CS 580 Specification of Software Systems

Homework 03: Region Labeling.

Consider a square matrix C of size N. Each cell in the matrix stores some color. All adjacent cells having the same color form a region.

(1) You are asked to write a simple program that generates unique labels for each region. A matrix L should store the region label assigned to each of the corresponding cells in C. To keep the program proof simple, you are required to update labels one at a time, i.e., please avoid using multiple synchronous updates.

(2) Write a formal specification of the correctness of the program following the general form:

a. init \rightarrow Post

b. stable Post

Hint: Key to writing clean and elegant specifications is to introduce helpful formally defined functions and relations that capture important concepts associated with the program, e.g.,

$x \rho y =$ "cells x and y are neighbors"

where the phrase in quotations needs to be replaced by a mathematically sound definition. Such definitions are not part of the program (usually) and are not defined using the programming notation required to write the programs, they are mathematical definitions.