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IOT BASED SYSTEM FOR AUTOMATIC BASKETBALL SCORING BOARD

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Abstract

In the context of gameplay, a sophisticated counting device discerns instances of activity, serving both educational and recreational purposes. This innovative approach, incorporating an infrared sensor, facilitates the evaluation of shot effectiveness. Initial ball detection is executed by the IR1 sensor, with subsequent confirmation and score attribution carried out by the second sensor, IR2, recognizing successful ball penetration of the net wall. A notable feature of this system is its capacity to disseminate output in an online format, thereby enabling users to conveniently access information through connected devices. The adherence to established regulations adds a layer of complexity, designating the passage of a soccer ball from the lower to upper regions of the net as a penalty. Furthermore, the occurrence of IR1 detection subsequent to IR2 detection is identified as a foul, aligning with the stipulated guidelines.

1. INTRODUCTION

Basketball is the most popular sport in the world. The objective of this project is to create an inexpensive, automated basketball foul-detecting system. The objective is to develop a low-cost scoring system because the existing ones are rather costly. The players require the most affordable and effective training system possible. The problem now has two additional groups. First, it ought to recognize the basketball as soon as it passes past the net. There are now a few systems in use that can automatically identify a shot. The goal of the project is to create basketball scoring system an automated, affordable for educational use.

 The score system is employed in training so that players can benefit from the system's assistance. The mechanism will raise the scoring; the buzzer will sound when the score is raised when the sensor detects a shot. Additionally, the sensor will detect the foul in order to prevent incorrect counting automatically. Should the ball cross the net in the opposite way, there is a chance that the automated scoring system will record the foul in addition to the counting. When this technology detects a foul, a buzzer will sound.

2. LITERATURE REVIEW

Yun Jin in "Football Match Scoring Method Based on Neural Network Algorithm", a football game scoring method based on an adaptive neural network algorithm is proposed. Firstly, the application background of football match prediction, the research and application status of the adaptive neural network algorithm, and the related research of football match prediction are described; Secondly, the factors affecting the outcome of football games are analyzed, and the applicability of the adaptive neural network algorithm in football match prediction [1].

Lorant Andras Szolga, Janka Szocs in "RFID Tracking System for the Basketball Game", proposes a novel system for the tracing of the semicircle line during the play of a basketball game. A wide range of solutions are focused on the image detection techniques which require a lot of expensive cameras and data processors for the run of the classification algorithms [2].

Y.S. Pai et.al. in "UbiTrain: Leveraging the Physical and Virtual environment for ubiquitous sports training", In this paper the authors proposed the idea of ubiquitous sports training using UbiTrain, which enables users to exercise anywhere, at any time, using virtual and mixed reality (MR and VR). The following are the contributions made by this work: 1) it makes use of both virtual and real spaces for sports training; 2) it adapts to the user's present physical

location, enabling ubiquitous usage; and 3) it blends practice and observation into a cohesive learning package [3].

D.L Neumann et al. in "A systematic review of the application of interactive virtual reality to sport", demonstrated that a variety of performance, physiological, and psychological outcomes had been improved by interactive VR apps. Athlete factors, task factors, VR environment factors, and non-VR environment variables are among the aspects that have affected the unique effects and the VR system. The existence of other people in the virtual environment, rivalry, task autonomy, immersion, attentional focus, and feedback are all significant variables. The use of interactive virtual reality in skill-based sports needs further investigation as most study to date has focused on endurance sports like cycling, rowing, and running [4].

Laszlo Ratgeber et. al. in "Video Mining in Basketball Shot and Game Analysis", algorithms for detecting player positions of the court, ball position detection and determination of shot. It is achieved by detecting court position and applying spatial transformation. It also includes detection of shot, detection weather shot was successful and position from which shot was taken. All algorithms are tested in large number of frames from different basketball games[5].

3. EXISTING SYSTEM

A number of basketball detection tools have been created using different methods. They are complicated and expensive because they use laser beams to locate the basketball during the game, which requires multiple laser beams. They can sometimes produce incorrect statistics due to things other than basketball interference. Another option is to use three accelerometers or vibration sensors.

Piezoelectric or piezoelectric accelerometers are used to monitor basketball pass pressure, basketball motion, and rim vibration. Three sensors are placed in the network to detect the mentioned characteristics. A rigid cable connects one of the networks to a sensor edge attached to the rear edge. A processor mounted on one or more sensor PCBs receives data from all three sensors. After combining and evaluating the received data, the microprocessor transfers the data to the console, where it is processed and the results are displayed.

