[Quinn]

answer should express average communication cost per iteration as a function of guard wrapper width k, λ, β, and χ.

b. Assume $n = 5000$, $p = 16$, $\chi = 10$ nanosec, $\lambda = 100$ μsec, and $\beta = 5 \times 10^6$ elements/sec. Plot communication cost as a function of ghost wrapper width k, where $1 \leq k \leq 10$.

13.7 Write a program to solve the component labeling problem. A binary image is stored as an $n \times n$ array of 0s and 1s. The 1s represent objects, while the 0s represent empty space between objects. The component labeling problem is to associate a unique positive integer with every object. When the program completes, every 1-pixel will have a positive integer label. A pair of 1-pixels have the same label if and only if they are in the same component (object). The 1-pixels are in the same component if they are linked by a path of 1-pixels. Two 1-pixels are contiguous if they are adjacent to each other, either horizontally or vertically. For example, given this image:

```
1  0  0  0  0  0  0  0
0  1  0  1  0  0  0  0
0  1  1  1  0  0  0  0
0  1  1  0  1  1  1  1
0  0  0  0  1  0  0  1
1  1  1  0  1  1  0  1
1  1  1  1  0  1  1  1
0  0  0  0  0  0  1  1
```

one (but certainly not the only) valid output would be:

```
 1   0   0   0   0   0   0   0
 0  10   0  10   0   0   0   0
 0  10  10  10   0   0   0   0
 0  10  10   0  29  29  29  29
 0   0   0   0  29   0   0  29
41  41  41   0  29  29   0  29
41  41  41  41   0  29  29  29
 0   0   0   0   0   0  29  29
```

Note that a 0 in a particular position of the input image results in a 0 in the same position in the output image. If two positions in the output image have the same integer value, it means there is a path of 1s between the two positions in the input image.