

In figure 4, the scale and orientation transformation of the target are studied. Moreover, the influence of viewpoint and brightness modification is studied too. As shown in figure 4, with the SIFT algorithm, the matching results are robust and reliable. For each picture in this group, the left side is the input image to be detected, and the right side is the sample library. Their relationship is shown by connecting lines between the extracted feature points.

After the target is extracted by matching with SIFT algorithm, the next step is to determine its position. Generally, the center is necessary for each object, so the moment invariant algorithm is developed. As shown in figure 5, each target area is marked with rectangle, and its center is marked with a dot. Their coordinates are also given in unit of pixel.



Fig.5 Illustration on the target positioning

3. Experiments

Based on the above target positioning with image processing algorithms of SIFT and moment invariants, the positioning control experiment with our arm robot is carried on. The experiment setting is as shown in figure 6. The CCD camera is fixed in the arm robot coordinate system. Thus the target position can be easily transformed to the end pose of the manipulator. With inverse kinematics equations, the angle of each joint can be calculated.

The experiment results show that the flexible control for multiple target operations can be performed with image processing methods developed in my lab. Moreover,

with SIFT and moment algorithms, the influence of lighting and scale is low to the target position calculation.

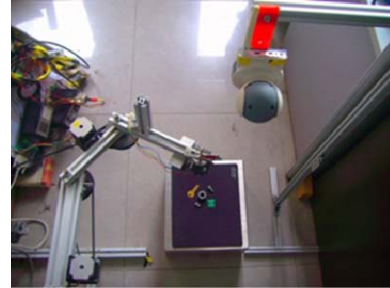


Fig.6. Control experiment with vision matching and positioning

4. Conclusions

In this paper, an arm robot and the position control system based on a CCD camera is developed. Multiple target control operations are performed with our lab arm robot. By algorithm fusion of SIFT and moment invariants, the multiple targets can be extracted robust and their positions can be calculated accurately. Moreover, it can effectively control the influence of lighting and scale etc.

References

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