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A Study on the Korea National Archery Training Monitoring System Using IoT Sensor and Image Information

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Abstract

Background/Objectives: More and more people are

enjoying Korea national archery (the Korean traditional archery) as a sport for all that anyone, regardless of age or gender, can do. As national archery has become widespread, a system for systematic training is desperately needed, but there is a lack of training system research compared to items such as archery or shooting. In this paper, we propose a training monitoring system to solve this problem.

Methods/Statistical Analysis: The system is basically focused on maintaining and maintaining correct posture. Knowledge of result has a great impact on improving the effectiveness of training by correcting posture and maintaining correct posture. To acquire knowledge of these results, IoT sensors and images are continuously monitored to gather information. We have studied a monitoring system that can monitor performance in real time to improve performance by systematically training and modifying posture and motion, and monitoring motion after training.

Findings: Korea national archery is an outdoor sport, and it is affected by the surrounding environment such as location, wind, temperature and humidity. It is very important to maintain and revise the posture so that it can overcome a lot of limitations due to the great change in performance depending on the surrounding environment. The system proposed in this paper monitors the image information to check the posture of each moment during the training, collects and records the surrounding environment information using IoT sensor, keeps the optimum posture at all times with the collected information, Modify the aim point to provide knowledge of the results to reach the target performance.

Improvements/Applications: At present, Korea national archery is becoming more and more popular as a sport for all. Knowledge sharing service system research using big data should be continued by collecting and analyzing knowledge of result data of theoretical and practical training results so that anyone can learn and learn more conveniently and easily.

Key Words : CCTV, Knowledge of Result, IoT Sensor, Korea National Archery, Monitoring, Context Awareness, Sport for all.

1 Introduction

In recent years, as a popular sports culture or sport for all that can be enjoyed by both young and old, the number of people who enjoy Korea national archery is rapidly increasing. In spite of this increasing tendency, the movement and posture of Korea national archery has been transmitted almost only by the mouth, and as a result, it is difficult to learn for those who are new to the Korea national archery because there is no standard or clear numerical value for each movement and posture. It is difficult to learn the posture that is suitable for the person because the movement and posture of shooting the bow should be changed according to the physical condition and strength of the individual. It is a reality that there is not enough systematic data about the way of training and the method of training of Korea national archery the sport of archery shooting bow of Korea tradition. Compared with studies on archery or shooting training methods, studies on the training methods of Korea national archery are rather lacking[1]. The posture, which is one of the parts that needs lots of practice for the training of the Korea national archery, plays a very important role in improving the performance. As with all other sports, if you correctly feedback your posture, you will get better results by correcting or keeping it in the right posture. Until now, it has been a normal training method for the Korea national archery to tell the correct posture and to let the peer and the teacher watch the training posture from the side in order to receive the feedback. In order to solve these inconveniences and inaccuracies, we are going to use IoT sensors and CCTV, which are widely used in various fields due to recent development of communication and information technology, for training and competition of Korea national archery. There is a need for a system capable of recording and monitoring the posture and motion of the training and playing, analyzing the posture, and correcting and maintaining the correct posture. The environmental factors that can affect the game and the situation of the stadium are collected and recorded by sensors and cameras, respectively, so that the influence and correlation can be analyzed. The Korea national archery is influenced by fine movement and posture change. If the posture or movement is always constant and unstable in the process from the aiming target with bow to shooting

arrow while feeling the state of the bow and arrow, your skills will improve greatly. In the past, research was conducted to monitor the target hit point image based on the record of the game or the hit point of the target [2], which was helpful for progress and recording of competition but it was not very helpful for improving the performance of the athlete. According to the necessity of recording and collecting motion and posture for improving the performance of the archer, in this paper, we studied the archery training monitoring system which can record and monitor the posture of the archer and analyze the posture and correct the posture.

