Camera Assistant For Blind Cricketers

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***Abstract* — Cricket is undoubtedly the most loved sports in India. Even Blind people have been playing Cricket from many years. This paper aims at taking blind cricket to a next level by introducing few advancements in the game using Image Processing. The main aim is making the game more interesting while keeping in mind that the technology doesn't hamper the spirit of blind cricket which is solely based on the hearing power of the blind cricketers.**

Keywords *— image processing*

I. INTRODUCTION

Image Processing is a method of performing operations on images so as to extract useful information from them. Image processing is extensively used in cricket from a lot time, Technologies which includes the extensive use of image processing are Snicko , ultra-edge, hotspot, ball tracking etc. This paper proposes few advancements in blind cricket using OpenCV. Firstly, we detect the ball using the object detection, once the ball is detected, its distance from the camera(batsman) is calculated in real time. Once the ball reach at a particular minimum distance the information about the distance and speed of the ball is conveyed to the batsman, it is done by using text to speech feature in python. For the fielders the speed of ball approaching them and the direction of the ball is dictated using microphone. Raspberry pi is used as a processing unit, various techniques for detection includes background subtraction, hsv color space etc. Ball tracking and distance calculation is done using contour approximation. Various other techniques are used. Those will be discussed in detail later in this paper.

II. LITERATURE REVIEW

Background subtraction can be used for object detection and tracking. [6] [7] [11] [25]. We can also apply the frame difference method and then the final result equals the AND operation of the result obtained from the Background Subtraction and Frame difference method(6). Frame difference is a good method in application where the object is fast moving as then in every frame, the corresponding pixels will be different so moving ball will be easily trackable. [6]. Still, there is some noise so the filtering of the noise is done using dilation. [7], the optimal solution is provided by Kalman filters [25], to get even better results we can do binarization of images before filtering[7]

III. METHODOLOGY/EXPERIMENTAL

A. Components

1. Raspberry Pi

Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom. Early on, the Raspberry Pi project leaned towards the promotion of teaching basic computer science in schools and in developing countries. Later, the original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It is now widely used in many areas, such as for weather monitoring, because of its low cost, modularity, and open design.

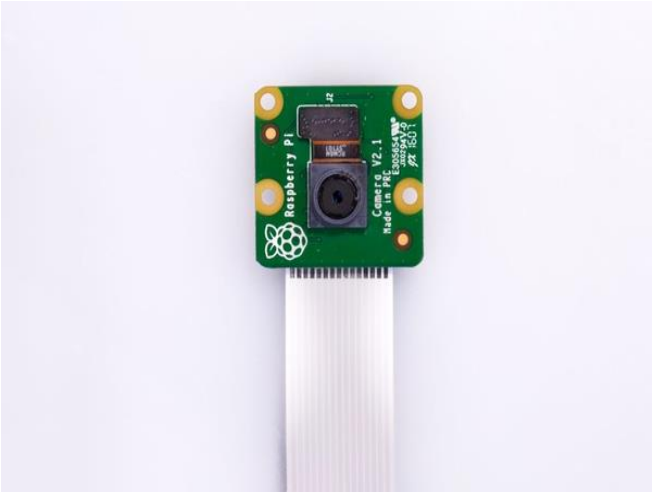
Raspberry Pi 3 Model **B** was released in February 2016 with a 1.2 GHz 64-bit quad core ARM Cortex-A53 processor, on-board 802.11n Wi-Fi, Bluetooth and USB boot capabilities.

2. The Raspberry Pi Camera Module v2

The Raspberry Pi Camera Module v2 replaced the original Camera Module in April 2016. The v2 Camera Module has a Sony IMX219 8-megapixel sensor (compared to the 5-megapixel OmniVision OV5647 sensor of the original camera).

The Camera Module can be used to take high-definition video, as well as stills photographs. It's easy to use for beginners but has plenty to offer advanced users.

The camera works with all models of Raspberry Pi 1, 2, 3 and 4. It can be accessed through the MMAL and V4L APIs, and there are numerous third-party libraries built for it, including the Picamera Python library.



PROTOTYPE:

The prototype is supposed to be fitted on the wicket which will tell the batsman about the position of ball approaching towards him.

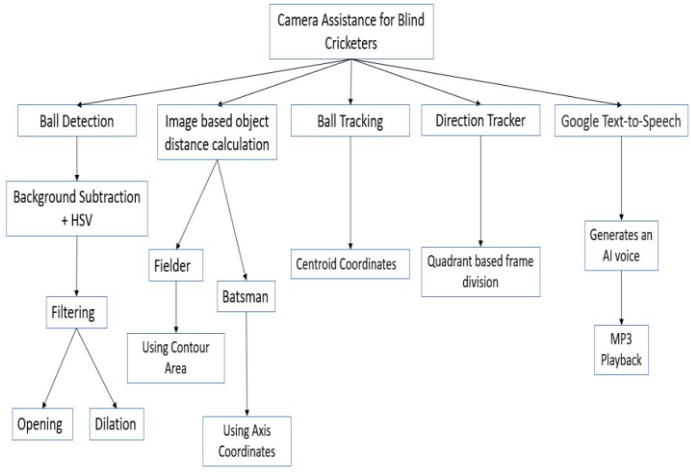
The fielders will have the camera on their cap and it will assist them about the position of ball.

