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Hawk Eye Technology in Sports

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ABSTRACT –

Game of cricket is improving day by day. Development of the sport technologies is one of the major reasons behind this improvement. Hawk Eye is one such technology which is been used in the game of cricket. Due to numerous amount of assistance given by this technology for the improvement of the quality of the game it has become very popular among the public. But due to a lees number of researches carried out on this topic the public understanding regarding the technology is very much law. Therefore this paper aims to discuss the principal behind the Hawk Eye, multiple uses of it in the game of cricket, accuracy of the system, reliability of the system while suggesting future enhancements to be done.

I. Introduction

Television broadcasting has become a very profitable business all around the world. Sport broadcasting is one area where a large amount of audience is available. As a result there is a massive competition among the broadcasting channels to become the pioneer. In order to achieve this channels intend to give a superior experience to their viewers with the help of the latest technologies available. Hawk-eye is one such technology which was used by broadcasting channels to produce various kinds of visualizations including colorful wagon wheels [1]. Hawk-eye technology was created by Dr. Paul Hawkings and it was developed by the engineers of Roke Monor Reseach limited [1]. Although this technology was initially used by the broadcasting channels, with the improvement it has become a decision aid tool for a number of sports including cricket, tennis, snooker, football etc. In the game of cricket this is used to aid the LBW (Leg Before Wicket) decision because it is the first and the only ball tracking system which is available in the game of cricket [2]. Using multiple cameras to feed the system the trajectory of the cricket ball is monitored during the entire duration of the play.

What you can do:

Hawkeye can sing all forms of lifting, spin, swing, and suture ball movements. Provides up to 99.99 percent forecast. Hawkeye was used to present options to the LBW's third referee. In tennis, Hawkeye creates the impact of the ball, either "IN" or "OUT". After seeing the actual movement, the probability of making the wrong decision is correct. The Hawk-Eye generation was first developed for cricket to spread criticism of the referee's LBW (earlier than wicket) decision. This can be completed by creating a 3D digital simulation. In this simulation, the event can be played from behind from an exclusive angle to evaluate the incident. Determine if the referee has made the right decision [4-5].

Principle: -

The Hawkeye system is based on the principle of "triangulation". Triangulation is a system that finds the area of a point by measuring the angle from the element to the point detected at any end of the fixed baseline, rather than directly measuring the distance to the element. This point can be specified as the third point in a triangle with a recognized edge and angle.

Working Diagram

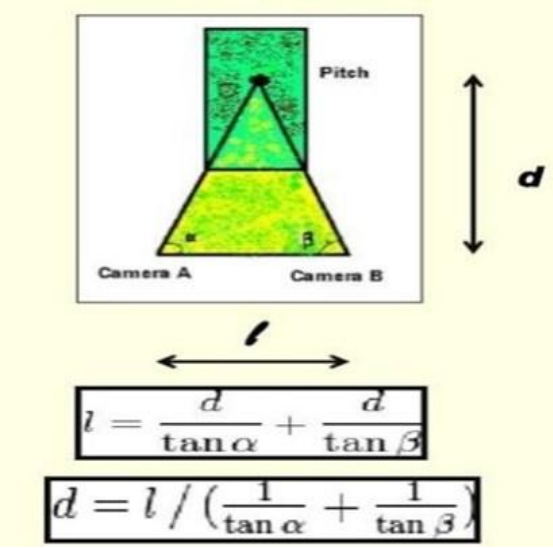


Fig. 1. Block diagram

How it works:

Hawk-Eye requires two inputs. Video provided by 6 special cameras in 6 special locations. The tempo of the ball. Gadgets quickly route video feeds through a high-speed video processor. This part of the gadget can also be broken down into basic elements. [6] Detects pixels in 6 specific locations.
B. Ball speed. Gadgets quickly route video feeds through a high-speed video processor. This part of the gadget can also be broken down into basic elements

1) To detect the pixels representing the cricket ball of each image captured by each video camera: captured using algorithm. Search for ball-like pixels in the captured image. The recording used is a good way to record the size and shape of the ball. After this degree, the x and y coordinates of the ball in each frame are output.
2) Geometric algorithm: Facts and coordinates from each camera are received using the attached geometric algorithm. Work inside the HAWKEYE machine. Now that we know the exact position of the cameras in the area and the coordinates of the ball are larger than any of the images captured by those cameras, we can correctly determine the placement of the ball. Kalman filtering: 3D ball trajectories are created from photographic statistics using a process called Kalman filtering. From this 3D orbital, you can determine the velocity, position, and deviation of the ball's flight.

