# Field Based Assessment for the Horizontal Jumps

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## Introduction

The horizontal jumps in athletics have been studied by a number of international research teams, which have focused on the critical performance factors that determine the distance jumped, e.g. contact time at take-off, take-off angle, horizontal and vertical velocity. The gold standard measurement systems to track and monitor these parameters have traditionally been sophisticated measurement systems such as force plates and 3D kinematic cameras. Such systems have rapidly advanced our knowledge and understanding of all these events.

The limitation with such systems has been the ability to translate and track such measures quickly and easily enough, and at a reasonable cost, to assess the impact of coaching drills or scientific interventions in a field setting. In the past decade, with the miniaturisation of electronics and sensor technologies, there has been an increased attempt to measure such parameters with more portable and lower cost alternatives.

One technology that has developed by an Italian company – Sensorize (www.sensorize.it) - is providing potential to inform the training process across all track and field events. Although the devices are still targeted at the higher end of the performance pathway, in the next decade, these are likely to filter down to club level as costs fall.


*Figure 1. The FreeSense device*

*Figure 2. Freesense device worn by an athlete*

## FreeSense

FreeSense (see Figure 1) is a light, compact measurement system that measure 3D linear accelerations, 3D angular velocities and GPS coordinates. When used in wireless mode, it is possible to see real-time visualisations of data directly on your PC for real time feedback. The device can be worn in a number of locations but tends to be attached to a belt in the lower back (see Figure 2).

The software interface, which has been developed alongside the FreeSense hardware, provides visually appealing graphical images to supplement the feedback process with coach and athlete (Figure 3). The strength is in the simplicity and ease of use for non-technical specialists.

## How accurate is the device?

FreeSense is currently being used and tested in research labs around the world. One group at the Bioengineering Laboratory of the University of Rome is currently investigating the biomechanics of sprinters. Getting insight

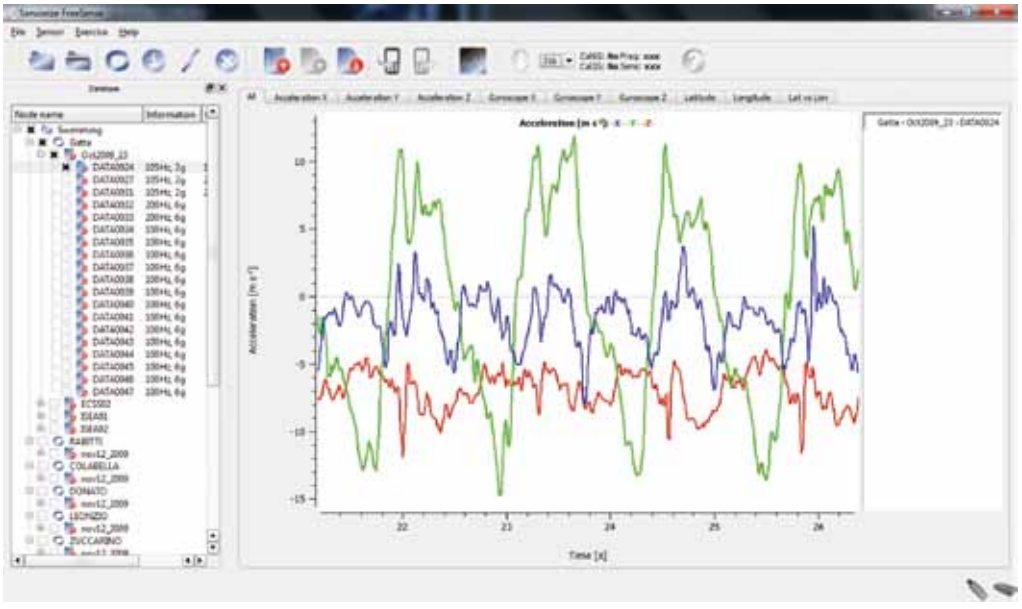

*Figure 3. Graphical display from FreeSense*

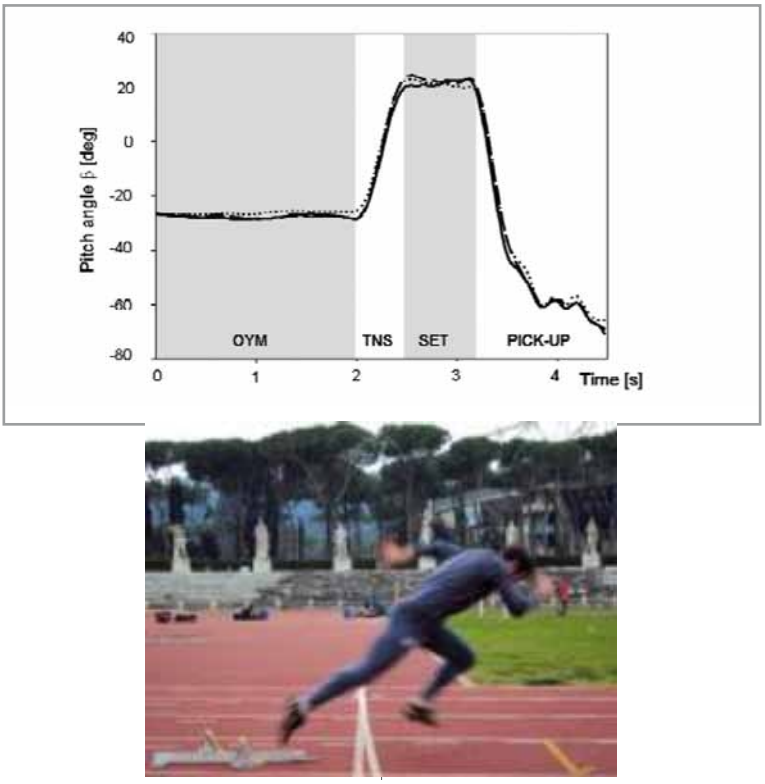


*Figure 4. FreeSense vs. stereophotogrammetric system for trunk measurement during sprinting (OYM – On Your Marks, TNS – Transition, SET – set position, PICK-UP – pick-up phase)*

into crucial information such as trunk inclination during the start phase, foot contact times, flight times, and acceleration profile is fundamental to improving the performance of sprinting and its contribution to horizontal jumps. In some of this initial work the FreeSense was assessed during acceleration phases and maintenance phases of the sprint.

Figure 4 shows show example data from Elena Bergamini and colleagues illustrating the match between FreeSense and a stereophotogrammetric system for the pitch angle of the trunk from across different sprint phases – the key phase of relevance here is the pick up (acceleration). This illustrates the strong relationship between FreeSense and a gold standard method.

## Summary

The use of inertial sensors to measure and track field based mechanics are becoming increasingly popular in sports. FreeSense is one example that has direct application and potential in track and field and particularly in horizontal jumps.

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

Reported by Scott Drawer

*Scott Drawer, PhD, is Head of Research & Innovation Unit at UK Sport in Great Britain.*

*He can be contacted at scott.drawer@uksport.gov.uk*