The technology uses ultrasonic sensors to detect successful shots. Under the edge, there is an ultrasonic sensor equipped with 1 transmitter and receiver at an angle to the work area. Turning the sensor down prevents the detection of objects above the perimeter. The ultrasonic waves generated by the sensor are interrupted when the ball passes through the rim. The distance to

the ball is determined by the speed of the ultrasonic wave and the reaction time of the receiver to the bouncing ultrasonic wave. The algorithm recognizes it as a successful shot if the distance is within the valid range.

4. SOFTWARE DESCRIPTION

An open- source electronics platform called Arduino is erected on simple tackle and software. A buzzer can be actuated, an LED can be turned on and commodity may be published online by using an Arduino board to read inputs like light in a detector, a cutlet on a button, or a tweet. Transferring a set of instructions to the board's microcontroller will instruct your board on what to do. You achieve this by using the Arduino Software (IDE), which is grounded on Processing and the wiring- grounded Arduino Programming language. Over the times, in numerous of systems, ranging from simple ménage particulars to intricate scientific instruments, have used Arduino as their brain. Scholars, artists, programmers, and professionals from each around the world have crowded around this open- source platform. Inexpensive Arduino boards are affordable when compared to other microcontroller infrastructures. Indeed, the pre-assembled Arduino modules bring lower than$ 50, and indeed the cheapest interpretation of the Arduino module can be put together by hand. Cross-platform The Arduino Software (IDE) is compatible with Windows Macintosh OSX, and Linux. The maturity of microcontroller systems is Windows-only.

5. METHODOLOGY

The overall system design was shown in Fig.1. The IR1 sensor detects when the shot is made. IR2 second sensor ensures the shot and then the score will be increased on the LCD.
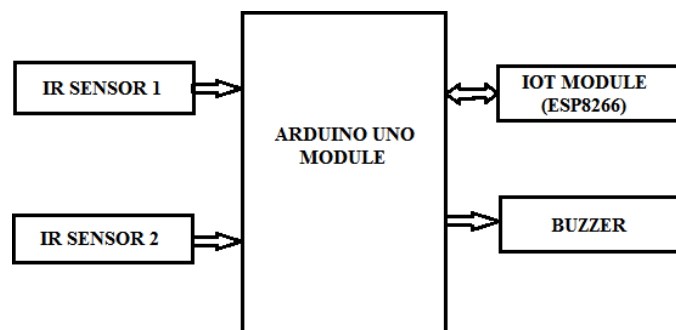

Fig 1 System Design

If it is passes through the net from lower to upper it is foul in basketball game, if it detects foul the buzzer alerts to acknowledge. If the IR2 sensor first detects the ball and then the IR1 detects the ball the buzzer will raised and "wrong entry" displayed on the LCD to denotes the foul.

6. RESULT AND DISCUSSION

Scoring board system will give a result as much as I expected. The scoring system displays the score in the LCD display and also in the webpage. The direction of the ball monitored and alerts if the ball comes from lower to upper according to the game condition it is foul. This system is used for automatically sensing and displaying the scores in the Score Boards using the IoT Technology. This system can also be used to suspect the foul which is related to direction. The following outputs from Fig. 2 to Fig. 6 represents the Overall automatic Score Board Implementation, IR1 sensor detection of the Ball above the Hoop, IR2 sensor ensuring the detection of the Ball from below the Hoop, the increase in the Score Count and the Buzzer alert for a Fowl.

Fig 2 Overall implementation

Fig 3 IR1 the first sensor detects the ball from above the hoop

Fig 4 IR2 the second sensor ensures the count from below the hoop

Fig 5 Count increase triggered by successful ball detection

Fig 6 Activation of the buzzer signaling a foul as a result of an incorrect entry detected by the system

If the ball is first detected by the second sensor IR2 and after detected by the first sensor, LCD displays "Wrong Entry" and the buzzer will raised. If only one sensor detects the ball score will not increased. The ball must detected by both sensors.

7. CONCLUSION

The system was created as part of this research. It was also put into practices and underwent some early testing. The developed automatic basketball scoring system detects when the ball enters the hoop's and awards a point value based on the continuously changing LCD data to each basket. This system uses an Arduino NANO Microcontroller an LCD, a conductive rubber cable stretch sensor and other widely used, easily available, and reasonably priced electronic components like transistors, resistors, and IR sensors. Future game conditions will be used for greater results. Numerous projects have been created for this topic, but none of them have game conditions. Finding more affordable materials that can be utilised as IR sensors will require more research.

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