2. Hawke Eye Technology

- Hawk-Eye requires two inputs

1) Video is delivered via six unique cameras in exceptional locations.
2) The speed of the ball.

- The system is processing video feeds fast using a video processor that is too fast.
- Hawkeye consists of both photo analysis and radar time.
- The frame rate of the digital camera is 120MHz.
- Traces the entire trajectory of the ball, from far enough away from the bowler's hand to the point at which the ball is considered a batter .

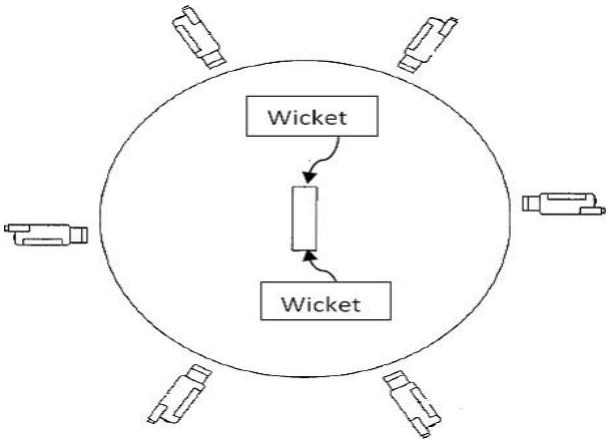
3. Functions of Hawkeye

Hawkeye consists of two main components.

- Tracking system
- Video playback system Tracking system
- There are six fast and imaginative predictive cameras that match the ball from the bowler`s hand to the batter's hand [8-10].
- The system automatically calculates the next step.
    1. The speed at which the ball leaves the bowler's hand.
    2. Batter reaction time.
    3. The swing of the ball from the bowler's hand to where the ball was thrown.
    4. 4 The place where the ball became bowling.
    5. How well did the ball bounce?
    6. Tonnage of balls moved laterally from the wicket (eg seam or spin)
    7. Predict where the ball may have passed the stump.

Video Replay System

- However, tracking data provides coaches and players with a record of their travel path. The Hawk-Eye Cricket system can include multiple video playback cameras to improve analysis from different camera angles [11]. These can be controlled remotely. The video is recorded and stored digitally on your hard drive.



Technical accuracy

- At checkout in 2006, Hawk-Eye performed all tests 100% correctly with an average error of only 3.6 mm.
- Outdoor testing was conducted on an ongoing basis, including situations that took into account the following factors:
- Wind (and consequent camera shake)
- Bright sunlight at certain times of the day
- Elements or public shadows of the general court
- Dark or cloudy
- Artificial floodlight

Applications:

- Programs especially in sports:
- Cricket
- Tennis
- Billiards
- Soccer

Used for military electricity in some video games (eg Cricket 2007)

- Use in the automotive industry

With cricket

Hawkeye-Eye Assist to fix the following problem: Did the ball hit a tree stump ?? Did the ball hit the line? Did the ball hit the batter? The unmarried 2, 3, 4, and 6 that make up the short 50`s or century are represented by the extraordinary colors of the wagon wheels.

For Tennis:

In tennis, Hawkeye produces the effect of the ball regardless of whether the ball is IN or OUT.

For snooker:

This technique is useful when the cue ball comes in contact with the required ball for the first time or every second .

Cars and Army:

Wheel alignment can be done with the help of this era in the automotive industry [14-16]. Track enemy territory from a distance. The E-2C aircraft used by the US Army take advantage of this era.

Conclusion:

This study deepened the public's understanding by discussing technology, various uses, reliability, and uncertainty, and proposing future improvements related to Hawkeye technology. It turns out that this technique is closely related to cricket matches in many ways. For this reason, technology must be developed so as not to adversely affect the nature of this beautiful game.

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