CSci 3003 – Lab 11
Dot Matrix Display: Finish and Analysis

In this step, you will need to locate the chains of dots that represent the alignments of sequence A and B. This code will prune the matrix so that only those dots corresponding to long chains will be plotted. You will need to come up with a scheme that scans through the sequences to find the chains of dots. You will have to design a scheme that does not scan the entire matrix more than necessary, because this will be expensive for long strings. Therefore you should think a little how you will design this scan before you come into the lab.

One suggested way is to scan the entire matrix, and every time you reach a 1, you scan down the diagonal to find how long the chain is, and then replace all the 1's in that chain with the length of that chain. One must also build up a list of all the i, j-positions within a chain above a given threshold. This can be done in the same scan or in a subsequence scan of the matrix. The coordinates can be recorded by writing them out in a file as shown in the section on graphical displays.

Once you have your program working...

- Derive an expression showing how the time your code takes to run should vary with the lengths of the input sequences. Don't worry about constants. Get an expression that is enough to tell how the time shuold grow as the sequences get longer.
- Run your code with the "time" command with sequences of different lengths, and show that the time grows with sequence length as you would expect.
- Discuss how you would modify your code design so that you can adjust the threshold on the minimum length of the diagonal chains to display without having to repeat the entire computation from scratch.
- As the length of the sequences grows, the program takes more memory, eventually exceeding the memory available on the computer. Think about how you might modify your program to save space, so you would have to store all those zeroes. Also, think about how many passes you are making over the data. Include some discussion on how you would solve this problem.

Include your answers to these questions with your perl code. You can include that as a comment, or at the end of your code, separated by a line consisting of

```
=cut
```