

Missiles and videos

Introduction

The development of knowledge to drive coaching practice in the throwing events has received significant scientific interest in the past 30 years. This work has found the biomechanical parameters or key performance indicators (KPIs) that determine throwing distance to include release height, angle of release and release speed.

It is obvious that the effective use of accurate information about these KPIs could allow the coach and athlete to better understand movement patterns and enhance skill development in the training environment. However, the technology required to quickly measure these and other KPIs has not been readily available or affordable for most, which makes it difficult to monitor the effectiveness of various technical strategies on performance in a practical setting.

Previous approaches based on 3D analysis of high-speed film recordings have been limited by data processing and feedback times. In the past five years, however, this has begun to change with the effective integration of video analysis methods. In addition, the application of currently existing military and video technology for tracking of projectiles in real time promises to build on the current capabilities and increase both the accuracy and possibilities for monitoring technical development in the throwing events.

This short report sets out the current situation and the prospects for the future, including two product concepts currently under development.

Current practice – video analysis tools

One approach that has been used to build on the knowledge developed from research with sophisticated equipment and translate it into the practical coaching environment has been to provide high fidelity feedback information through video analysis tools, e.g. Dartfish, Quintic SiliconCoach, etc. These tools have in-built capabilities to help provide more immediate analysis of some of the critical KPIs and thereby supplement the coaching view and athlete feedback.

The use of visual data with various editing and analytical tools has certainly strengthened the feedback environment and enabled better monitoring in the field. However, these methods are limited in their accuracy and precision and should be used with caution.

Future developments – radar and video tracking

In recent years, we have seen the application and development of other methods and approaches that promise to at least partially fill the accuracy gap. There are two main methods that have evolved and are now applied to other sports where the measurement of a projectile is a critical coaching requirement on a regular basis. We are, of course, monitoring developments with respect to the throwing events in athletics

The first method is the use of military 'tracking' technology, called 3D Doppler radar. This has primarily been developed for golf (see Figure 1 and Figure 2 for an example from Flight-Scope) but it provides an example of the type of data now possible for real time projectile flight

measurement and could be developed for the throwing events. Unfortunately, the cost of these devices tends to remain prohibitive unless the coach is a part of a national sporting system.

The second method involves the use of equipment and software that can track projectiles through video images and there are numerous research groups that have evolved this practice driven by other sports. The underlying principles are the same for all sports and the basic equipment requirement is one or two video cameras plus a laptop. One example of current research is from a UK based sports engineering research group at Sheffield Hallam University, which has developed its expertise in tennis under the leadership of Professor Steve Haake. Their method uses one video camera and a software program to accurately calculate the speed and spin rate of a tennis ball in flight. Results can be provided within 15 seconds of the video recording. Further details can be found in the group's paper at the following web address: <http://www.sciencedirect.com/science/article/pii/S1877705810003504>. The group is now working to apply the principles of its work on behalf of British Olympic and Paralympic sport associations, including athletics

Conclusion

Although still out of reach for most athletics coaches, the eventual advantage of the 3D Doppler radar and video tracking techniques will be precision of measurement, and concurrent reporting together with standard video feeds. By combining increased quality of objective and video data with the coaches eye and athlete feedback, there will be a greater probability of providing useful input for the training process thereby increasing the likelihood of technique development and competitive success.

Please note: the author has no involvement with any of the commercial companies or products mentioned in this report.

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Figure 1: Example of a 3D Doppler radar tracking system used in golf



Figure 2: Example screen shot taken from golf application