Communications and Transport Systems
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TNSL20 - basic logistic algorithms

Homework Set 4, 2017

Solutions are due October 13, 2017.

Question 1 (IMPLEMENTATION): Implement the algorithm that tests if a given set of vertices I is an independent set for a given graph $G = (V, E)$ using the adjacency matrix of the graph.
The pseudocode of the algorithm is as follows:

Algorithm 1: Test for independence

    Input : Adjacency matrix A, set of vertices I
    Output: Boolean value t (true if I is an independent set and false
            otherwise)

  1 **Function** is_independent_set (A, I)
  2 $t :=$ true;
  3   **if** length$(I) > 1$ **then**
  4   **for** $v_{index} = 1$ **TO** length$(I)-1$ **do**
  5 $v := I[v_{index}]$;
  6   **for** $w_{index} = v_{index} + 1$ **TO** length(I) **do**
  7 $w := I[w_{index}]$;
  8   **if** $A[v][w] == 1$ **then**
  9 $t :=$ false;
  10   **end**
  11   **end**
  12   **end**
  13   **end**
  14   **return** t;
  15 **end**

Test your code on the adjacency matrix obtained from Homework 2 Question 3 for the graph G_2.

Question 2 (IMPLEMENTATION): Combine the code from Homework 2 Question 3 and Homework 4 Question 1 in order to get a code that works with E and n as an input.

Please note that you must create Matlab functions adjacency_matrix and is_independent_set using the code from Homework 2 Question 3 and Homework 4 Question 1. Description of the input and output variables of the functions you can find in the corresponding files with pseudocode.

Algorithm 2: Test for independence

    Input   : Edges E, number of vertices n, set of vertices I
    Output: Boolean value t (true if I is an independent set and false
           otherwise)

1 **Function** is_independent_set_without_adjacency_matrix (E, n, I)
2   A := adjacency_matrix (E, n) ;   `// algorithm from HW2 Q3`
3   t := is_independent_set (A, I) ;   `// algorithm from HW4 Q1`
4   **return** t;
5 **end**