PSV's field lab:
Knowledge is ever

Optimizing the performance of the players is no longer a matter of just training and skills; it has also become a matter of science. By registering the player's movements, coaches will obtain additional information which will give them a better insight into the player's behaviour. This allows the technical staff to discuss it and modify it where necessary.

By: Guy Oldenkotte

Visualisation is what it is all about in today's society and especially in today's sports society. Neither an oral explanation nor a drawing on a white board will convince the player that what he or she could have done better, unless they are convinced by seeing it with their own eyes. This has even become more important since soccer teams nowadays can have players of various nationalities, each with their own language. Reluctance to accept advice has nothing to do with unwillingness of either party involved, it is all a matter of communication. We tend to take our own direct visual observation as more important or relevant over any other observation, most likely much to the frustration of many coaches.
So, when coaches of PSV Eindhoven and scientist of TNO, the

Radio frequency

To be able to collect the information, TNO and PSV established, what they called, a field Lab at PSV's training centre 'De Herdgang'. Here a number of video camera's and base stations have been positioned along the training pitch. The base stations receive over 300 signals per second from transponders the players carry in a specially designed vest. As the transponders communicate with all the base stations, the x and y positions of players on the field are recorded and a highly accurate picture can be drawn from the movements of the player on the field. To be able to do so, the communication between de transponders and the base stations is done by using a Local Position Measurements system which uses a radio frequency instead of the widely known Global Positioning System. "By using a radio frequency we can be more accurate than with GPS," explains Frans Lefeber, Project Manager Sport at TNO. "The radio frequency is a very accurate position measurement tool which has a deviation of only 5 centimetres of the actual position where GPS can have a deviation which can be up to three metres."

3D animation

The data is collected in a computer where video footage and transmitted signals are synchronised and which allows the trainer to follow the movements of a player directly from a laptop through real time data processing. This way the trainer can already guide the team directly or the individual players during the training on the field. By using a real life 3D, the system provides a unique impression of the position play of the players. This enables the trainer to watch the session from any point in space, whether from the middle, from the sideline or a bird's-eye view, contrary to what was possible before, when just video camera's were used. The disadvantage of that was that the camera could only produce a 2D picture.

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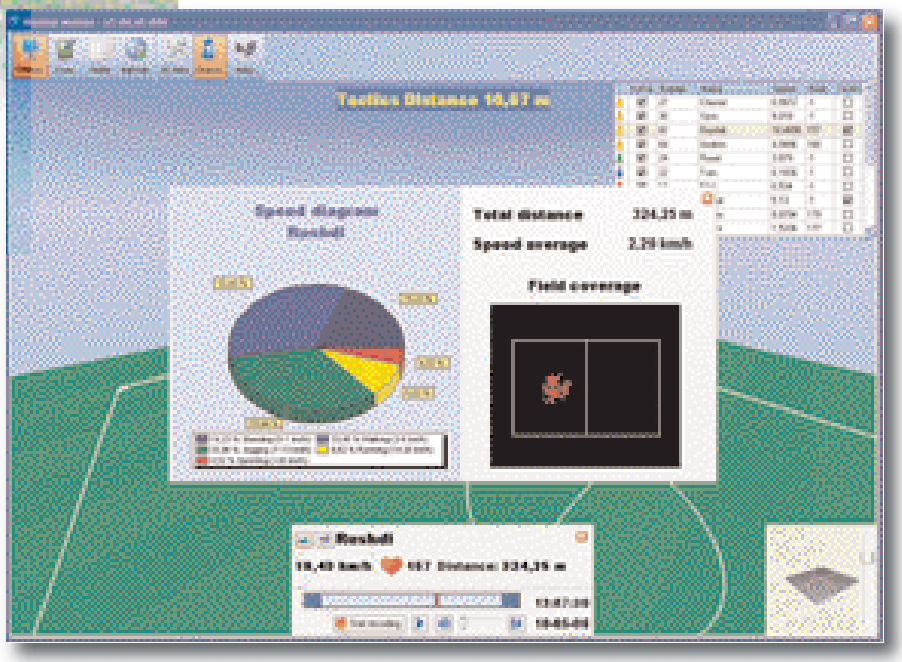


Dutch Organisation for Applied Scientific Research, discussed this matter during a meeting, the idea of a new way for bringing the message across slowly evolved. To date the club uses a new technical approach of improving its players by using video footage combined with parameters obtained with the use of a local positioning system. All data is than visualised in a 3 D software program which is used by the technical staff for further player development.

