

Dynamic Active Search for Quick Object Detection in an Indoor Scene

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We are pursuing a method to quickly detect target objects in an indoor scene to realize the visual function for home robots or an intelligent sensor room.

In searching a large 3-D space like a room for a target object, numerous images taken using various pan, tilt and zoom camera parameters must be compared with reference images. The number of reference images also becomes large because the appearances of an object vary according to the angles, distances, and illumination conditions. For these reasons, finding objects by conventional search methods in a practical time is extremely hard.

We proposed Dynamic Active Search [1], which enhances Active Search [2] in two aspects: dynamic camera control with a best-direction-first strategy and two-step data compression (Fig.1). The best-direction-first strategy reduces the number of pan-tilt-zoom camera operations by taking an image at a wide angle, searching for the target objects with small reference images (less reliable), zooming promising areas, and confirming the existence of the target objects with large reference images. The first step of data compression encodes pixel color features in a small number of color codes optimized for each target object. This reduces the computation for matching. The second step analyzes similarities among reference images and compresses many reference images into a small number of intermediate features. Using these features, the number of calculations is reduced without sacrificing detection accuracy.

The search time for a target object in a room environment by Dynamic Active Search is around 9 seconds. This search time is 1/300 of that for a conventional template matching method and is 1/5 of that for Active Search (Fig. 2).

- [1] Kawanishi T., Murase H., Takagi S. and Werner M. “Dynamic Active Search for quick object detection with pan-tilt-zoom camera” *Proc. of ICIP2001(to appear)*, 2001.
- [2] Vinod V. V. and Murase H., “Focused color intersection with efficient searching for object extraction” *Pattern Recognition*, vol. 30, no. 10, pp. 1787–1797, 1997.

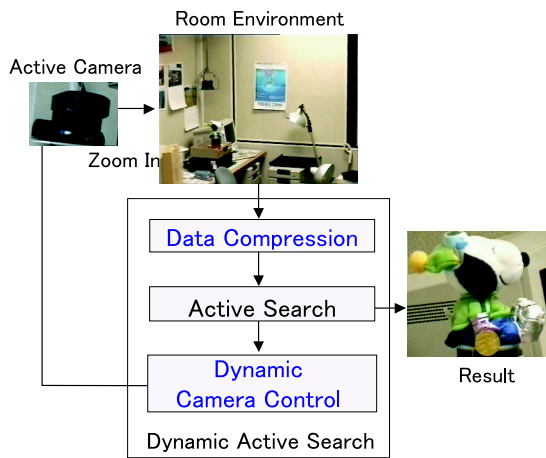


Fig. 1: Dynamic Active Search

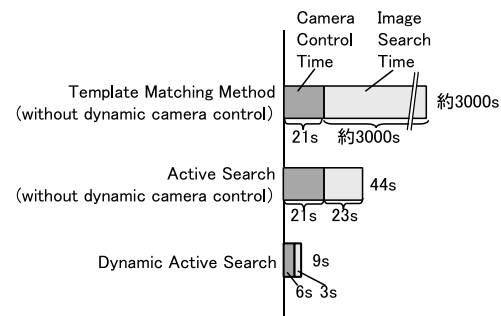


Fig. 2: Experimental Result