Assignment 4: Image Segmentation using Random Walker Algorithm

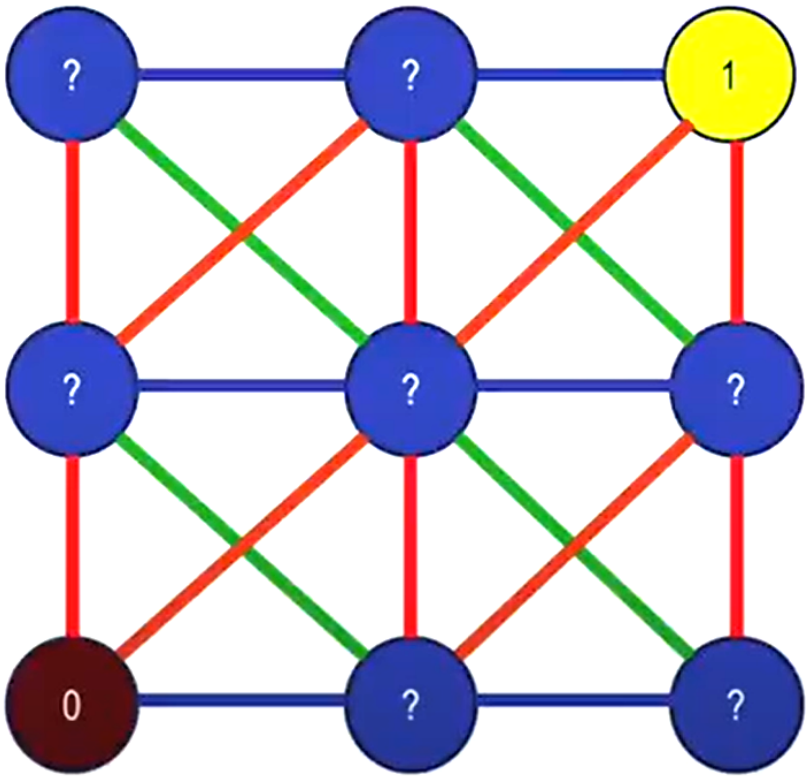
Assignment 4 20110098

Overview

Random Walk Algorithm

In the Random Walk Algorithm, we have some marked and unmarked pixel nodes. We calculate the probability of a neighbor taking the same pixel value as inversely proportional to the difference between the pixel values. The final probability is the solution to the combinatorial Dirichlet problem that can be found by solving the equation for one label.

$$L_U x^s = -B^T m^s,$$



$$m_q^{\omega} = \begin{cases} 1, \text{if } Q(v_q) = \omega \\ 0, \text{if } Q(v_q) \neq \omega \end{cases} \qquad L_{pq} = \begin{cases} d_p, \text{if } p = q \\ -w_{pq}, \text{if } v_p, v_q \text{ adjacent} \\ 0, \text{otherwise} \end{cases}$$

$$\begin{bmatrix} L_M & B \\ B^T & L_U \end{bmatrix}$$

$$L_U x_U = -B^T x_M,$$

Algorithm

1. Mark nodes based on pixel values. If greater than 110 than 255. If less than 75 than 0.

2. All the unmarked nodes will be marked later.

3. Lu . X =(-B)T . M

4. For a matrix of size p*q. We will have L of size p*q*8.

5. (B)T is a submatrix of the L matrix that contains the information about all the unmarked nodes to marked nodes.is

6. Lu is a submatrix of the L matrix that contains the information about all the unmarked to unmarked nodes.

7. M matrix is defined for zero and 255 class M0 and M255

8. We find the L inverse, (B)T and M matrix to find X.

9. X for M0 is probability for pixel k taking value 0.

10. We construct a new image from X by finding pixel value by comparing their probability.

Results

Image	Accuracy
1	95.17
2	92.82
3	98.13
4	97.04
5	90.95
6	86.46
7	97.79
8	91.69
9	89.73
10	97.04
	93.682

Performance

Accuracy
(|White Pixels in SkitLearn - White Pixels in New Image|) / (White Pixels + Black Pixels in Total) *100

Accuracy = **93.682 %**