

## 1 SIFT feature matching

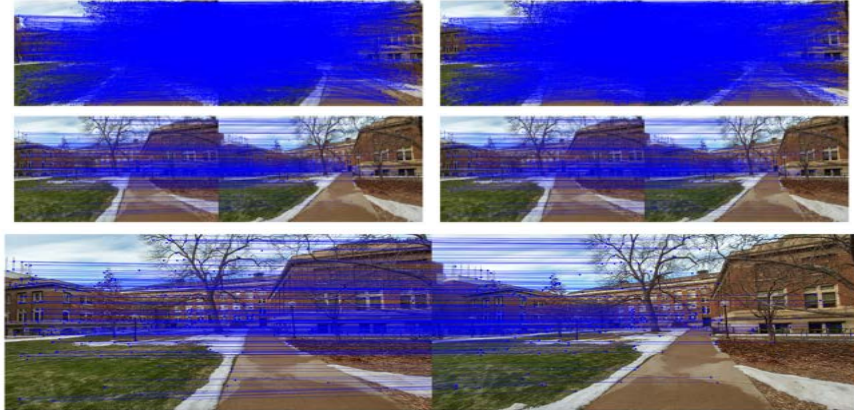


Figure 1: SIFT feature matching

Figure 1 shows SIFT feature matching between left and right images, matches after nearest neighbour filter and bi-directional check filter. Here nearest neighbour ratio used = 0.7

## 2 Computing F and epipolar lines

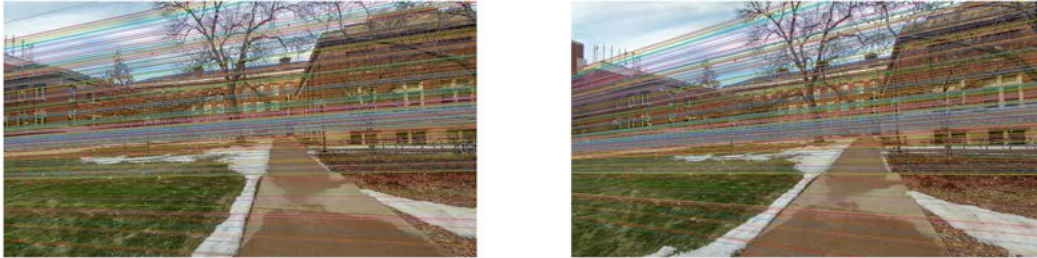


Figure 2: Epipolar lines

Figure 2 shows epipolar lines for SIFT correspondences in left and right images. These lines are computed using fundamental matrix, which in-turn can be found using 8-point algorithm and RANSAC. Here number of RANSAC iterations used = 1000.

## 3 Traingulation and pose disambiguation

Figure 3 shows the traingulated points with camera poses and a final disambiguated camera pose. Given poses of cameras and SIFT correspondances we can use linear traingulation method to compute 3D co-ordinates of correspondances. During this process while finding null\_space using numpy rcond=1e-1 was used. The homogenous co-ordinates are converted to metric co-ordinates by dividing by w. The final pose disambiguation is done by checking if most of the points are "infront of" both the camera. To check if a point is infront of a camera a dot product b/w its z-axis and vector from camera to point can be checked to be positive or not.

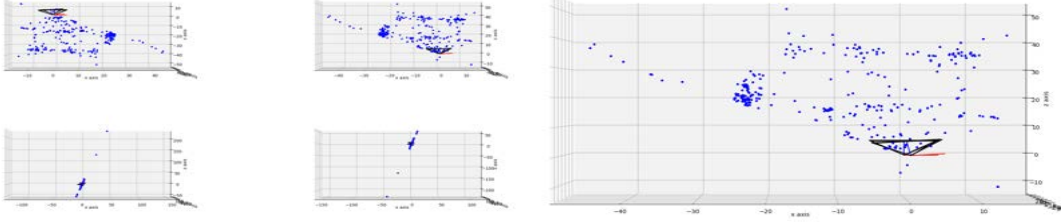


Figure 3: Possible poses with traingulated points and disambiguated pose

## 4 Rectification



Figure 4: Rectified images

Figure 4 shows rectified left and right images. To calculate these homographies first  $R_{rect}$  is calculated and then  $H1$  and  $H2$  are calculated using  $H1 = K * R_{rect} * K^{-1}$  and  $H2 = K * R_{rect} * R^T * K^{-1}$  where  $K$  is camera matrix and  $R$  is rotation matrix of camera 2 w.r.t camera 1

## 5 Disparity Map

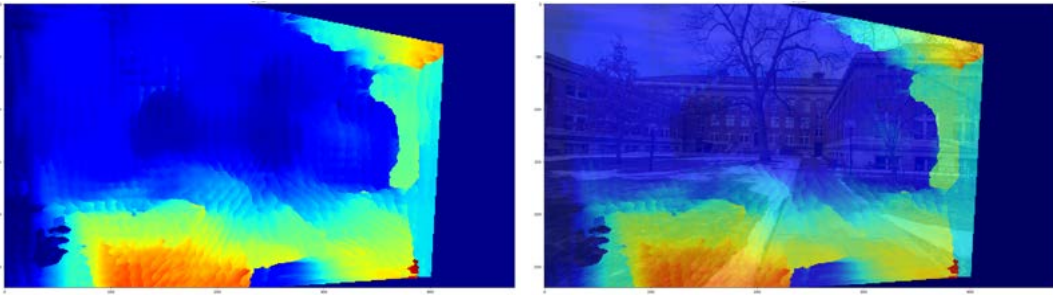


Figure 5: Disparity map and blend with rectified left image respectively

Figure 5 shows the disparity map on rectified left image and the rectified left image and disparity map blend respectively. Dense SIFT matching is used by taking advantage of the fact that in rectified images a correspondance to  $u$  has to be on its epipolar line which turns out to be horizontal. Here SIFT size = 7 is used. Disparity is calculated as difference of  $x$  positions in rectified left and right images with blue and red colors representing lowest and highest disparity.