

Algorithms in Genome Research
Winter 2019/2020

Exercises

Number 4, Discussion: 2019 November 22

1. What types of vertices has the graph-based data structure used in solving the consecutive ones problem? How are they defined/what is their meaning?
2. Does the following matrix M satisfy the consecutive ones property? Justify your answer.

$$M = \begin{pmatrix} 0 & 1 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 & 0 & 0 & 0 & 0 \end{pmatrix}$$

3. Discuss the assumptions of the consecutive ones property and their applicability in modeling the problem of constructing a physical map from clone probe hybridization experiments.
4. The following matrix M violates one of the assumptions of consecutive ones property.

$$M = \begin{pmatrix} 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 \end{pmatrix}$$

- (a) Which one?
- (b) Create the graph $G(M)$ and solve the Traveling Salesman Problem.
- (c) What is the length of the shortest tour?
- (d) What is the probe order that this tour corresponds to?
- (e) What is the overall number of blocks of consecutive ones in this order?