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An Effect Of Aerodynamics On Cricket Ball Related With Pitch Condition

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Abstract:

This paper describes An Effect of Aerodynamics on Cricket Ball related with pitch condition. The results show the deviation of ball using unpredictable flight. This paper also shows that different types of ball have different Renold number with different types of surface. This paper will help for referring decision to third umpire in LBW

Keywords: *cricket ball, aerodynamics, trajectory deviations, asymmetric flow, unpredictable flight*

1.Introduction

Cricket is a ball game within a fixed area. The Hawk eye system comprising of video cameras mounted at specific angle can track the path of ball and take pictures as a moving object. Hawk eye system can find any type of bounce, spin, swing and seam movement of the ball. The aerodynamics plays an important role in cricket. The swing of ball depends on asymmetric flow of wind tunnel over it which causes the unpredictable flight. This paper will be an effort to debate to explore the use of principle aerodynamics engineering techniques.

2.Related Work

2.1.Effect Of Aerodynamics On Cricket Ball

One of the objectives of this research is to understand the aerodynamic properties of the ball and to explain the mechanism of swing and de-mystify the unpredictability of the ball's trajectory. The sideway deviation of the ball during the flight towards the batsman is called swing. There are various types of swing: conventional swing and reverse swing. Conventional swing results in the ball experiencing a sideways force directed away from the shiny half of the ball. Such a force is achieved by maintaining laminar boundary layer of air flowing over the shinny or smooth half with a turbulent boundary layer of air flowing over the rough half. Roughness over one half of the ball is a result of its natural deterioration during play whilst a shiny side is maintained by polishing the ball when the opportunity presents itself to the fielding team.

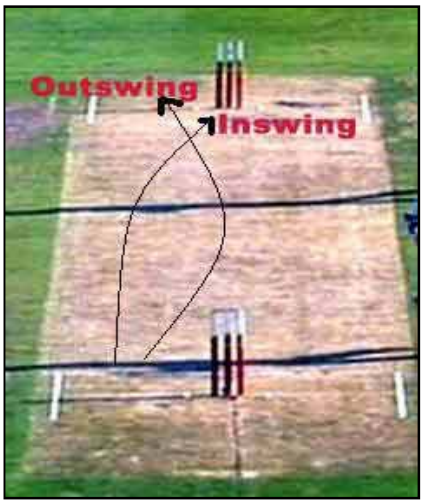

Figure 1

2.2.Basics Of Ball Theory Of Aerodynamics

Conventional swing can be achieved in at least two ways:

- By angling the seam to the batsman and with the mean direction of the flight so that one side experiences laminar (smooth) airflow and other side experiences turbulent airflow caused by the angulation of the seam itself.

The points on each side of the ball half where the flow separates is asymmetrical, generating aerodynamic pressure variations with a component transverse to the ball's motion causing eventual trajectory deviations. Generally, the ball is pushed towards the half where the airflow is remains attached.

- By bowling a deteriorated ball possessing shiny and rough halves to a batsman. However, by aligning the ball's seam under some angles, the bowler can generate different type of swings.

03.Types Of Ball With Properties

3.1 Red New Ball

Mass	Diameter	Renold Number	Surface
160 gm	224mm	280	Grass
160 gm	224mm	310	Smooth

Figure 2

3.2.Red Seminew Ball

Mass	Diameter	Renold Number	Surface
163gm	224mm	315	Grass
163gm	226mm	350	Smooth

Figure 3

3.3 White Seminew Ball

Mass	Diameter	Renold Number	Surface
163gm	224mm	300	Grass
163gm	226mm	360	Smooth

Figure 4

3.4 White New Ball

Mass	Diameter	Renold Number	Surface
160 gm	224mm	290	Grass
160 gm	224mm	380	Smooth

Figure 5

4.Testing Of Pitch

The pitch is tested for its bounce by free dropping a cricket ball i.e 160g from a height of 3 M and the bounce is noted. The bounce should be uniform. The quality of pitch is classified from the bounce as given below

Ball Bounce	**Pitch Pace**
Over 19 inch	Very Fast
15-18 inch	Fast Medium
12-15 inch	Pace
10-12 inch	Easy Paced
Less than 10 inch	Slow

Table 1

4.1.Some Important Points

- The pitch should not be played on during the first season to allow for good root development
- A heavy roller should not be over-used when the pitch is too dry. It will promote surface crumbling and horizontal shearing.
- Core should regularly be cut out to know the amount of compaction achieved.

