

# An Example L<sup>A</sup>T<sub>E</sub>Xfile with pseudocode

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Instructions for the latex package `clrscode`, as well as the package itself, can be found at <http://www.cs.dartmouth.edu/~thc/clrscode/> Most L<sup>A</sup>T<sub>E</sub>X implementations have the package installed by default.

After describing your algorithm at a high level (see lecture notes for a high level description for Propose-and-Reject algorithm for Stable Matching Problem), you will need to provide pseudocode. I recommend that you use CLRS conventions, posted on Angel. What follows is an example write up that you might have included after your high level description if one of the homework problems was an algorithm for the Stable Matching Problem. In addition to the pseudocode, you should also include the proof of correctness, and the analysis of the running time and space complexity of your algorithm.

## Example Write Up

Assume men are numbered 1 through  $n$ . Similarly, women are numbered 1 through  $n$ .

Data structures:

- Two arrays:  $wife[1..n]$ ,  $husband[1..n]$ .
  - Set each entry to 0 if unmatched
  - If man  $m$  is matched to woman  $w$ , then set  $wife[m] = w$  and  $husband[w] = m$ .
- $Q$ : queue of free men
- array  $proposed[1..n]$ : entry  $proposed[m]$  holds the number of women that man  $m$  proposed to.
- Two-dimensional input arrays  $Men-prefs[1..n, 1..n]$  and  $Women-prefs[1..n, 1..n]$ , where entry  $Men-prefs[m, i]$  holds the  $i$ th woman on man  $m$ 's list and  $Women-prefs[w, i]$  is the  $i$ th man on woman  $w$ 's list.

PROPOSE-AND-REJECT( $n, Men\text{-}prefs, Women\text{-}prefs$ )

▷ Initialization

```
1 for  $i \leftarrow 1$  to  $n$ 
2   do  $wife[i] \leftarrow 0$ 
3      $husband[i] \leftarrow 0$ 
4     PUSH( $Q, i$ )
5     for  $w \leftarrow 1$  to  $n$ 
6       do  $inverse[w, Women\text{-}prefs[w, i]] \leftarrow i$ 
```

▷ Main loop

```
7 while  $Q \neq \emptyset$ 
8   do  $m \leftarrow DEQUEUE(Q)$ 
9      $proposed[m] \leftarrow proposed[m] + 1$ 
10     $w \leftarrow Men\text{-}prefs[m, proposed[m]]$ 
11    if  $husband[w] = 0$ 
12      then  $husband[w] \leftarrow m$ 
13           $wife[m] \leftarrow w$ 
14    else  $m' \leftarrow husband[w]$ 
15        if  $inverse[w, m] > inverse[w, m']$  ▷  $w$  prefers  $m$  to her fianc e  $m'$ 
16          then  $wife[m'] \leftarrow 0$ 
17               $wife[m] \leftarrow w$ 
18               $husband[w] \leftarrow m$ 
19              ENQUEUE( $Q, m'$ )
20        else ENQUEUE( $Q, m$ )
```

▷ Output

```
21 for  $m \leftarrow 1$  to  $n$ 
22   do Print  $m$  "is married to"  $wife[m]$ 
```