Title	2 3
Author(s)	,
Citation	
Issue Date	1997-03
Type	Thesis or Dissertation
Text version	author
URL	http://hdl.handle.net/10119/1042
Rights	
Description	Supervisor: , ,

Appearance Based 3-D Object Recognition Independently of Environment Conditions

Yukinori NOGUCHI

School of Information Science,
Japan Advanced Institute of Science and Technology

February 14, 1997

Keywords: 3-D Object Recognition, Image Normalization, Fourier Transform, Parametric Eigenspace Method.

The recognition of 3 dimensional object can be applied to the element technology of the robot for the industry and the watch of the movement object of the general environment, has been researched widely. But, there are few things which can be adapted to the actual environment, if there are thing which can be applied to the actual environment, that the shape of the object and the condition of the environment such as a lighting are restricted.

In such a case, the appearance based on 3 dimensional object recognition is unnecessary to extract the characteristic, and a high generality, and it can be adapted to the actual environment as well.

In appearance based on 3 dimensional object recognition, all appearance 2 dimensional images of target object are stored in the dictionary in the computer. Appearance based on 3 dimensional object recognition is technique that an object is recognized matching based on the correlation and the one for the difference between the inputted unknown images and this dictionary. But, because appearance images exists abundantly, the dictionary stored in the computer must be compressed in the method what. And, because of appearance based on 3 dimensional recognition is to check to do recognition treatment fundamentally by template matching of the image of the appearance, that is poor at the change such as the rotation, magnification, reduction and is influenced by a the position and the intensity of the illumination. Therefore, as for the appearance based on 3 dimensional recognition, it becomes the problem that

- How do appearance images are used of and are compressed.

- How does it cope with a change such as the rotation, magnification, reduction of the applicable object region and the position and intensity of the illumination.

is important. The way of saving the images which conforms to yes and every conditions in the computer is thought about in the technique which copes with this problem. But, even if images stored in the dictionary in the computer is condensed by using the K-L transform of the compression efficiency, this technique isn't effeciency target when it thinks from the surface of the memory capacity and calculation cost of the computer.

So first, this research normalizes the size, position, intensity of target object in the 2 dimensional images. And the capacity of an image to memorize by absorbing a difference in the image which orignates in the change of the photography conditions is reduced and is improved recognition rates. Next, this research proposes a necessary memory region is reduced, and the technique that an target object if expressed in the small characteristic quantity by the benefit that treatment time is shortened. It is examined about the technique that resistant recognition to the direction of the target object in the input image and the direction of the illumination and the change of the strength if done.

This research proposes normalized mutual correlation is used first as a grade before the 3 dimensional object recognition process, and a technique to bring up the target object region. Next, normalization technique of two kinds of images of geometrical normalization and normalization of the density value is proposed. An target object region faces the image brought up, and the change of the expansion reduction of a geometrical image to check is absorbed in normalization that it is geomerical. The influence of the shadow which occurs in the change of the strngth of the illumination and the direction and the object by using only the information of hue whichi it can get by the change and saturation is contralled in normalization of the density value. It was confirmed that the difference of the size of the target object region in the image could absorb it by doing normalization of the image by using the proposed technique by the experiment. But , rotation about the optical shaft of the object couldn't absorb those changes only in normalization of the image.

So, this research proposes the characteristic quantity which isn't strange for the position deviation of the object which electric power in the frequency space was used for and the rotation. Then , recognition based on the way of the sace a is done by using this characteristic quantity.

Mapping the quantity of the image of the object which a separation target can get in the characteristic space, and the thing that inter did this point line is prepared with this technique as a dictionary in the computer.

Mapping the characteristic quantity of the unknown inputted image in the characteristic space,and the estimation of the direction are done at the recognition grade of the object by the comparison with the dictionary. A recognition experiment was done it could actually cope with the change of the photography conditions based on this proposed technique. Though the strength of the lighting and the position of the object were different, a direction could be presumed the distinction could be presumed the distinction of the only object which some declines are seen with in the recognition rate as a result. This thing is thought the thing which the characteristic quantity which isn't strange for the rotation which it can zureru in normalization of the image proposed by the this reserch and the position of the objct acts on effectively in the recognition treatment. And ,when the image of the direction which doesn't exist was inputted, the distinction of the object

and the estimation of the direction became possible at the time of the preparation of the dictionary by expressing an object in the characteristic sapce.

However, the individual problem which the recognition technique which it said how it copes with it toward the object which has mirror surface reflection about has is left, and it is a future subject.