

1. Introduction

The topic commands us: Given a heap of dice, players should count the number of dice early and exactly by using the computers and the electronic devices like digital cameras. We first use image analysis technologies, i.e., finding red dot, edge detection and enhancement, and counting objects of different sizes. But there are many spurious objects as well as dice on the table, and these spurious objects should not be counted. The most difficult task is occlusion problem. To solve the problem, second we suppose that the proportion of counted dices is as same as that of hiding dices, so this is a problem of approximately solution. Thus we suggest a model which is based on the Knapsack Problem, and how unseen dices are put in knapsacks of three sizes on the condition that the total weight is known.

2. How to solve the problem

2.1 counting the red dot

The red dot is the salient character which is detected easily.

2.2 edge detection

A number of methods are used for edge enhancement and detection. To count the visible dices of 3 sizes, edge must be stand out.

2.3 counting the hiding dices

An important hypothesis is that the visible dices are as same as the invisible dices. The simplest prediction is defined as the solution of the Knapsack problem. Our assumption is not unique, and it is probably not same, and the new proportion relation can be obtained by many experiments and random algorithms (e.g. genetic algorithm, neural network algorithm etc.).