CS4243's Project

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Outline

1. Introduction
2. Panorama Stitching
   - Extract SIFT features
   - Estimate homography with RANSAC
3. Object Tracking
   - Mean shift
   - Background Subtraction
4. Registration into 2D field Map
   - Estimate homography
   - Represent players into 2D map
   - Calculate the distance covered by each player

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- provide robust matching across a substantial range of affine distortion, change in 3D viewpoint, addition of noise, and change in illumination.
- Matching feature descriptors between two using a fast nearest-neighbor algorithm.

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- **RANSAC** algorithm is used to perform robust homography estimation.
- Warp the source frame (right or left view) using the robust estimated homography matrix.
- Align the resultant source frame(warped left or right frame) with destination image(mid view frame), using color averaging.

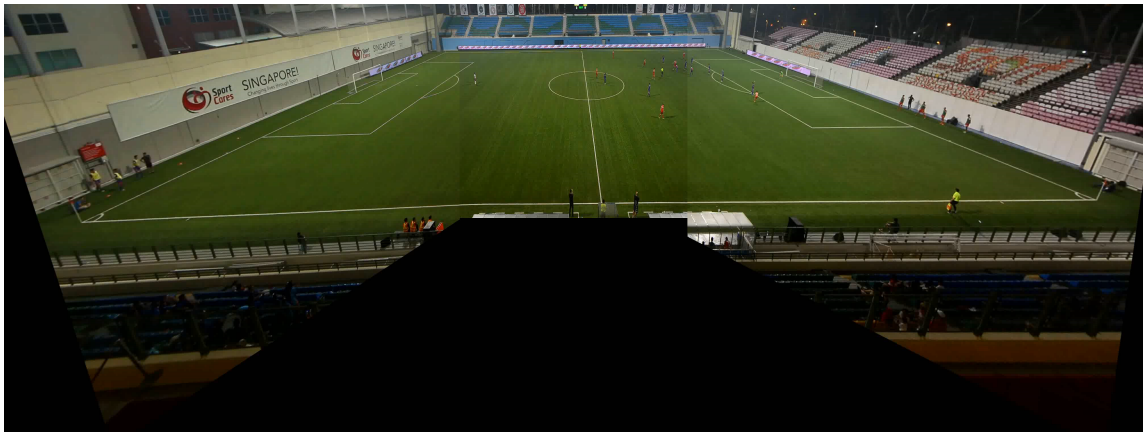
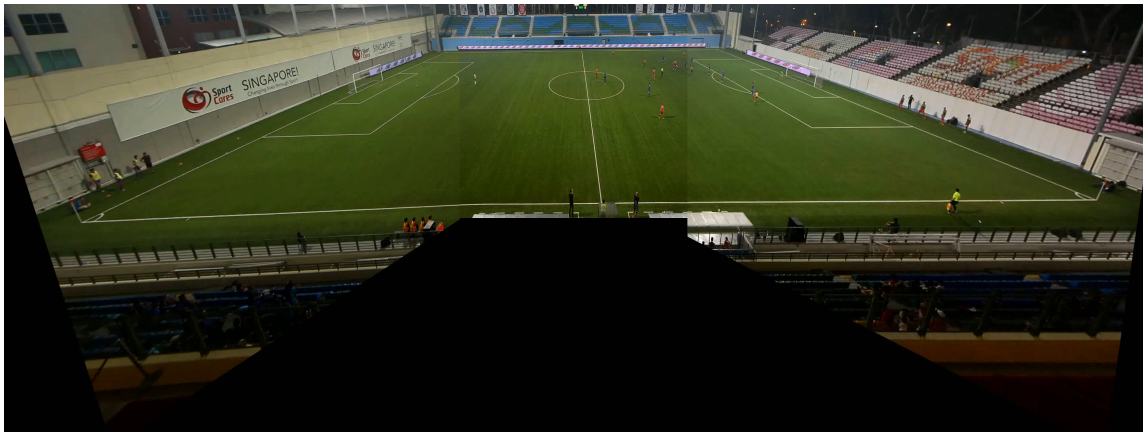


