

No Ball Detection

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Abstract - The most profound technologies are those that disappear. They weave themselves into fabrics of everyday life until they are indistinguishable from it^[1]. This research work is a mere effort for automated decision making during sports of most common interest leveraging ubiquitous computing. Primarily cricket has been selected for the implementation of the idea. The game of cricket and the use of technology in the sport have grown rapidly over the past decade. However, technology-based systems introduced to adjudicate decisions such as run outs, stumping, boundary infringements and close catches are still prone to human error, and thus their acceptance has not been fully embraced by cricketing administrators. In particular, technology is not employed for no-ball decisions. Main objectives of the research are to help achieve the following goals. 1) Make No- ball Decisions where human eye can make error due to human limitations. 2) To investigate the use of microcontrollers in developing a No- Ball detection adjudication system for the game of cricket.

Keywords – Cricket, No-Ball detection, Microcontrollers.

I. INTRODUCTION

Everyone has liking and disliking and when it is the matter of National sports and things get more sensitive and touchy. Any keen follower of cricket knows that when a batsman is dropped during an innings he is given a life. Whereas when he is declared 'out' it is death for him. Wrong decisions at the time of a climax in any game can lead to ultimate disappointment and a state of disparity for its fans. Remember, a single wrong decision can spoil the entire match. Sports science divides coaching into activities that take place before, during and after competition^[2]. Computer Science already supports a number of coaching activities before and after competitions, such as strategy development and performance evaluation. Computer-based, semi-automatic observational systems support coaches by combining quantitative statistics with qualitative video analysis^[3]. A number of misjudged decisions by umpires due to incapability or simple carelessness led to totally spoiled matches. There are numerous examples which one can quote in this respect. "Test in England where an umpire gave three batsmen out on no-balls. TV replays showed that the bowlers had clearly violated the no-ball rule but the umpire never called.

The revenue generated from sport globally is estimated to reach over \$130bn US dollars by the year 2013^[4]. In 2010, Soccer, the world's most popular sport according to^[5], was reported by its international governing body, FIFA, to have generated US\$1bn on the strength of the successful world cup in South Africa^[6]. Cricket is the second most popular sport, and the Indian Premiere League's (IPL) 20/20 format boasts of being the second highest paid sport ahead of the football's English Premiere League (EPL)^[7]. In 2009, the Indian Premier League (IPL) offered pay checks as high as US\$1.55 million to top class cricketers for a five week contract^[8].

It is well known that bookmakers have also capitalized on cricket's wide fan-base. The plethora of online betting sites dedicated to cricket, such as bet.com, cricketworld.com, cricket.bettor.com and cricketbetlive.com, to list a few, are evidence of this practice. Unfortunately, the sport has gained notoriety with several of its elite players being charged with bringing the game into disrepute. In the 1999-2000 India-South Africa match fixing scandal, Hansie Cronje, the South African captain admitted to accepting money to throw matches and was subsequently banned from laying all forms of cricket^[10, 11]. In August 2010 during the match between England and Pakistan at Lord's Cricket Ground two Pakistani players were accused of match fixing by deliberately bowling three illegal deliveries (i.e. No-Balls) at pre-determined times during their bowling spells. It was alleged that Mr. Mazhar Majeed, a property developer and sports agent, orchestrated the events and tipped off betting syndicates so they could place "spot" bets and make profits of millions of pounds^[12, 13].

To deter match fixing, and ensure legitimate results, it is not surprising that the use of technology in cricket has steadily increased over the years and now has a major role in adjudicating the outcome of events. Now a day's No-Ball in the game of cricket is like intervention of GOD in the match outcome. It is a lucrative opportunity for the batting team as it awards one extra ball immune to prominent ways of getting a batsman "OUT". Hence solving this problem of No-ball detection is imperative.

There exist a number of problems which cause dissatisfaction of the players and game lovers when a decision is of great importance and a misjudgment done by an umpire crumbles the whole situation. The Automated No-Ball Detection system proposed in this paper helps solve the issues in judgment and decision making of No-Ball during the game using real-time computing.

