**Gaming cameras used in high-tech movement research**

NEW high-tech cameras installed in the High Performance Complex (HPC) offers biokineticists and sports scientists the ability to research all movement, ranging from top athlete performance to stroke patient rehabilitation.

Nelson Mandela Metropolitan University (NMMU) currently has the only fully tartan indoor running track combined with 10 newly-installed near-infrared Vicon optical motion capture cameras in the country. These are coupled with two high definition video cameras that are synchronised to force plates embedded within the track, all of which is integrated via a sophisticated software programme.

Although similar equipment exists at the universities of Stellenbosch and Cape Town and the CSIR High Performance Centre in Pretoria, these are not combined with a complete indoor running track.

“We are trying to cover a gap in the Eastern Cape with this equipment and facilities to do good research,” says Mark Kramer, lecturer in biomechanics and exercise physiology, who manages the High Performance Complex laboratory, together with biokineticist Dezi Rosenblatt.

He says NMMU will access the major sports such as soccer, rugby, cricket, hockey and netball and the research area will focus on everything from chronic rehabilitation to high performance sport.

**3D analysis**

The latest set-up includes 10 optical cameras and two video cameras that allow for a complete three-dimensional analysis of almost any human movement you can imagine. The optical cameras do not take traditional photographs but tracks specific objects using the reflective marker image from the video camera, which is customised as a reference video. This allows for a detailed analysis of range of motion, velocity, acceleration and any compensation that may be present.

Reflective markers are placed on the body areas of the athlete or patient – depending on the needs. The camera’s system then throws out light which bounces back from the markers placed on the athlete or patient.

“Every camera focuses on a marker and together provides a three-dimensional picture,” says Vicon’s Jacques Gay who provided training on the cameras and software system.

In the biokinetics injury rehabilitation or prevention programme, the markers are placed on areas of the body the researcher wants to focus on, for example, landing mechanics, or knee deviation or any changes that occur as a result of injury.

The camera then picks up the information from the marker and creates a three-dimensional image which is assessed in precise detail.

“The kind of activity one wants to capture determines the number of cameras and the speed of the capturing but these are indeed high-speed cameras.”

Any sport analysis can be done – not only sprint athletes, for example, but also netball players jumping to a patient suffering from a stroke trying to walk.

Jacques says these cameras are normally used in engineering as a “virtual reality training tool” and most people know them from the gaming and movie industry where, for example, they track movement in humans or animals.

“As long as it moves we track it. In the latest *Star Wars* movie, for example, face movement is tracked.

“A range of motion can be tracked in a specific joint and the data is then interfaced with the different software options. There are also force plates in the track which interface with the software to allow complex movement parameters to be worked out in all three dimensions,” says Mark.

“The power of the system gives us a complete picture of what the person is doing. We can use it with rugby players or nurses lifting patients to mention only a few.”

A number of research projects using the new equipment are in the pipeline.