Figure 1: Normal Alignment



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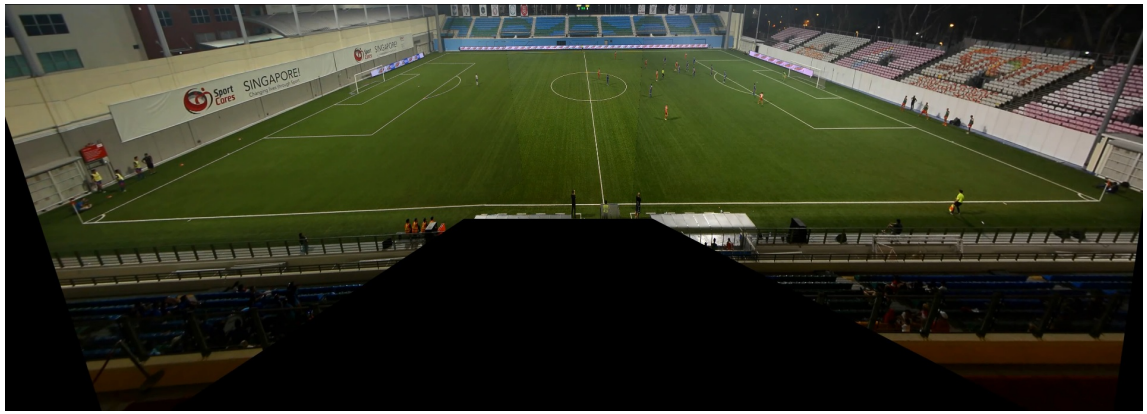

Figure 2: Color Averaging Alignment

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- Add a mask that ranges the desired color pixels using **HSV** color space.
- Move accordingly the center of mean shift's window to highest density of desired pixels.

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- The normal video and the background subtraction video used alternatively to track objects with a mean shift.

Figure 3: Empty field after subtracting the foreground

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Figure 4: Match the red points, which are show the corresponding corner points

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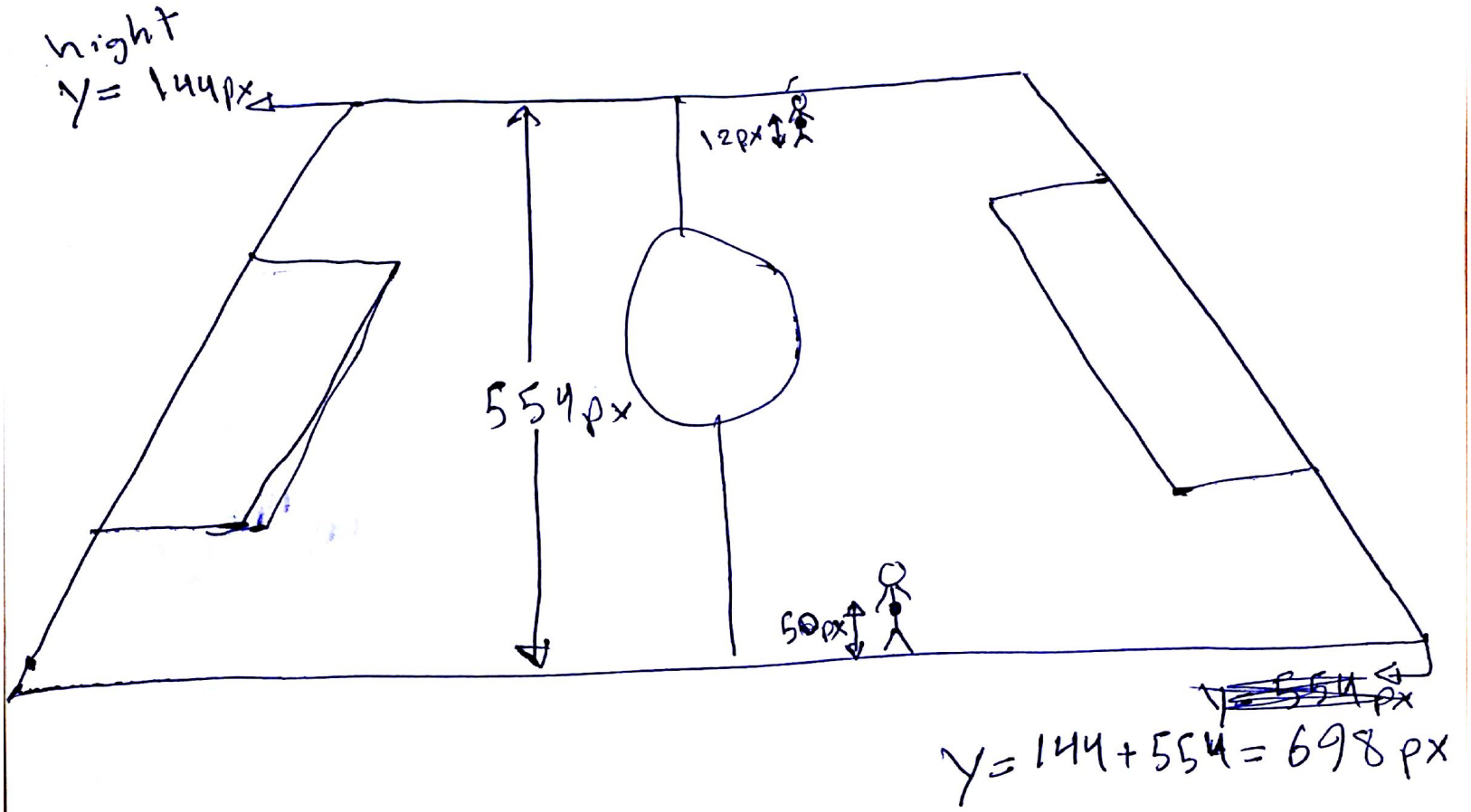