By adding parameters such as speed, acceleration, covered distance or heart beat to the newly created 3-D picture, the trainer has a deeper insight to the player' performances. "Most trainers and players prefer visual information. Thanks to the synchronisation between video and position measurement, you are now able to observe the players and their movements. When necessary you can act immediately, but the information can also be reviewed and discussed when the training is finished," Lefeber says. Coaches can than develop skill drills or point out game strategies.

Unlimited number of parameters

The system can basically monitor an unlimited number of parameters. "It is difficult to say how many parameters can be monitored as the system can easily be adjusted to the requirements of the user. It depends more on the question of how many parameters the coach wants to monitor and what he or she is going to do with all that information." This becomes especially important as the system can be used to monitor an individual player or a whole team simultaneously.

The technique of monitoring athletes by using transponders and high-accurate positioning systems is not restricted to soccer. It is also in use by TNO at the athletic track at the Dutch national Olympic training Centre Papendal, and in the ice-skating area Thialf. Olympic gold-winning medallist Marianne Timmer for example has sensors fitted to her joints which, according to Lefeber, contributed to the development of Timmer. "The system exactly monitors the spread of those joints. In ice skating this is very important as it affects the air resistance." Eventually, Timmer won a gold medal in Torino 2006 during the Olympics, exactly eight years after she won her first in Nagano. Recently Lefeber also produced a test where the system was used to monitor the performance of an Amazon and her horse.

Heart beat monitor

Most trainers prefer to see technical information about the position a players takes on the pitch but information about the physical condition of each player can also be vital. Therefore a heart beat monitor is optional. PSV physiotherapist Luc van Agt decided to have it included in his system. "During the training sessions I can now see, even when I am not running the session, what the player's heart beat is doing. When necessary, this will allow me to adjust the training session and make it become more difficult or a bit easier. You don't want players to come a cropper. We can tailor made training sessions and avoid players to get injured from overburdening their body."

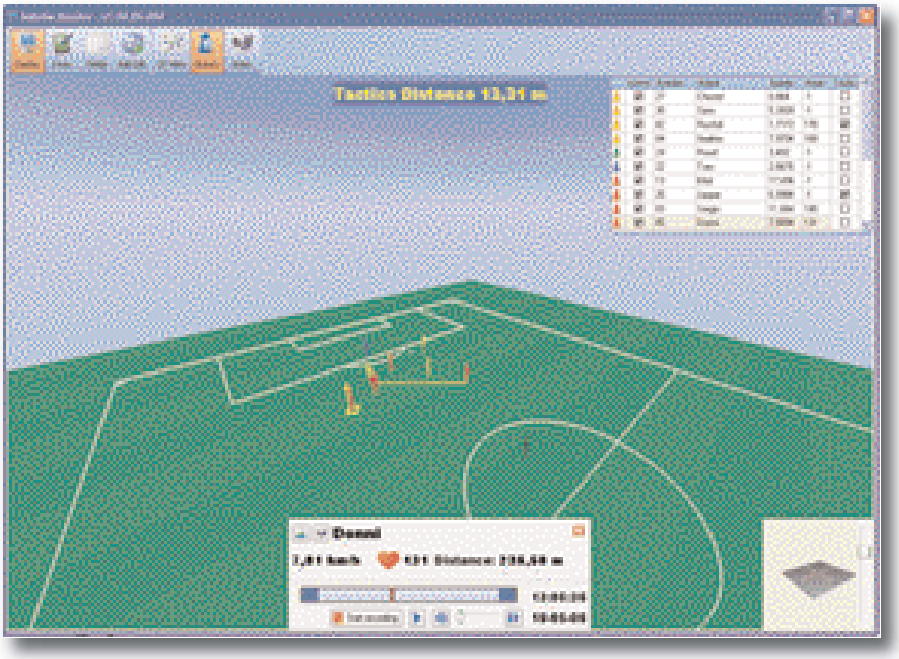
The importance of a heart beat monitor has become more obvious since a number of active players in the various European competitions have died, for no apparent reason, from heart failure during training sessions and matches over the past few years. PSV Eindhoven has never been confronted with incidents like this but made a statement in 2005 by contracting Arouna Koné. The former Roda JC striker saw a transfer to Ajax Amsterdam cancelled when a medical check showed he was suffering from a heart with an extreme capacity, a so-called 'athletes heart' which could become dangerous in the future. For the club from Amsterdam this was not acceptable since the club went through much turmoil when it became clear that their striker Nwako Kanu suffered from the same symptoms when he was transfered to Inter Milan years before. Where as Ajax Amsterdam decided to cancel the transfer, PSV Eindhoven felt this would not be a problem. The new system, which was by that time still a provisional version, would give the technical staff of PSV Eindhoven enough information to remain informed on the condition of the player. Since Koné has become

