Cricket Ball Detection Project Report

Project Domain: Computer Vision & Machine Learning

Abstract

This project focuses on detecting a cricket ball in video frames using computer vision and machine learning techniques. The primary goal is to accurately locate the ball across frames despite challenges such as high speed, motion blur, small object size, and occlusions. The system is designed to support sports analytics applications like trajectory analysis, speed estimation, and performance evaluation.

1. Introduction

Cricket ball detection is a challenging task due to the ball's rapid motion and varying lighting conditions. Automating ball detection can significantly assist in match analysis, umpiring decisions, and player performance tracking. This project proposes a vision-based approach to identify and track the cricket ball from video input.

2. Objectives

1. Detect the cricket ball accurately in each video frame.
2. Handle missed detections using temporal continuity.
3. Provide a scalable solution for sports analytics.
4. Lay the foundation for trajectory and speed estimation.

3. Methodology

The system processes video input frame by frame. Each frame undergoes preprocessing such as resizing and color conversion. A detection model or image processing technique is applied to locate the ball. Detected positions are stored and analyzed across consecutive frames to ensure smooth tracking and reduce noise caused by missed detections.

4. Technologies Used

1. Python – Core programming language.
2. OpenCV – Video processing and computer vision operations.
3. NumPy – Numerical computations and array handling.
4. Machine Learning / Computer Vision Techniques – Object detection and tracking.

5. Challenges Faced

1. Small size of the cricket ball in video frames.
2. High-speed motion causing motion blur.
3. Inconsistent lighting and background noise.
4. Temporary loss of detection in some frames.

6. Results and Observations

The system is capable of detecting the cricket ball in most frames with reasonable accuracy. Even when the ball is missed in a few frames, trajectory-based estimation helps maintain continuity. This validates the robustness of multi-frame analysis over single-frame detection.

7. Future Scope

1. Integrate deep learning-based detectors such as YOLO or SSD.
2. Implement ball trajectory prediction and speed calculation.
3. Extend the system for real-time match analytics.

4 Combine with player and bat detection for richer insights.

8. Conclusion

This project demonstrates an effective approach to cricket ball detection using computer vision techniques. It addresses key challenges associated with sports video analysis and provides a strong foundation for advanced analytics systems in cricket.