$y = 144 + 554 = 698\ px$

$$y = y + int(((y - 144.00) / 554.00) * 38 + 12)$$

- $(698 - 144)$ ratio
- $(50 - 12)$ ratio
- offset

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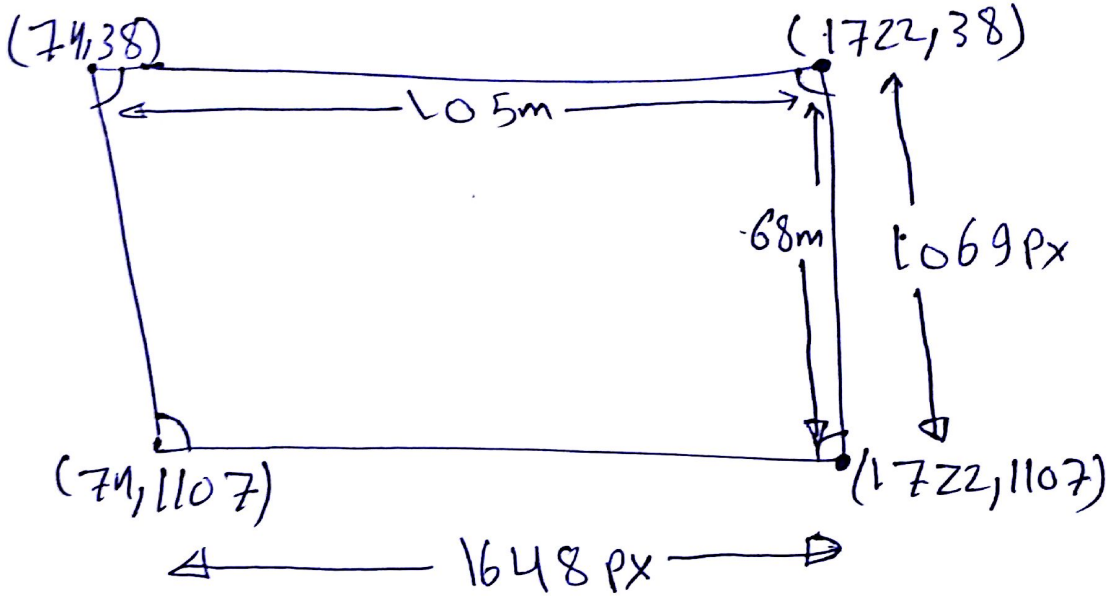

Standard pitch measurement. Not all pitches are the same size, though. the preferred size for many Proffessional team's stadiums is 105 by 68 metres.

105m ⟶ 1648 px | 10500 cm ⟶ 1648 px

68m ⟶ 1069 px | 6800 cm ⟶ 1069 px

10500/1648 = 6.37 cm/px

6800/1069. = 6.36 cm/px

Conclusion

- Build a python code from scratch.
- Stitch a dynamic panorama taken from three different cameras.
- Track players along five minutes.
- Register the players into 2D map.
  - Analysis of total overall distances covered in a match.
  - Build the entry point to analyze the soccer match.

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