Self-Localization with Panoramic Image
(Prof. T. Arai and Prof. E. Pagello (The Univ. of Padua))

For the self-localization of a mobile robot, methods which compare an input image with reference images taken beforehand on known positions and estimate robot's position according to the result of the comparison have been proposed. We have developed a method which localizes the position of a robot with a 180 degrees panoramic (semi-omnidirectional) image taken by panning a perspective camera.

The outline of the method is as follows. First, reference images are collected previously on observation points (Fig. 1). On each point, two images of opposite directions are taken. Then, an input image is compared with reference images and the similarities are calculated. The similarities are considered to indicate the probability of the existence of the robot.

This method needs the information of the direction of an input image, but the direction is unknown when self-localization is needed. Therefore we jointly use the Monte Carlo localization method which approximates the probability density function of the robot's position by the distribution of sample particles. This fusion will open a way to practical use.

Keywords: Self-Localization, Panoramic Image, Monte Carlo Localization

References

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2) Ryuichi UEDA, Tamio ARAI and Kohei SAKAMOTO, Toshifumi KIKUCHI and Shogo KAMIYA: "Expansion Resetting for Recovery from Fatal Error in Monte Carlo Localization - Comparison with Sensor Resetting Methods," Proc. of IEEE/RSJ IROS 2004, pp. 2481-2486, 2004.
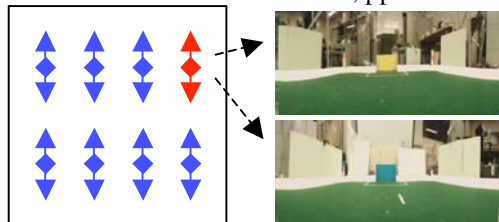
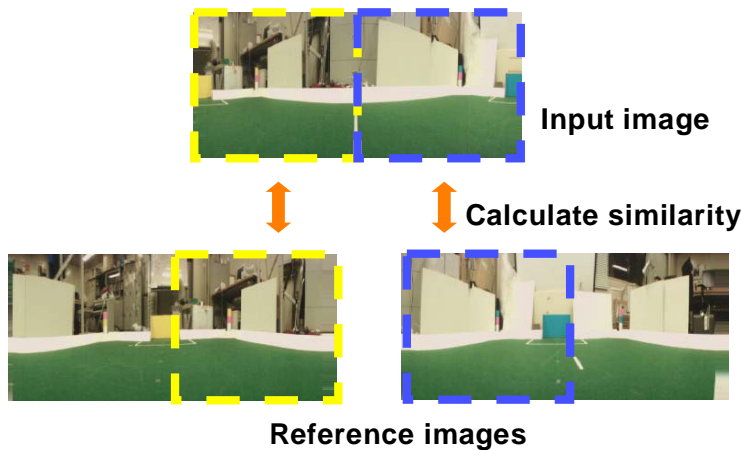Fig. 1: Reference images

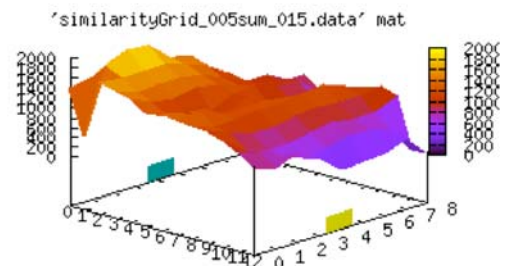Fig. 2: Calculation of similarity between
an input image and reference images

Fig. 3: Calculated similarity
for each position