Algorithms in Genome Research
Winter 2006/2007

Exercises

Number 1, Discussion: 2006 November 03

1. Remember physical mapping by clone-probe hybridization.

   (a) What are the main assumptions when the problem is modelled as the consecutive ones problem?

   (b) Discuss experimental reasons why the assumptions do not hold in practice.

2. Solve the consecutive-ones problem for the following clone-probe hybridization matrix M (if possible).

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

3. For the following matrix M create the graph $G(M)$ and solve the Travelling Salesman Problem.

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

   (a) What is the length of the shortest tour?

   (b) What is the probe order that this tour corresponds to?

   (c) What is the overall number of blocks of consecutive ones in this order?