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Proposed Work on Door Status Identification using Image Processing Aproaches

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***Abstract*—** This paper proposes a technique that can be used to identify door and its status. This technique can be used in system for visually impaired people. First, points are detected from the image. Second, only true points are retained. This gives area of door. Then features of door are extracted to find out status of door.

Keywords- Corner detection, feature extraction, object reorganization, door detection, Status Detection

I. INTRODUCTION

A System for visually impaired people has the ability to assist people in a variety of tasks. E.g.in searching particular object or finding way or the state of that particular object, heavily depends on the reliable recognition of the objects by the system in the environment that is closed e.g. room like environment. For this one has to find out location of the object in the environment. Numerous approaches are there to recognize objects based only on the system used and its ability to differentiate the objects. However, the same type of object can have very different visual appearances, such as shape, size, pose, and color. Feature extraction is an important part for finding and locating the particular object. [9] Here, Feature extraction can be taken as finding status of the door.

The technique includes having images of closed environment, as we have assumed that system is used for visually impaired people in a closed environment, these images should be of equal size.

We can show the area of the object by showing points in the image or pixel location can be given as output. For this we need to identify pixel location of points which have particular properties. To be specific, it can be said that the pixels on the corner of the edges should be used. We identify points based on local and global curvature of the properties.[2]

After points are identified false points are removed and all the remaining points are placed to identify that it has the properties of particular object or not. The points having those properties are retained and all other points are removed.[4]

The area made by these remaining points is used for further processing. The next part is feature extraction. This feature extraction part is for increasing probability value of having said door in that area. It also indicates status of the door.

II. PROPOSED METHOD

1) Corner Detection

For area detection first step is to identify the corner points in the image which may be probably the points indicating the area.
Traditional single-scale algorithms detect corners by considering their local properties and either miss fine features or detect noise as false corners. The philosophy of the proposed method is to utilize global and local curvature properties, and balance their influence when extracting corners. With this philosophy and the problems of traditional corner detectors in mind, a new corner detector is proposed as follows:

1. Detect edges using the likes of a Canny edge detector to obtain a binary edge map.
2. Extract contours as in the CSS method.
3. After contour extraction, compute the curvature at a fixed low scale for each contour to retain the true corners, and regard the local maxima of absolute curvature as corner candidates.
4. Compute a threshold adaptively according to the mean curvature within a region of support. Round corners are removed by comparing the curvature of corner candidates with the adaptive threshold.
5. Based on a dynamically recalculated region of support, evaluate the angles of the remaining corner candidates to eliminate any false corners.
6. Finally, consider the end points of *open* contours, and mark them as corners unless they are very close to another corner.[1]
Traditional single-scale methods detect corners only according to their local properties. They are ineffective for objects with multiple-size features. We find that the global property of curvature can be used to determine a more appropriate ROS for accurate detection.[1]

2) Finding The Area

After we get a set of points are find out, next thing is to do is that checking if it is making an rectangle area or not. Rectangle has the property that it has the corners of 90 degrees. So taking four points at a time from the remaining point we check that it makes four corners with angles having value nearly 90 degree. The choice of range of angle is depends on how camera takes images. The default value range can be taken as 88 – 92 degrees. The points fulfilling this criterion are kept and all other points are eliminated from the list.

Next part is to find the ratio of height and width. From the remaining points four points are taken and the lines between them are created so that it makes a rectangle. For this particular rectangle we find out that if its height and width ratio are from those which we want. If yes then points are kept otherwise we move forward.[3]

For door the height and width ratio is 2.25: 1.[3] This method will give area of interest for detecting door. This is shown in figure 1.

Fig. 1 Detection of Door

III. FEATURE EXTRACTION

As seen in fig. 1 that based on corner detection and using horizontal & vertical lines in image, area of the door can be identified. These horizontal and vertical lines are having equal spacing. They can be used as a feature to identify door status. Apart from that two main features that can be used for same purpose are door knob or handle and key hole.

Fig. 2 (a), (b), (c), (d)
a & b – Door opening away from Camera
c & d – Door opening towards Camera

Fig 2 shows two cases of door opening. First, door opening away from camera shown in figure 2a and 2b. Second, door opening towards camera shown in figure 2c and 2d.

If we observe, vertical parallel lines in figure 1 and compare them with figure 2 then it can be seen that they remain parallel, but one relative property of these lines have changed. The line which is near is camera is having more length as compared to line which is away from camera.

Similar procedure can be followed for horizontal line to identify that some features are changed. First, parallel horizontal lines of figure 1 have not remained horizontal but they tend to meet each other at some point. These lines make an angle either positive or negative with x-axis.

Comparing relative position of door knob or handle and key hole in figure 1 and 2, we can identify that they tend to move closer to opening edge of door when case is of figure 2a and 2b, while in other case they tend to move away from opening edge.

IV. CONCLUSION

From this proposed technique, it can be concluded that door can be identified by using corner detection along with some properties like height width ratio, parallel lines etc. These properties also indicate closed status of door. When door is open, same properties tend to change. Identifying pattern of change in these property, it can be said that is door open or not and if it is open then in which directed it has opened.

REFERENCES

[1] Corner detector based on global and local curvature properties. Xiao Chen He and Nelson H. C. Yung. University of Hong Kong Pokfulam Road, Hong Kong.
[2] Object recognition using region detection and feature extraction.E. Jauregi, E. Lazkano and B. Sierra.Robotics and Autonomous Systems Group.Computer Science and Artificial Intelligence Department.University of Basque Country, Donostia.
[3] Hensler, et. Al. "Real-time Door Detection based on AdaBoost learning algorithm," University of AppliedSciences Konstanz, Germany. Laboratory for Mobile Robots.
[4] Cokal, et. Al. "Development of an Image Processing System for a Special Purpose Robot Navigation," Middle East Technical University, Turkey.
[5] B. V. Funt and G. D. Finlayson. Color constant color indexing. *PAMI*, 17(5):522-529, May 1995.
[6] M. J. Swain and D. H. Ballard. Color indexing. *International Journal of Computer Vision*, 7(1):11-32, 1991.
[7] Wavelets and Filter Banks by Gilbert Strang and Truong Nguyen, Wellesley-Cambridge Press, 1997.
[8] Ripples in Mathematics: the Discrete Wavelet Transform by Arne Jense and Anders la Cour-Harbo, Springer, 2001.
[9] Area detection of Object in a closed Environment by Dr. T D Pawar, Jaymit Pandya & Jayesh Chaudhari