2 Related Work

2.1 IoT Context Awareness

Recently, the IOT has been attracting attention as one of the most important technologies to prepare for the fourth industrial revolution as the strategic industry of major countries in the world along with the hyper-connection (networking). For IoT-based customized services or intelligent services, context information about the surrounding environment should be grasped. Context awareness technology has been developed as a core technology of ubiquitous and pervasive computing sysytem since the early 1990s. Context awareness was first used by Schilit and Theimer in 1994, and four technologies are gathered to construct a situation awareness system to recognize and understand the environment of people and surrounding objects. Four technologies are context acquisition, context modeling, context reasoning, and context dissemination [5,6,7]. The context awareness technology identifies valid data from the data input from the sensor, and processes the error correction value and the limit value according to the discriminated data. In addition, context awareness technology is constructed through inference through valid data. The problem with awareness technology is that if the amount of data coming from the sensor is large, there is a delay in processing the data, so we have to study how to solve it [9].

The following [Table 1] is a description of the Context awareness technology [5].

Table 1: Context awareness System Requirements Technology

Technology name	Technology description
context acquisition	Technology to collect status data through sensors
context modeling	Technology for representing and storing context awareness
context reasoning	Technology that makes meaningful and usable information based on the collected context
context dissemination	Techniques that use delivery methods through queries or subscriptions

2.2 Processing of Image Information

Image processing technology can be broadly divided into computer vision based on images generated by cameras and computer graphics that generate images using computers. Image processing can be classified as following [Table 2][10].

Table 2: Classification of image processing

Classification	Description
Image Manipulation	If the image is blurred or too dark due to the surrounding environment when acquiring the image, or if there is a lot of mischief, we can manipulate the image
Image Analysis	By identifying features in the image corrected by image manipulation, it is possible to identify printed or handwritten characters, measure the dimensions of parts through a camera, check the accuracy of the PCB substrate, and analyze images such as cell analysis in the medical field Area
Scene Analysis	Finding the microscopic differences of video objects that cannot be identified by the human eye and comparing them with other images to identify the features and recognize the images
Image Transmission	It is a field that studies how to transmit efficiently in transmission of image. It is a field to process / transmit image using image compression

In this study, we use an image information processing algorithm that applies an iterative binarization algorithm to select a repetitive threshold value and improve the estimated value to determine whether or not the target is hit. Image processing is used in a variety of applications such as biology, military, document processing, factory automation, medical diagnostic imaging systems, remote sensing, and video film effects.

3 The Proposed System

3.1 Korea National Archery Training Monitoring System

The proposed system consists of the following three parts. First, IoT sensor collects information on wind speed, wind direction, weather, temperature, humidity, etc. that affect performance, and transmits it to intelligent management system through transmission module. Second, the sensor data received through the receiving module recognizes the current context based on the standard aggregation data, determines the optimal context, and transmits it along with the training image. Third, it is configured to receive desired training videos and data such as wind speed, wind direction, weather, temperature, and humidity at the time of training with a monitoring app on dashboard, monitor, and smartphone.

The following [Figure 1.] shows the structure of the proposed system.