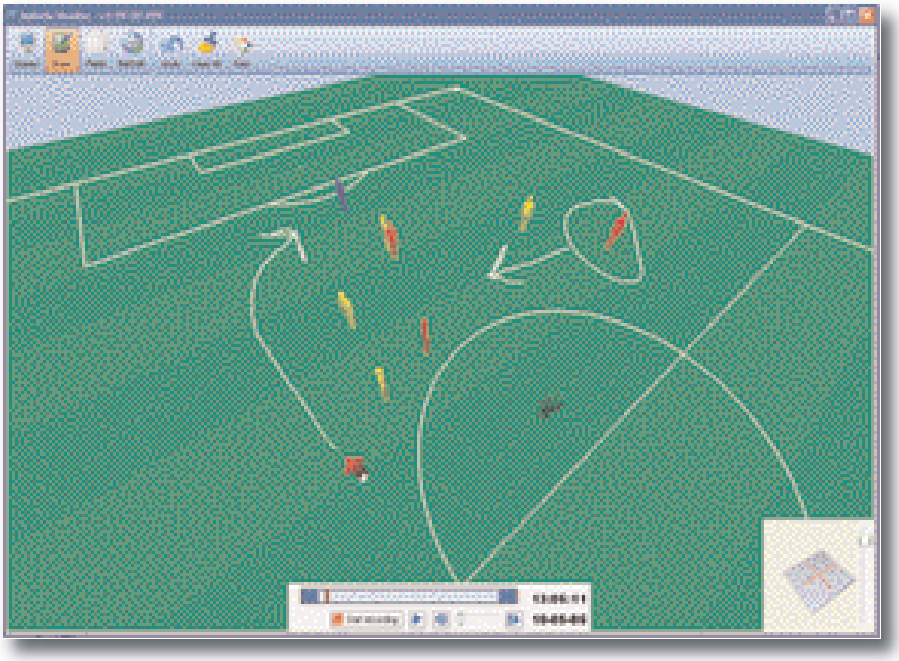
part of the PSV squad, the striker has become one of the most feared strikers in the national and international competitions.

Easy to evaluate

The use of systems like this, should allow coaches to better explain their instructions during a training practice, but also when the training is finished. TNO fitted the system with an evaluation mode in which training sessions and situations can be assessed and situations can be retrieved for further discussion. For this purpose a drawing tool was added to the application.

And even when the message still does not come across, the coach can also show what he has in mind as he can move players through the animation in order to show the "right" position to the players during the evaluation session. A special 'scratch pad' and an electronic pen allow the drawing of tactical indications.





Digital television

With the latest developments in digital and personal television, the new system might also have a future in the media. "This system will make it possible to have the same view as the player has. Wouldn't it be great be able to look through the eyes of Ruud van Nistelrooy for example?" Lefeber says. With the possibility already to choose between camera's in a television-on-demand system, an extra number of camera's is added to that list, although the vision they create would be animated.

The system also allows more statistics to be shown, something which was first introduced during the WC in Italy in 1990. "You could also get a fade-in on the TV screen telling us how fast Beckham is running, or which player has the best physical condition." According to Lefeber, this can also contribute to a better discussion about soccer, since more unbiased data will become available.

Younger players

The technical approach can become vital for clubs like PSV in the near future. Since the Bosman-ruling, it has become expensive to train youngsters to become professional soccer players. The ability to recognize gifted players as early as possible has therefore become more important. Lefeber believes the new system can contribute to that. "The transponders on the shoulders can be used to register the position of each shoulder, indicating the direction he is looking at. This is extremely important for soccer players. With the use of this system, a coach can see whether the player also takes part in the tactical game, without having the ball in his possession." Being able to recognise that with players at a younger age can therefore be very important. "We know from experience that the way younger players look around during a game, shows the talent he is gifted with." Being able to determine these skills could therefore allow PSV Eindhoven to contract players at an early age, allowing the club to still have its soccer school be a lucrative project.

The question remains, what kind of players we will get in the future. As professional athletes distinguish themselves from average athletes by the best combination of speed, physical condition, technical skills and another twenty or so variables, systems like this might be a huge contribution to bring all these variables more in balance. Bionic athletes or supermen could be the future on our fields, but this is hard to predict. What we do know for sure is that these kind of developments no longer force trainers to be directly at the sideline of a training pitch to remain informed about the progress of his team. And that might be a tempting idea given the harsh weather conditions we sometimes can get!