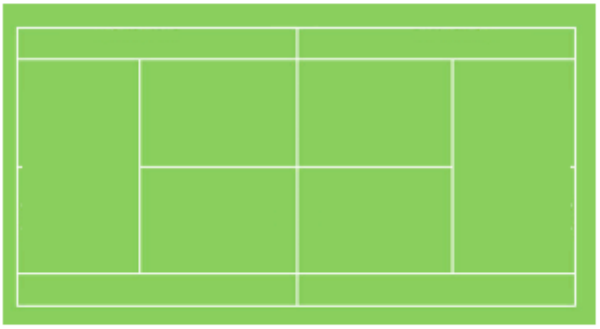
Instructions:

- Answer both parts of the question.
- This is a sample exam question. In an exam you would have only one hour to answer this question. While you may spend more time developing your answer to this question a strict limit is imposed on the length of the answer which you may submit. This limit is based on the length of answers to this question in the exam in the past.
- Your answer to the complete question (parts a and b) must be submitted as a single PDF file which is no longer than 3 pages (12 point, 1.5 spacing, normal margins). Longer answers will be seriously penalized.
- The following regulations are from the actual exam paper:
    - For Application parts, a series of computer vision operations must be detailed to solve the application problem. The input to and output from each technique used must be clearly and precisely stated. How technique is used within the context of the application must also be described including the setting of any parameters.
    - For Compare and Contrast type parta marks will only be awarded for the detailed comparison of techniques. No marks will be awarded for separate descriptions of the techniques.
    - In all parts of all questions you must describe computer vision theory and should not refer to code or library calls (OpenCV or any other library).

The question:

1. (a) [APPLICATION QUESTION] Given a video of a tennis match taken from a camera which is not moving (with a view such as that shown in the Complete Image of the court below) describe how you would locate the place on the court where each ball bounce occurs and show the locations on the plan view (as shown below). You are provided with the pixel coordinates of the four corners of the court. You may assume that the tennis ball will always be at least 10 pixels in diameter and will contrast with the court. Your solution must consist of a series of computer vision techniques and you must provide details of how the techniques will be applied including expected input and output for each technique.
[30 marks]

COMPLETE IMAGE OF THE COURT



PLAN VIEW

TYPICAL IMAGE OF THE BALL IN MOTION

1. (b) [COMPARE & CONTRAST QUESTION] Compare and contrast:
   - Gaussian Smoothing
   - Median Smoothing
   - Opening

You must provide a list of the differences and similarities between the techniques. Each of the differences and similarities must be clearly explained. NOTE: Marks will only be awarded for the detailed comparison of techniques. No marks will be awarded for separate descriptions of the techniques
[20 marks]