The rest of the paper is organized as follows. Proposed work is explained in section II. Experimental results are presented in section III. Concluding remarks are given in section IV.

II. PROPOSED WORK

Recent practices involved in No-Ball detection in cricket are direct perception of the No-ball by the umpire or in case the field umpire is unable to decide then the Third Umpire checks it on the screen utilizing the action replay feature of the recorded ball. In both these methods directly or indirectly umpires make decision based on what they perceive. Hence the limitations of human perception through the eyes prevail. So the probability of error in No-Ball decision cannot be ignored.

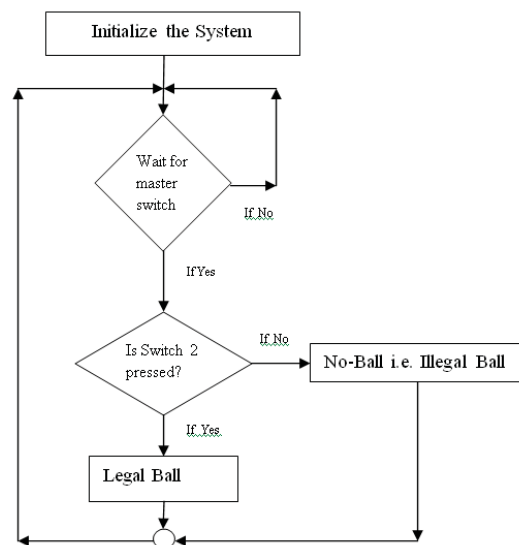
The proposed system makes the use of microcontroller to implement the No- Ball detection algorithm, which will provide extremely high degree of accuracy to the on field umpire to detect No-balls.

Taking into point of view the intense scenario of the game we have provided the facility of Vibrator for the on field umpire which will activate only in case of illegal ball (i.e. No-ball).

2.1 No-Ball decision –

We only address the issue of over stepping the popping crease by the bowler. To detect whether a specific delivery is legal or illegal we use the crease itself as the sensor. We achieve this by placing two sensors statically in the crease. Of the two one sensor is placed right under the white line(also acts as Switch 2). If this sensor is not activated when the ball is bowled then it is illegal ball else it is a legal ball. The other sensor is placed at the start of the crease and it also acts as master switch.

2.2 No-Ball detection flowchart –



III. EXPERIMENT AND RESULT

Following are the images of the obtained results:-



Fig 3.1: Illegal ball (i.e. No-Ball)

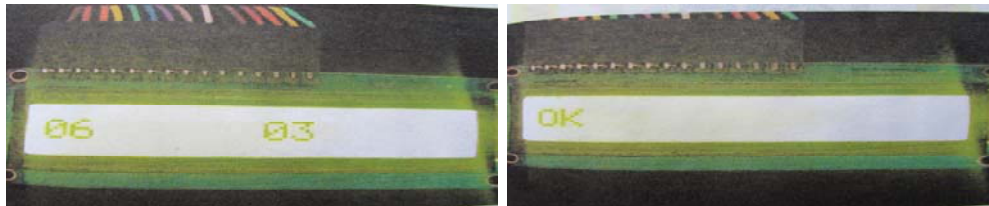


Fig 3.2: Legal ball

Real-time detection of No-Ball is successfully implemented using microcontroller.

IV. CONCLUSION

The system designed provides a very high degree of accuracy of No-Ball detection. The transmission of the sensor information to the microcontroller can be made wireless in future. This system can also be implemented for other athletic games as well. Technology must be used judiciously if it is to gain support of the players and administration. For example consider the case of the 2nd Test match between India (I) and the West Indies (WI) in Barbados where the on field umpire consulted the third umpire regarding the legality of a delivery from Fidel Edwards (WI), which ultimately resulted in Raul Dravid (I) being given out to a no-ball. Ironically, the wrong television reply of the bowling delivery was used. This paper therefore aims to completely remove the human factor from the data gathering and information-processing portion of the adjudication process.

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