This project mainly revolves around 5 techniques:-

1) Ball Detection
2) Distance Calculation
3) Ball Tracking
4) Direction Assistance
5) Text to Speech

Flowchart

Flowchart



IV. RESULTS/DISCUSSIONS

The following results are obtained from the code we applied:

Fig: distance of the ball with notification and converts "get ready ball is approaching you" into speech.

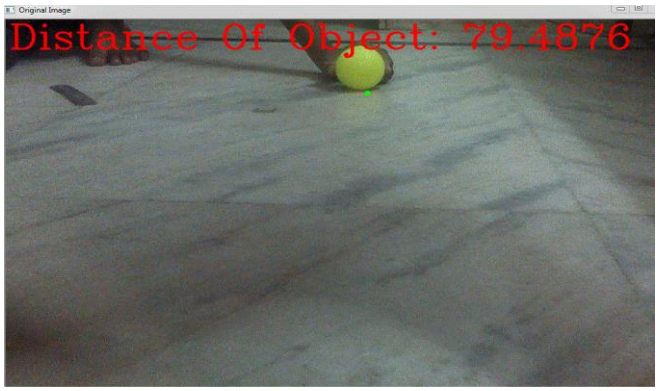


Fig: distance of the ball without notification as ball is moving away no speech conversion requires for the batsman.

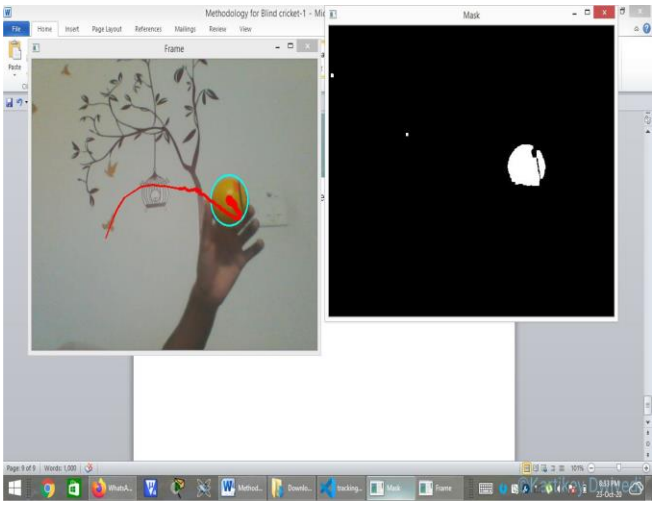


Fig: Ball tracing by centroid method, the code identifies the ball based on its color and shape and makes a contour around the ball. The center of the contour i.e. the centroid of the ball has been tracked perfectly with a red line which disappears after 2 seconds.

Fig: Resulting image after filtering-the background has been removed and the camera is only detecting the ball anything outside the contour has been completely vanished, highly accurate results obtained.

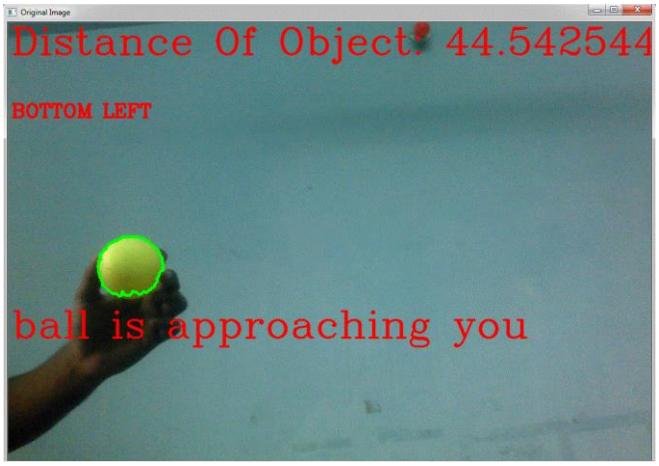


Fig: Bottom left approach of ball with distance calculation and the system converts "ball is approaching you from bottom left" into speech so that fielder can take a note of it and be attentive accordingly

Fig: Bottom left ball position with distance calculation, here the ball is moving away from the fielder, so no speech conversion is required.

