is to introduce a ‘tool’ that has potential to provide more detailed monitoring of the success of applying such knowledge through the tracking of the most significant outcome measure - speed. There is a common line of thought in sprint events that the winner is actually the one who ‘slows’ down the least. Therefore, the ability to have accurate data on this aspect is crucial in order to focus and direct planning of training interventions.

The challenge as to whether such technology and investment can add more than other

Real time ‘speed’ tracking for the ‘sprints’
current off the shelf solutions available to a coach, e.g. stopwatch, light gates www.fusionsport.com, http://www.browertiming.com/; or other timing devices, e.g. www.freelap.ch, will depend on the questions being posed by the coach, assuming budget is not a crucial driver. There is no doubt that in some cases, existing tools and technologies may be sufficient to ‘do the job’ but where more detailed information is required, more sophistication, accuracy and detail is also required.

Some of the coaching requirements identified above are no different in other sports where speed is crucial to the success of the final outcome. It is from professional football, that the ‘Inmotio’ system (www.inmotio.eu) was borne through the coaching demands of
PSV Eindhoven Head coach at the time (Gus Hiddink). Tracking of time motion characteristics in football is a common practice to baseline physical and physiological demands of a game; however, tracking such characteristics in training is a very different demand. To solve this requirement, a ‘transponder’ based system, originally developed to track cattle in the Austrian mountains, was modified and applied to tracking of humans in a closed environment (http://www.abatec-ag.com/index_html?sc=121). It has since been applied to speed skating and it is from this application that we have most insight.

Such a system for accurate tracking of speed requires a semi-portable installation of some hardware within a closed environment (see Figure 1). The hardware is ‘movable’ from venue to venue but requires a skilled technician to assist in this process. As the system is relatively expensive, the system can be shared across sports. The system is characterised by a number of key functions:

- The system can work in a closed area of 500m²
- The system is calibrated by a known fixed transponder within the signal area
- The device captures data at a frequency rate of (measurements per second) up to 1000 times per second
- Multiple athletes can use the system at any one time (see Figure 2)
- Data is transmitted back to the coach ‘real time’ (or as close to real time as possible) for immediate display on computer hardware (see figures 3 and 4)
- High accuracy (10-15cm indoors)
- The data can be fully synchronized with video footage
- The system can also integrate physiological data (e.g. heart rate)

By accurately locating the transponder worn by an athlete, the resultant data can provide data that can have numerous applications:

- Pacing and practice of various race strategies for individual and multiple athletes where bunching and tactics are crucial
- Identification of key speed profiles during various components of an event (e.g. first 0-50m section)
- Monitoring of training load for accurate assessment of training stress / recovery
- Application for controlled investigations where field testing is appropriate and ‘new’ concepts are being implemented

Figure 4: A screenshot from the software

Summary

The ability to obtain real time race analysis data from track and field events should provide the foundation that provides insights into the planning and programming of any athlete development programme. In addition to the growth and application of GPS systems, there are further opportunities through the application of ‘transponders’, which can further enhance the knowledge and insights for track and field where GPS technology is unsuitable. A future opportunity has been outlined which could potentially add greater insight than some current off the shelf tools and technologies.

Please note – the author has no affiliation or association with any commercial organisations used as example in this article.

Reported by Scott Drawer

scott.drawer@uksport.gov.uk