CONCENTRATION
Epson Manipulator Card Sorting System

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Abstract—An implementation of an Epson robotic arm as a card sorting mechanism aimed towards situational problem solving regarding the game Concentration (A.K.A. Memory) with the intent on addressing methods to simplify decision making processes for the game Set. By first addressing a simpler problem solving method

I. Introduction

This demo file is intended to serve as a "starter file" for IEEE conference papers produced under LaTeX using IEEEtran.cls version 1.7 and later.

Introduction: Provide an introduction to the problem you are investigating. Why is it an important or interesting problem? What are potential applications of the techniques you are developing? The introduction should also contain an outline of the remainder of the paper I wish you the best of success.

mds

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II. Background

Background: Describe related work that has been published in the literature. What papers, books and other resources have you consulted and how does their work relate to yours? What outcomes and possible innovation are you hoping to achieve?

A. Program Control Paradigms

B. Vision Detection Principles

The task was to identify the model of the card from the variations on shape, shape count and the filler. Figure shows the different variables in the used card set.

Fig. 1.   *Different types of cards*

In the robot arm we had there is a camera mounted on top of the table which can be used to get images of the objects place on the table. This images can be used to identify the object properties using image processing techniques.

There are plenty of approaches to find features in image processing. Following are some of the processing techniques.

Shape	Shape Count	Filler
Triangle	One	Shaded
Rectangle	two	Non-Shaded
Ellipse	three	Block

Fig. 2.   *Variables*

1) Edge detection.
2) Corner detection.
3) Hough transformation.
4) Swift operator.
5) Binary image processing
6) Histogram comparisons. . . .

In this project Edge detection and Binary image processing methods have been used to identify the cards from the table and shapes in the cards.

Edge detection

An edge in an image is a significant local change in the image intensity, usually associated with a discontinuity in either the image intensity or the first derivative of the image intensity. Matlab toolbox has an inbuilt function for Edge detection. Canny operator have been used in this project.

Binary image processing

Thresholding: Using the histogram of the image a threshold can be identified to convert the image to a binary image with areas of interests. This method was feasible to this project as the image of back of the card gives pixel value near to black and a image of the front of the card gives pixel values near to white.

Position/Orientation: After creating the binary image with interested regions matlab inbuilt functions can be used to identify centroids and orientations of the interested regions. Local positions can be transferred to world coordinates using a reference point in this case are 3 fiducial boxes at known positions.

C. Motion

III. Experimental Design

Experimental Setup or Design: Describe your experiment or the design of the system you are developing.

IV. RESULTS

Results: Show the results you have achieved. Consider how you might present these results in a clear and concise manner. Although you will understand the significance of the results, make sure it is clear to the reader as well.

V. DISCUSSION

Discussion: What are the implications of your results? What are the limitations of what you have done and how might the experiment/design be improved in the future?

VI. CONCLUSIONS AND FUTURE WORK

Conclusions and Future Work: Discuss the implications of the results in a broader context, drawing conclusions and providing directions for future research in the area.

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REFERENCES

[1] H. Kopka and P. W. Daly, *A Guide to LATEX*, 3rd ed.   Harlow, England: Addison-Wesley, 1999.

[2] John Canny, *Pattern Analysis and Machine Intelligence* , 6th ed.   ,IEEE, 11/1986.