- The final roll is designed to give a glazed surface. A light roller is used after water has been sprinkled onto the surface so that it becomes slightly pugged. (means workable and kneaded clay with water).

5.Result

Figure 6:- Shows the input format for newly implemented Hawk eye system with aerodynamics properties.

Figure 7:- Shows Two Good length Delivery with different properties where Red path indicates minimum deviation of ball and Brown path indicates maximum deviation of ball with the help of renold number.

Figure 8:- Shows Two York Delivery with different properties where Red path indicates minimum deviation of ball Brown path indicates maximum deviation of ball with the help of renold number.

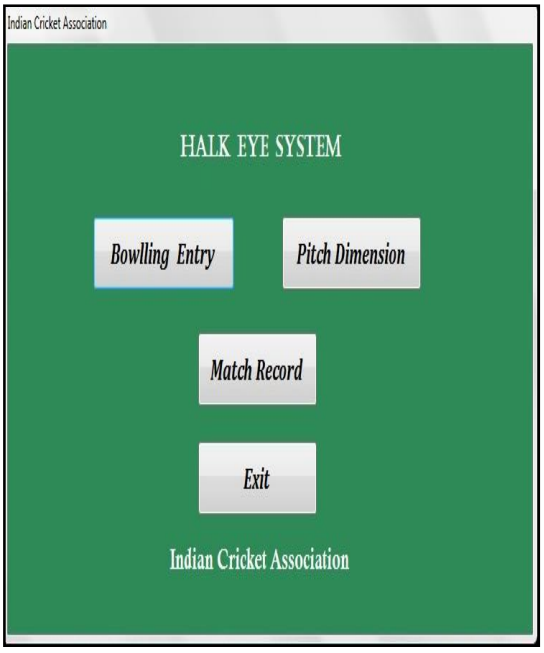

Figure 6: Input Format for Analysis

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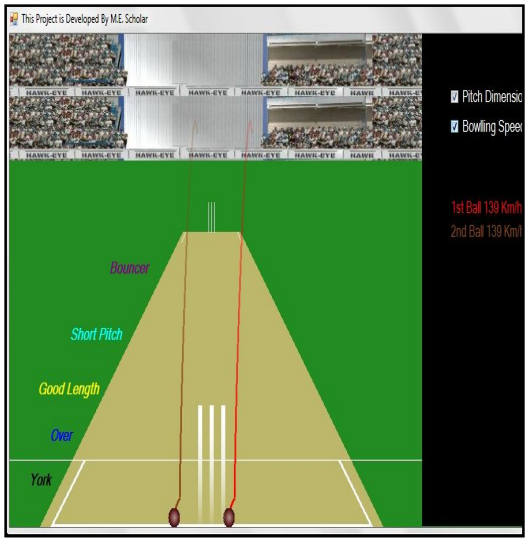

Figure 7: Two Good length Delivery with

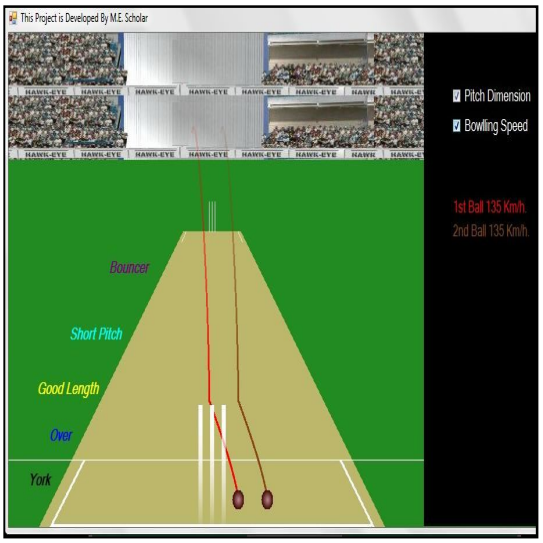

Figure 8 (Two York Delivery with : Renold Number)

5.Conclusion

• The airflow around a cricket ball is complex due to the surface roughness, seams and spins involved.

• There is minimum deviation of aerodynamic Flow coefficient between new and used balls

• The effects of soil quantize spin of ball.

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