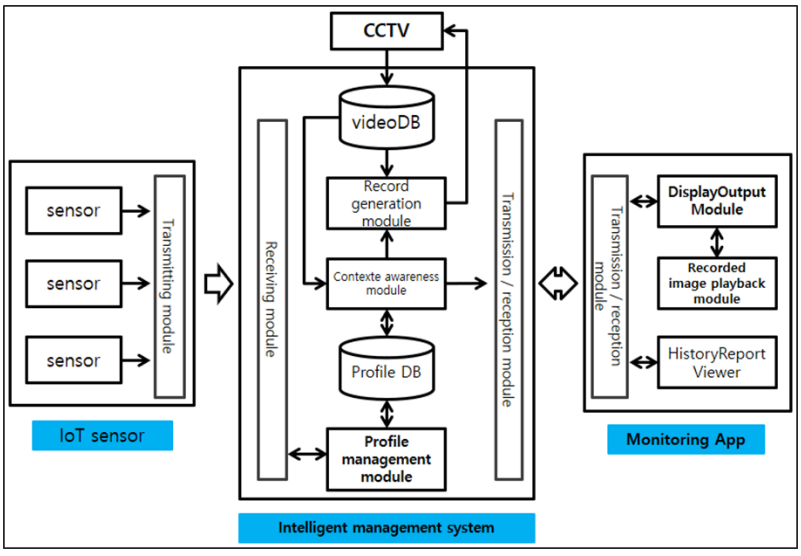

Figure 1: Monitoring system structure diagram

3.2 Record Management System

The following [Figure 2] is a configuration diagram of the previous record management system [8].

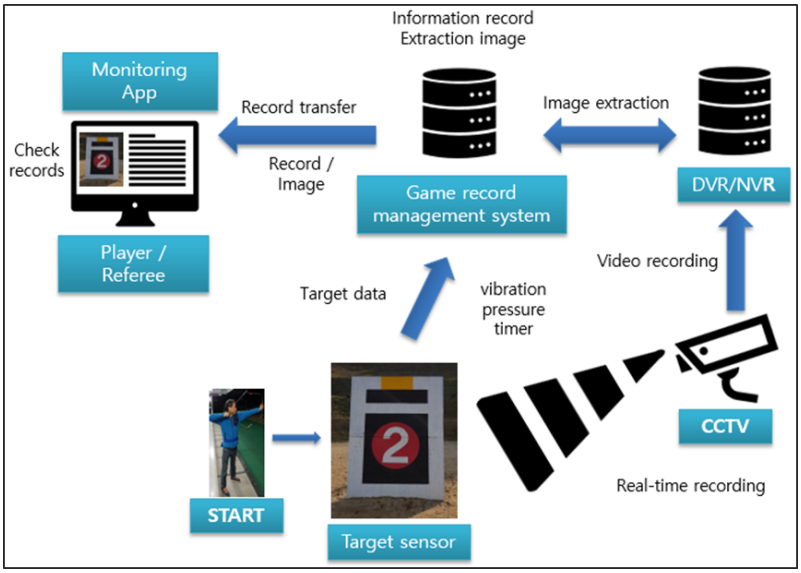

Figure 2: System Architecture

A system for extracting and storing images of a target hitting point of CCTV images captured by a target sensor, and automatically recording a game record of the athlete by transmitting a target image on a monitoring screen, [5] and is expected to fuse the archery training monitoring system proposed in this paper to be an evolutionary step forward Korea national archery systems research.

4 Experiments and Discussion

The proposed system consists of a module that detects the motion of the archers using the IoT sensor and CCTV image information, records them in units of 10 seconds and sends them to monitor, and a module that analyzes the difference from the existing posture through the posture analysis. In the case of screen transmission, it consists of a monitoring module that can be checked

by PC monitor or mobile app. The sensor module receives information about the surrounding environment such as wind direction, wind speed, temperature and humidity collected by the IoT sensor. The situation analysis module feeds back the posture correction information which analyzes the hit point of the arrow obtained from the target sensor as a threshold value which is a standard of the posture analysis.

Figure 3: Target system configuration status

Figure 4: Korea National Archery game images

Figure 5: Korea National Archery Training posture

5 Conclusion

It is necessary to systematize the training methods according to the increase of interest and demand in Korea National archery as sport for all. In order to solve this problem, the training system proposed in this paper provides knowledge of result (feedback) of training results using IOT sensor and CCTV image information. This monitoring system is able to check the visual information in real time during training or after the training is finished, and can adjust the posture and also provides the information about the surrounding conditions such as wind, temperature, humidity, weather, etc. By providing the information analyzed by the situation recognition module and the judgment module, the monitoring system improves the performance by securing accurate hit points and aiming position compared to when the system is not in use.

In the future, it is necessary to continue research on more detailed and customized training system by collecting and analyzing accumulated situation information and feedback information based on image analysis and motion detection.

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