# Enhancing the Design pattern Framework of Robots Object Selection Mechanism –A Overview

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***Abstract*— *In order to enable a computer to construct and display a three-dimensional array, solid objects from a single two-dimensional photograph, the rules and assumptions of depth perception have been carefully analyzed and mechanized. It is assumed that a photograph is a perspective projection of a set of objects which can be constructed from transformations of known three-dimensional models, and that the objects are supported by other visible objects or by a ground plane. These assumptions enable a computer to obtain a reasonable, three-dimensional description from the edge information in a photograph by means of a topological, mathematical process. A computer program has been written which can process a photograph into a line drawing .transform the line drawing into a three-dimensional representation and, finally, display the three-dimensional structure with all the hidden lines removed, from any point of view. The 2-D to 3-D construction and 3-D to 2-D display processes are sufficiently general to handle most collections of planar-surfaced objects and provide a valuable starting point for future investigation of computer-aided three-dimensional systems.*

***Keywords—Objects, Dimension, transformations and construction.***

## I. INTRODUCTION

The problem of machine recognition of pictorial data has long been a challenging goal, but has seldom been attempted with anything more complex than alphabetic characters. Many people have felt that research on character recognition would be a first step, leading the way to a more general pattern recognition system. However, the multitudinous attempts at character recognition, including my own, have not led very far.

The reason, of the study of abstract, two-dimensional forms leads us away from, not toward, the techniques necessary for the recognition of three-dimensional objects. The perception of solid objects is a process which can be based on the properties of three-dimensional transformations and the laws of nature. By carefully utilizing these properties, a procedure has been developed which not only identifies objects, but also determines their orientation and position in space.

Three main processes have been developed and programmed in this report. The input process produces a line drawing from a photograph. Then the 3 -D construction program produces a three-dimensional object list from the line drawing. When this is completed, the 3 -D display program can produce a two-dimensional projection of the objects from any point of view. In these processes, the input program is the most restrictive, whereas the 2-D to 3-D and 3-D to 2-D programs are capable of handling almost any array of planar-surfaced objects[1][2].

In order to implement the three-dimensional processing of pictures, perspective effects must be considered. For this reason, a four-dimensional, homogeneous system of coordinates will be used. In this system a single 4 X 4 matrix can modify a position vector by a linear transform, a translation, and a perspective transformation[3]. Although many books discuss this homogeneous system of coordinates, their presentations are either incomplete or too involved for our purposes.[1] Therefore, the system is explained in Appendix A. Without the notational simplicity provided by using homogeneous transformations, most of the following analysis would not have been accomplished. It clearly depicted in the following figure 1.1.

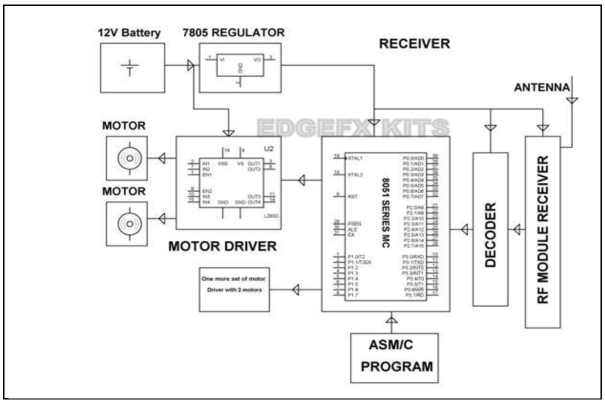


*Figure.1.1: Architectural Frameworks*

## II. RELATED WORK

There have been numerous attempts to recognize simple patterns by machine. There is the work with neuron-like nets of threshold elements which divide the set of all input patterns into a number of classes by correlating a set of adaptive weights with some functions of multiple input cells. For this type of system there may not be many output classes and the transformations of the patterns must be minimal or nonexistent. Because of these restrictions, the patterns worked on so far have been those, which worked on so far have been those which, although complex, are not subject to much transformation such as characters and spoken digits. This paper focus on the recognition is typical and gives the other references. This type of system would be of no value for multiple object recognition, except perhaps for finding the lines originally. That is, computation routines are developed to extract the useful information from the input, and their outputs are weighted to determine the most likely output class. Here again a small set of outputs is expected and characters were the patterns tested. One problem with both these methods is that they were intended for specific groups of abstract patterns, such as characters, and not for the well-defined geometry of photographs. They are better suited for looking at my resultant list structure of objects and deciding whether a group of objects is a chair or a table. There has been a large volume of psychophysical research on human depth perception and shape recognition[4].

Although the assumed size of objects such as playing cards tended to vary, the subjects would judge the depth reasonably well for normal-sized cards and proportionately shorter for jumbo cards. Thus he, for one, showed that the size of familiar objects is a good relative depth cue and fair for absolute depth[5].

