



## Virtual Environment Sports Training

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### Abstract

*Designing the training strategies using video analysis is another method widely used by the coaches and sports scientists. Virtual reality technique is an emerging area which helps the coaches as well as the athletes to find out the minute errors of the performance. Virtual reality techniques minimises these limitations through possibly capturing the athletes' performance during natural conditions. Virtual training considers even the most complex movement of the player and reconstructs it by means of computer soft wares. Motion capture, Manageable Kinematic Motion and presentation of the virtual environment are the three techniques involved the Virtual reality technique. Virtual environment training is the advance technology of science which allows the subject to design and experience the training task with the help of digital representation.*

**Keywords:** Virtual Reality, Motion capture, Manageable Kinematic Motion.

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### Introduction

Sports scientist had developed many methods to enhance the performance of the athletes. It includes the enhancement of the fundamental physiological, psychological and biomechanical parameters as well as the use of improved technological applications that maximise the performance achievement. Designing the training strategies using video analysis is another method widely used by the coaches and sports scientists. Video analysis aids the coaches to closely observe the kinematic variables of the athletic performance that helps to attain the success. Virtual reality technique is an emerging area which helps the coaches as well as the athletes to find out the minute errors of the performance. Virtual reality training ensures the possibility of introducing the effect of reproducible natural training environment conditions. Obviously, virtual training focuses on challenging technology and research at the same time. Virtual training considers even the most complex movement of the player and reconstructs it by means of computer softwares.

### Background

Video based analysis system is the traditionally used method for performance analysis. It is video play back system which help the two dimensional performance analysis of the athlete. The coaches and the athletes play the video with use of motion analysis software. The findings are concluded usually with the

help of mathematical modelling. The images are to be created and the motion tracking system is to be used. Comparison of the performance is only possible through numerical data and statistical analysis. Different tools are to be used to analyse various biomechanical parameters. The chance of the influence of the environmental factors upon the player is more. It is considered as a limitation of the video analysis. Also, stereoscopic extraction was not possible in video analysis. Virtual reality techniques minimises these limitations through possibly capturing the athletes' performance during natural conditions. Virtual reality technique uses the numerical simulations in immersive interactive environment to analyse and understand the performance (Viganais et al, 2014). It involves the creation of animated characters to compare the athlete's movements in real immersive, interactive environments. Virtual reality consist of creating numerical situations in immersive environments and now is being used as the best tool to analyse and understand performance in sports. (Bideau et al., 2010; Craig, 2014; Katz et al., 2006).

### Steps of Developing Virtual Reality Technique

#### 1. Capturing Movements

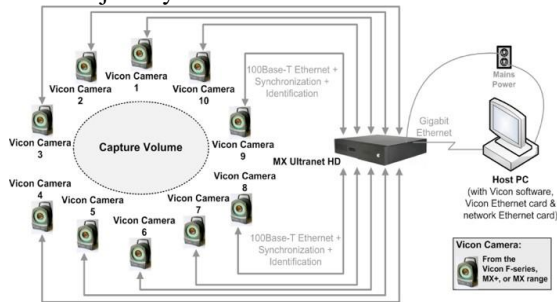
The first step of the virtual reality techniques involves the motion capture of the athletes' particular sport in real life situation (Bideau et al, 2010). High speed motion capture cameras are used for this purpose. Multi numbers of cameras are kept at different angles to capture the movements. The subject should be equipped with maximum anatomical body markers to specifically reconstruct the 3D

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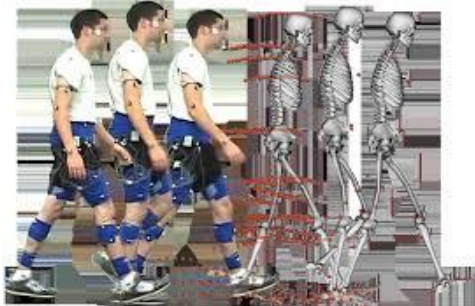
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position and orientation. Also, the markers should be pasted on the ball to find out the trajectory.



## 2. Manageable Kinematic Motion transaction (MKS)

Manageable Kinematic motion is an animated engine used to animate the virtual characters in to animated characters. It can be used to animate the kinematic data into suitable interactive characters in real time. MKS represents the motion independent of the morphology leading to the effective movement redirecting to the target. Using MKM we can produce any kind of humanoids which automatically adjust any types of movements even if the morphological characters vary from the captured data. MKM also uses an inverse kinetic and kinematic solver based on in-built limitations. This solver can help to transform the position and orientation of the body segments. Moreover, the MKM can be used to combine the animations by verifying the most important constraint first. The most important advantage of MKM is that it can be used to compare and determine the important parameters by comparing the athlete's performance with the animated one.



## 3. Virtual Environments Presentation

The virtual environments usually uses large cylindrical screen for the display. This is to create a real life feel to the athlete. This will help the athlete to identify the opponents' deceptive movements.



## Advantages of virtual reality for Sports training techniques

1. During virtual reality training, the player and the simulated opponent can interact each other through a cautiously well-ordered and modified situation. The player can receive the information repeatedly and more accurately at any time.
2. The trainer can analyse the players' feel of presence by the observation of head and eye movements.
3. The player will get an in depth information by means of stereoscopic displays.

## Sports training using virtual environment

The concept of sports training using virtual environment involves both research and technology. While designing a virtual environment for sports training the primary challenge is to identify the task to be fulfilled. The second challenge is to design and architecture the digital representation of the training environment. The detailed understanding of the characteristics of the task and its representation in terms of interfaces and simulation is the core part of the virtual environment training. Once the task has identified, design of the training platform is the primary phase of VE training (Ruffaldi and Filippeschi (2012)). The setting up of the components such as movement sensors, force sensors are the fundamental part for evaluating the user's performance. Digital representation is the core part of the virtual training. It deals with the characterisation of the subjects' performance using different algorithms. System uses the help of various aids that help to assess and analyse the movements of the athlete for simulation and augmentation of the data. Information exchange is the thirds phase of virtual training. It deals with providing the useful feed back to the user by the analysis of the data obtained from the performance of the subject. The information received form the sensors determine the feedback to be provided to the player. The training protocols accomplish the period of the work outs to be done and interval between the sets of the exercise and the rest period in between. In other words the tuning of the training per users ability and requirement is the last

phase of the VE training.

### Conclusion

The methodologies adopted for sports training depends on several new technologies of science. Now days the sports training uses the integration of mechanical engineering, computer engineering, biomechanics, motor engineering etc. These sciences use various algorithms to develop strategies to attain the training task of the athlete. Virtual environment training is the latest and more advanced methodology used by the players as measure of identifying the immediate feedback of the training strategies. The main disadvantage of this methodology is that developing virtual training platform is more expensive and more researches are yet to be started in this area.

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