

UNO Cards detection using pattern matching

Digital Image Processing Project Proposal

Team **Uno Reverse**

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Abstract

UNO is a popular card game that is played by people of all ages. The game is played with a deck of 108 cards, each of which has a unique color and number. In this project, we propose to develop a system that can automatically detect and recognize UNO cards using pattern matching.

Introduction

UNO is a card game that is played with a deck of 108 cards, each of which has a unique color and number. Out of these 108 cards, there are 76 Number cards, 24 Action cards and 8 Wild cards. There are four color "suits" in the deck, which are red, yellow, blue and green. Each suit has number cards, each having numbers from 0 to 9, and action cards (Skip, Reverse, Draw Two). Additionally, there are Wild cards and Wild Draw Four cards. We hereby call both action cards and Wild cards as "Action cards".

Problem Statement

The goal of this project is to develop a system that can automatically detect and recognize UNO cards using pattern matching. The system should be able to take an image of a UNO card as input and output the color and number (or action) of the card.

Proposed Solution

The proposed solution is to use pattern matching to detect and recognize UNO cards. Pattern matching is a technique that is used to find the location of a pattern (or template) within an image. In this project, we will use pattern matching to check if a given image matches with the templates of any of the UNO cards. The templates will be created by extracting the color and number (or action) of each card from a set of sample images.

Implementation Plan

To improve the accuracy of the system, we separate the number (or action) detection from the color detection. The color detection will be done using the color histogram of the card image. The number (or action) detection will be done using pattern matching with the templates of the number and action cards.

The implementation of the proposed solution will be done in the following steps:

1. Collect a dataset of UNO card images.
2. Create templates for each unique card (a total of 13 for a suit (10 numbered + 3 action) and 2 for Wild cards).
3. Implement a pattern matching algorithm to detect and recognize UNO cards.
4. Test the system on a set of test images and evaluate its performance.

The algorithm for the pattern matching will be as follows:

1. Preprocess the input image to detect edges and contours.
2. Find the corners of the card and label them
3. Transform the card to a standard size and orientation. This will help in comparing the card with the templates in a consistent manner.
4. Extract the color histogram of the card image.
5. Use the color histogram to judge if the card is a valid UNO card.
6. Apply pattern matching to match the card with the templates of all the number and action cards.

References

1. UNO Card deck: https://www.letsplayuno.com/news/guide/20181213/30092_732567.html
2. Pattern matching: https://web.stanford.edu/class/ee368/Project_Winter_1819/Reports/snyder.pdf