Recognition of forms, shapes, and objects is often discussed from the Gestalt point of view, where shadowy forms and plane geometry figures are the forms to be recognized. They discuss contour following, differentiating pictures, and some of the simple measures of shape complexity. If they were discussing character recognition, it might be reasonable to use these tools; however, they say they are investigating "natural forms". Rather, it defines the set of shapes which go with a single perception. Perspective variations in a cube were tested by Langdon in an experiment on 3-D solids. He found that perspective plays only a minor part in the perception of the size and depth and that the subjects always saw a cube, even when it was badly distorted by the perspective transform. The continual perception of a cube, even when transformed, is consistent with Gibson's idea that shape perception is and must be invariant under perspective transformation. My idea of models also follows from this, since each model represents an invariant percept, and can be identified with any projection of itself.

## III. OBSERVATION

The perception of depth in a monocular picture is based completely upon the assumptions of the observer. Some of the assumptions are about the nature of the real world and some are based on the observer's familiarity with the objects. Without these assumptions the picture is just another two-dimensional image, whereas with them the human is rarely confused about the depth relationships represented in the picture. Since humans agree so closely on their depth impressions, it is fair to assume that their major assumptions are the same, and are therefore subject to identification and analysis. The following is an attempt to set down some of the likely assumptions and derive what depth information can be obtained if they were used.

The first assumption is that the picture is a view of the real world recorded by a camera or comparable device and therefore that the image is a perspective transformation of a three- dimensional field. This transformation is a projection of each point in the viewing space, toward a focal point, onto a plane. The transformation will be represented with a homogeneous, 4 X 4 transformation matrix P such that the points in the real world are transformed into points on the photograph. The transformation depends on the camera used, the enlargement printing process and, of course, the coordinate system the real world is referred to. Let us fix the real world coordinates by assuming that the focal plane is the $x = 0$ plane and that the focal point is at $x = f$, $y = 0$, $z = 0$. In order that the picture not is a reflection, we choose the focal plane in front of the camera. Then the objects seen will be in the x-half-space. Thus the focal plane is really the plane of the print, not of the negative. The following figure 1.2 shows this arrangement.

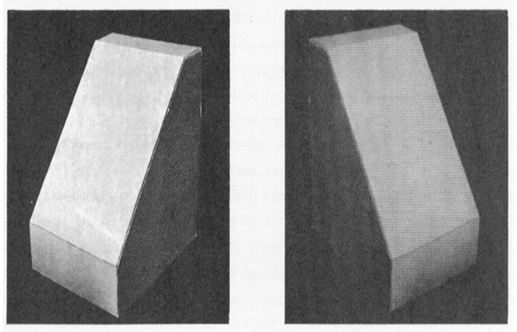

*Figure.1.2: Object Transformations*

The three-dimensional field observed consists of a set of solid objects which occupy a definite region of space. Since we realize that it is usually possible to pick out the lines which define the boundaries of the objects and their surfaces, we shall assume that this has been accomplished and that the picture has been reduced to a line drawing. Because the objects are solid, we do not expect to see the boundaries which are hidden from the focal point by another solid. Second, we shall assume that the objects seen could be constructed out of parts with which we are familiar. That is, either the whole object is a transformation of a preconceived model, or else it can be broken into parts that are. The models could be anything from a cube to a human body; the only requirement is that we have a complete description of the three-dimensional structure of each model. The transformation from the model to the real world object will be a suitably restricted homogeneous transformation matrix R. We must allow an arbitrary rotation and translation of the model in order to position it properly in space. We should also like to allow three degrees of freedom for size change of the model so that a cube model can represent any parallelepiped. So far we have allowed nine degrees of freedom. The 4 X 4 matrix R can allow 15 degrees of freedom since it has 16 elements and the total scale of the matrix is arbitrary in the homogeneous coordinate system. The last six degrees of freedom represent skew and perspective deformations. Skew deformations are size changes in the x-, y-, and z-directions after the model has been rotated, and will change the sides of a cube to parallelograms. A perspective deformation is most easily visualized as a compression of one end of the model. Objects that have been de- formed in either way are not usually considered to be simple instances of the model. Furthermore, objects deformed in these ways could be constructed from smaller parts, so it is not necessary to allow skew and perspective deformations.

It allow perspective deformation and still obtain a unique transform R from the picture; therefore, we require the top three elements in the last column of R to be zero. Skew variations can be allowed if we maintain very high accuracy in our computations, so our derivation will allow them, but later on they will be eliminated.

## IV. CONCLUSION

Let us say that we are given a picture of a parallelepiped and it has been reduced to a line drawing. It finds the interior polygons, which correspond to the surfaces of the object. There will normally be three quadrilaterals visible. These polygons all come together at one point, which can be used for a reference point. If we look through our list of models, we find that a cube and perhaps other models have three quadrilaterals about one point. Therefore, we can pick a point in the cube model which has the proper polygons around it, pick a polygon from both the cube and the picture as starting points, and proceed to list topologically equivalent point pairs.

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