

# Keep Your Eye On The Ball: Mobile Tennis Analysis

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The game of tennis has a playing population of about 87 Million people, at this point in time there is no product capable of accurately analysing a game of tennis for the casual player. In this report, we propose a Multi-Camera Mobile Tennis Analysis framework for the casual tennis player, which would deliver capabilities currently unavailable outside of the professional game.

Our proposed system features up to four Mobile Phones, each oriented so as to carry out their own analysis of the game at hand. By communicating their findings to each other, each device has a complete picture of the events unfolding throughout the game - In tracking both the players and the ball within multiple camera views, our proposed system would be able to provide useful performance indicators such as the locations of ball bounces, heat maps of the player's movement throughout the court, as well as classifications of the types of shots made.

Within the scope of this project, we are implementing a multi-camera ball tracking and bounce detection system for two devices. More specifically, the objectives of this project are as follows: The detection of a tennis court within multiple camera views; the detection and tracking of a tennis ball within multiple camera views; the determination of bounces points, through multiple views.

Through the testing of our Court and Bounce Detection Systems, we found the former located key points throughout the court within an error of about five pixels, while the latter system's performance in detecting bounces varied greatly depending on the lighting conditions - In overcast conditions using multiple camera views, 64.7% of bounces were correctly detected, while those bounces were on average about eight pixels away from their true locations. In sunny conditions, 73% of bounces were detected, while an error of over 10 pixels was recorded.

Having implemented our desired functionalities, a number of significant obstacles were exposed. Sources of error such as lens distortion, variable frame rates and insufficient camera resolutions all led to our implemented systems carrying error that would be unacceptable for a genuinely trustworthy Tennis Analysis System. Significantly, such errors are intrinsic to the usage Mobile Devices for video processing, and thus poses the question: *Can the Mobile platform be comfortably used in the implementation of Tennis Analysis?*