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The Development of a Novel Cricket Bowling System: Recreating Spin and Swing Bowling Deliveries at the Elite Level

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Abstract. During the game of cricket, bowlers create different deliveries by altering the manner in which they release the ball from their hand. The orientation of the seam, the speed at which the ball is released and the magnitude and direction of the spin combine to determine the motion of the ball through the air and its movement after impact with the wicket. These factors have to be considered if automatic training machines are to be capable of replicating elite bowling deliveries. The need for automotive systems for batting and fielding training at the elite level has arisen due to: (i) the capabilities of human bowlers are limited by the onset of fatigue and the risk of injury and (ii) a large number of accurate and repeatable deliveries to be "programmable" by coaches to ensure batsmen and fielders are tested to the limits of their abilities and a training benefit is achieved.

The boundary layer air flow around the ball may be laminar or turbulent, with the transition point dependent upon the Reynolds's number: $R_e = Ud/\nu$ (U is the ball velocity, d is the ball diameter and ν is the fluid viscosity). In laminar flow the boundary layer separates approximately halfway around the ball whereas in turbulent flow the separation is later. The seam "trips" the air flow into turbulence before the smoother leather cover and therefore during swing bowling the seam is oriented such that the ball will experience turbulent flow on one side and laminar flow on the other. This creates an asymmetrical wake region and sideways drift. The amount of drift is dependent upon the angle of the seam, the speed at which the ball is released and the air flow about the ball.

Current cricket bowling machines do not generally use real cricket balls or orientate the seam and therefore they cannot accurately re-create swing bowling. An advanced bowling system has recently been designed which aims to actually recreate a proper swing bowling delivery. The aerodynamic properties of the cricket ball have been considered throughout the development process, which has resulted in a machine which is able to launch correctly oriented cricket balls at release speeds and with spin characteristics comparable to that of real bowlers.

