HW10 Report

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Environment

Visual studio code, Windows 10

Language

c++11

Complile & Execute

1. In terminal, type in `cd /[file's name]` to change direction to file directory.

2. After successful compilation, type in `./hw10 ./[test input file's name]` command.

3. The answer will be output on the screen.

Description

Error query table

▼ First, I calculate error value for different combination of red intensities in terms of different k.In order to find the closet pixels for each red intensity combination, I use a for loop to test every pixel from 0 to 255.

```
//find the closet pixels for each red intensity combination.
    for(int l = 0; l < 256; l++){
        for(int i = 1; i <= d; i++){
            long long int ans = 0;
            for(int j = i; j <= d; j++){
                ans += (r[j]-l) * (r[j]-l) * p[j];//sum of squared errors
                f[i][j] = min(f[i][j], ans); //Error value query set for each combination of reds.
            }
        }
    }
```

DP

$$error(i,j) = min(error(i,j), error(l,j-1) + f(l+1,i))$$

$$i \epsilon [1, d], j \epsilon [1, k], and l \epsilon [1, i]$$
$$f\ is\ error\ query\ table$$

```
dp[0][0] = 0;

//assign error value for each blank

for(*int* i = 1; i <= d; i++){
  for(*int* j = 1; j <= k; j++){
    for(*int* l = 0; l < i; l++){
      dp[i][j] = min(dp[i][j], dp[l][j-1] + f[l+1][i]);
    }
  }
}
```

Complexity

$$O(d^2 * k)$$

▼ In the preprocessed error query table, the complexity is $O(256 * d * d)$. In the main part of DP, the complexity is $O(d * k * d)$. Hence, the total complexity is $O(d^2 * k)$.

Reference

2017年world final Problem F Posterize（DP）