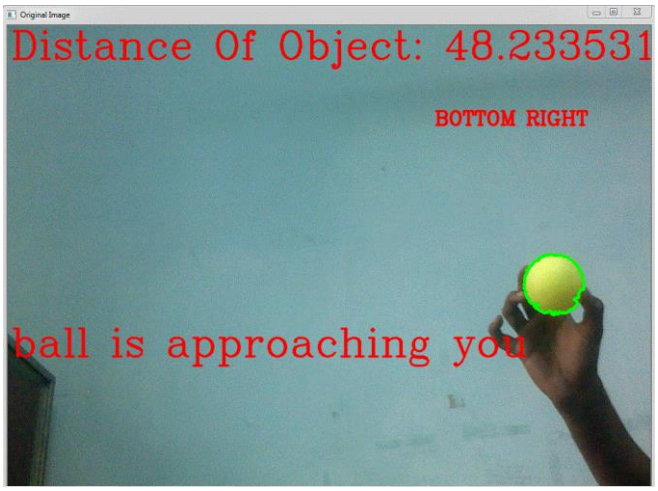


Fig: Bottom right ball position with distance calculation and the system converts "ball is approaching you from bottom right" into speech so that fielder can take a note of it and be attentive accordingly

Fig: Bottom right ball position with distance calculation, here the ball is moving away from the fielder, so no speech conversion is required.

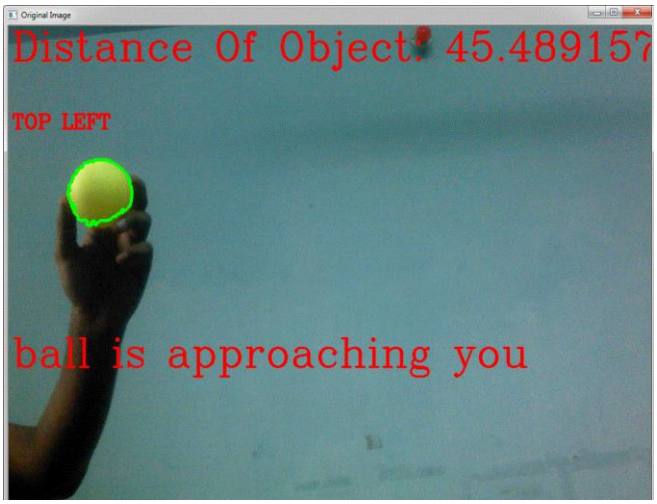


Fig: Top left ball approaching position with distance calculation and notification and the system converts "ball is approaching you from top left" into speech so that fielder can take a note of it and be attentive accordingly

Fig: Top left ball position with distance calculation, here the ball is moving away from the fielder so no speech conversion is required.

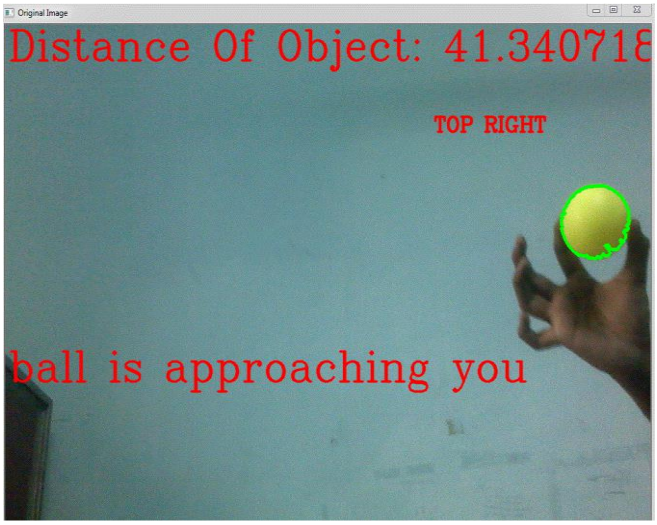


Fig: Top right ball approaching position with distance calculation and notification and the system converts "ball is approaching you from top right" into speech so that fielder can take a note of it and be attentive accordingly

Fig: Top right ball position with distance calculation here the ball is moving away from the fielder so no speech conversion is required

V. LIMITATIONS

1] Real time image processing applications requires stable and fast internet connection. This idea totally depends on how quick inputs are provided to the batsman and the fielders. Any lag in processing will result in a complete mess.
2]Players will require Bluetooth earphones to hear the processed instructions and data. But wearing them while constantly running might not be feasible
3]The ball detection algorithm are not very accurate and precise so the model may give false results.

VI. FUTURE SCOPE

1] Instead of "play" call called by the bowler while releasing the ball the bowler can give a beep signal through the earphones so as to alert all the players in the field .This can be done with the help of Distance calculation method used for Batsman.
2] Using Distance calculation method for the batsman we will give the beep sound once again when the ball crosses half of the pitch, so that batsman will estimate the ball speed and therefore he/she can time the ball accordingly.
3] Before facing any delivery , knowledge about the field position is very important for both the batsman as well as bowler , so we can alert the batsman about the real time field setting by converting that information into sound by using text to speech technique.
4] In the proposed system the hardware part plays a crucial role. Hence better hardware devices than Raspberry pi can be used to implement the algorithm to increase the overall accuracy and implementation speed of our algorithm

VII. Conclusion

Cricket is one of the most popular game in the world , there are lot of advancements in cricket in recent years , this paper focused on improving blind cricket using OpenCV , raspberry pi etc. Every game has its own set of rules and challenges. Similarly blind cricket is based on the hearing capacity of the players, we didn't want to kill the spirit of the game so while proposing the advancements , the appropriate care has been taken. We hope that these advancements will make the game even more interesting and therefore increase the popularity of this underrated sport .

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