Keeping track of athletes with wearable tech

March 31 2014, by Iain Collings

Reigning premiers Hawthorn was the first AFL club to trial the WASP tracking technology – so how does it work? Credit: AAP/David Crosling

With the AFL season in full swing many of us are glued to our screens marvelling at the speed and tactics of the athletes.

Midfielders, such as ex-Cat-now-Sun Gary Ablett Jnr, can run between 12 and 20km in a match, ranging from slow jogs to high-intensity bursts of sprinting.

Even forwards – such as Hawk-turned-Swan Lance "Buddy" Franklin – average around 13km per game.

But today's coaches aren't satisfied with analysing highlights footage post-

match to get these stats – they want to know how fast a player runs, track exactly where they run, and collect data on the movements of all players individually and as a group in real time.

To help gather and collate this information, the CSIRO has developed an exceptionally accurate wireless position location system that works anywhere that current global positioning system (GPS) satellites can't reach – handy when foul weather means the roof of Etihad Stadium is shut!

Athlete monitoring and stats

Sports fans among us have seen the proliferation of wearable GPS devices in professional sports such as AFL and the rugby codes, where tracking devices are worn between the shoulder blades of the athletes.

And it is not limited to the professionals, as any Lycra-clad weekend cyclist with a GPS-enabled smartphone will tell you.

By tracking athletes and measuring heart rates it is possible to monitor fatigue, track player movements in relation to each other, plan team strategies and improve training.

The next revolution is to make it all possible indoors and under stadium roofs, and with the new CSIRO indoor tracking system the future is already upon us.

With the addition of the CSIRO wireless ad-hoc system for positioning (WASP) technology, these parameters can all be measured under the roof of the Docklands stadium, in ice hockey rinks, netball centres and indoor velodromes. The device, called ClearSky, is produced by Victorian company Catapult Sports which supplies GPS devices to the international elite sports market, including the US National Football

League (NFL) and European football leagues.

Already AFL teams have been trialling the system in pre-season and in their training programs.

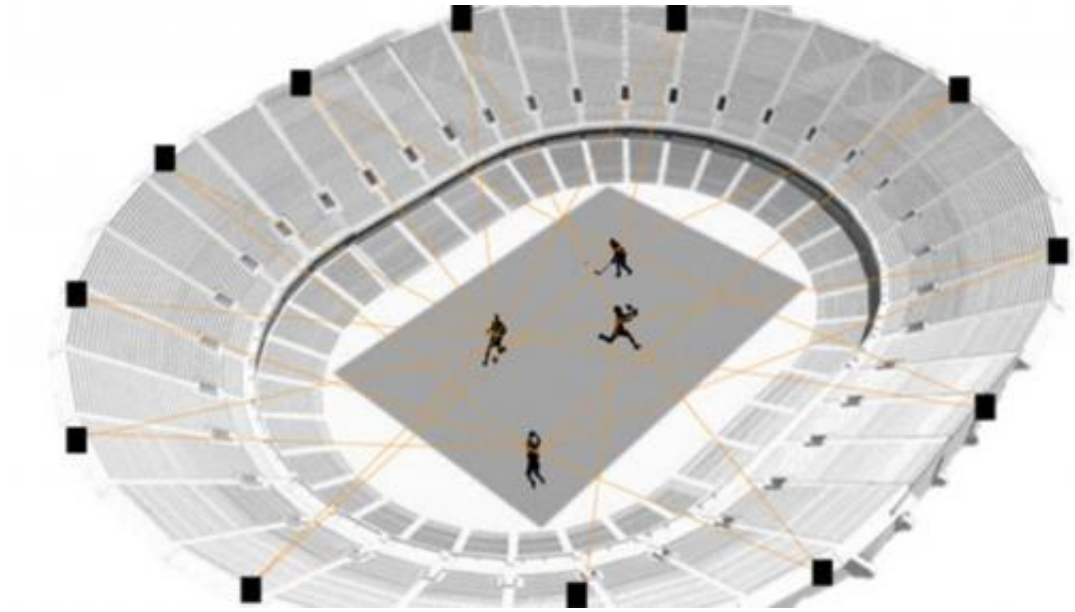
(The technology is not limited to sports, of course. In the mining space CSIRO has licensed the technology to a South Australian based company, Minetec. Its customers include open cut and underground mines and assists with improved operations production and safety.)

How does the WASP work?

The WASP indoor technology works much like a GPS system, but instead of using satellites in space, the WASP system uses fixed reference nodes that need to be located either within the building or just outside.

In football stadiums, the wall at the front of the upper levels of seating is the ideal location. The mobile devices measure the time it takes signals to travel from each of the fixed nodes, and triangulate to work out their position.

The technical challenge when doing this indoors is that the signals bounce off walls, resulting in multiple signal paths which must be taken into account (called multipath interference). This does not happen in outdoor GPS systems, where the satellites are all in a line of sight of the mobile devices, and as such it is much easier to triangulate.



Nodes – which act as satellites – triangulate an athlete's position to accuracy of 20cm. Credit: Catapult

CSIRO's WASP system has accuracy down to 20cm (compared to metre accuracy for GPS), has high resistance to multipath interference, long range operation, high update rate and simple deployment, so it's precise, sensitive and reliable.

Its unique set of features is well suited to a wide range of commercial and industrial applications for which no other solution currently exists.

In addition to tracking, the system also provides direct proximity detection between nodes for safety applications and provides more than 6Mbps data communication between devices.

The new technology opens up a vast range of exciting possibilities for revolutionising the way we organise our lives, ensure safe working environments, optimise factory operations, and support in-home health care.

Outdoor GPS based systems have already penetrated many aspects of our daily lives. Car navigation systems have replaced paper maps, and smartphone electronic maps have ended the need for planning your day's activities ahead of time.

After the final siren

Having solved the basic indoor wireless location problem, the next challenge is to extend the system to be fully integrated with existing cellular and Wi-Fi systems, and free the mobile sensor on the athlete from needing any reference nodes at all.

The future concept is to have all the mobile nodes simply self-referencing off each other. The potential then is for even more flexible use of the technology, extending to applications such as security, occupational safety, emergency response, virtual online gaming and in-home assisted living.

Wireless technology continues to surprise. Sensors and other devices get smaller and more wearable. The data they collect is more detailed and offers smarter analytics.

Having a mobile device that allows seamless location finding, both indoors and outdoors, cannot help but lead us to a truly extraordinary set of possibilities.

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