COMP70110 Computer Vision
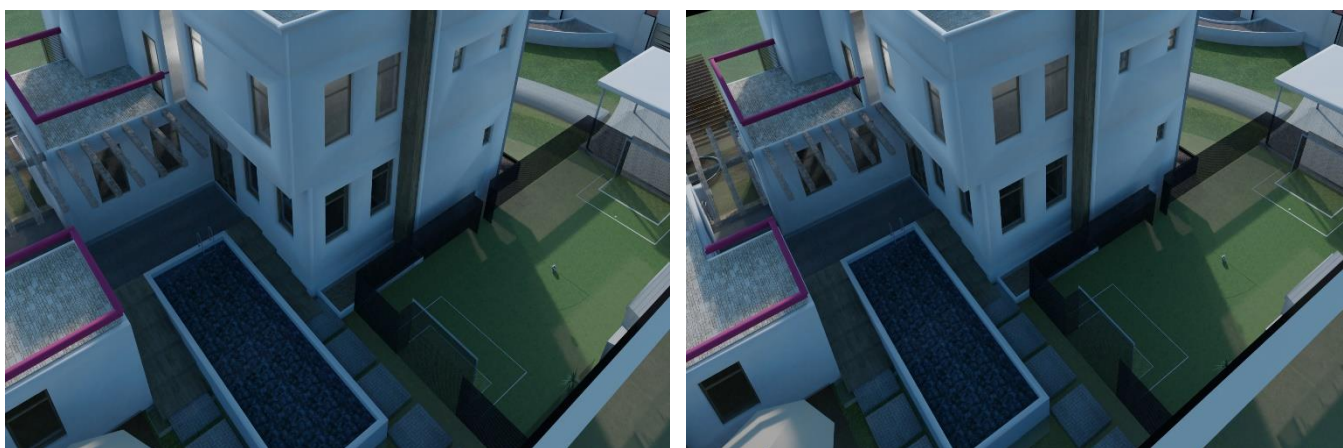
Assessed Coursework - Feature Extraction and Surface Reconstruction

Submission Date: Monday 18th Nov 2024, 09:00

The following are example frames from a video sequence.

Figure 1: (Left) Frame 1, (Right) Frame 2

1. Propose a technique to detect salient features of your choice on the video frames above. Explain the type of features on which you will focus and justify your choice. (Word limit: 150 words)

2. Propose a technique to match the detected salient features between the video frames. Explain how you would approach this task and the steps you would follow. (Word limit: 150 words)

3. Use a programming environment of your choice to:
   a. Implement your proposed salient feature detector and plot the detected features on the provided pair of frames.
   b. Find corresponding features between the two frames and illustrate those matches. To illustrate the matches you can, for example, create a composite image (e.g centered overlay image) from the two frames.
   c. Use the matched features to estimate the fundamental matrix between the two images. Now estimate the fundamental matrix using the extrinsic and intrinsic camera parameters. Compare the estimated fundamental matrices and explain any possible disagreement between the two methods. Which method is more accurate? Justify your answer and suggest how you could improve the least accurate method. (Word limit: 150 words)

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d. Find the correctly matched points that meet the epipolar constraint and illustrate these matches. Briefly explain how these matches have been identified. (Word limit: 150 words)

e. Estimate the area of the swimming pool and the length (touchline) of the football field. (hint: you can establish the disparity map between these frames or you can apply 3D surface reconstruction)

4. **Optional:** Illustrate the disparity map and the rectification result for the above video frames.