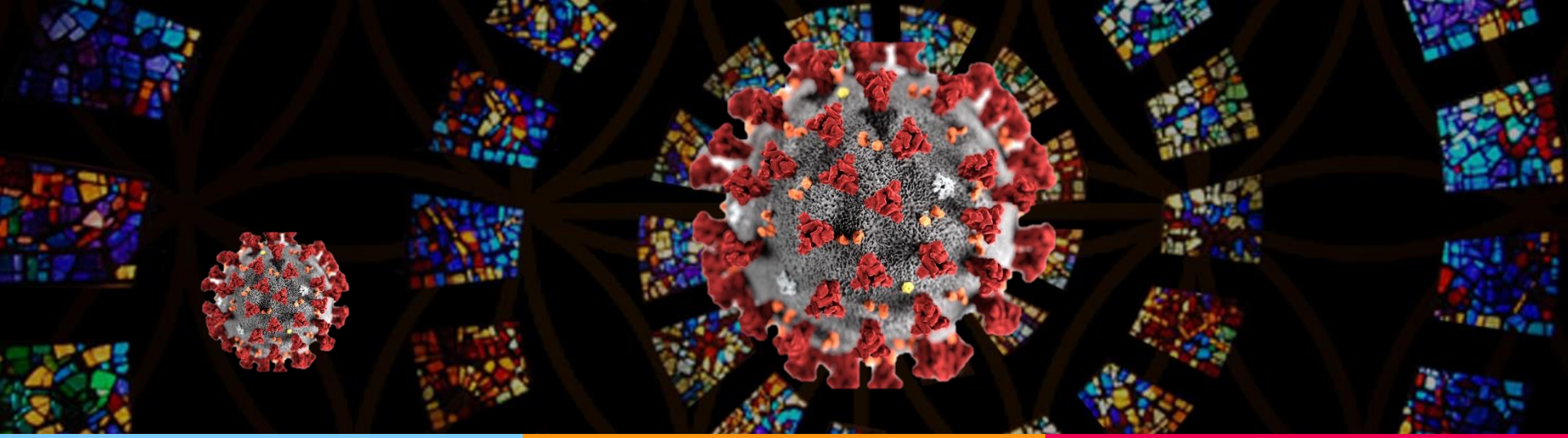


# COVID-19 Simulation

**You should not use STL to write this assignments**

Data Structures, 2020 Spring, EECS, NTHU

**https://acm.cs.nthu.edu.tw/problem/12744/**

# Descriptions

- The simulation takes place in one matrix $r_1 * c_1$ and an ICU list with capacity k
- Initially, people will be placed in the matrix
  - Either healthy, masked, or sick (i.e., tested positive for COVID-19)
  - It will be very sparse at the beginning
- People will be inserted into the regular matrix from time to time.
- The following sequence is an example, in which four people are inserted into the matrix at day 4, 5, 8, and 8 respectively, and their coordinates are (101, 33), (101, 34), (53, 21), and (101, 32), respectively.
  - 4 101 33 Alice Healthy
  - 5 101 34 Bob Masked
  - 8 53 21 Xeno Sick
  - 8 101 32 John Sick

# Specification

- Masked people are always healthy
- Without masks, healthy people will be infected by ill people in the orthogonally adjacent (上下左右緊鄰) cells.
  - For example, in the above example, Alice will be infected by John at day 8 and become sick at day 9
- Initially, the recovery time for all sick people is 14 days.
- Every sick neighbor will increase recovery time by 7 days.
  - For example, at day 9, Alice recovery time is 14+7 days (since John next to her).
  - Assume at day 10, Alice has another sick neighbor, her recover time will be (21-1)+7 days

# Specification (Contd.)

- A sick person should be moved to ICU, only if:
  - The recovery time is more than 28 days
  - For example, at day 10, Alice recovery time is 27 days, she will not sent to ICU
  - For another example, at day 11, Alice has another sick neighbor, her recovery time becomes (27-1)+7, she will be sent to ICU at day 11 (if none in the ICU yet)
- Once the people are moved to ICU, he/she will be there till the end
  - For example, Alice will become the survivor till the end but will stay in ICU forever.
- Sick people surrounded by more than three other sick people for more than 7 days will die.
  - When a person die, the cell becomes empty and blocked.
- The simulator needs to print:
  - The survivor rate in the end
  - The names of survivors (who are not in ICU)

# Illustration

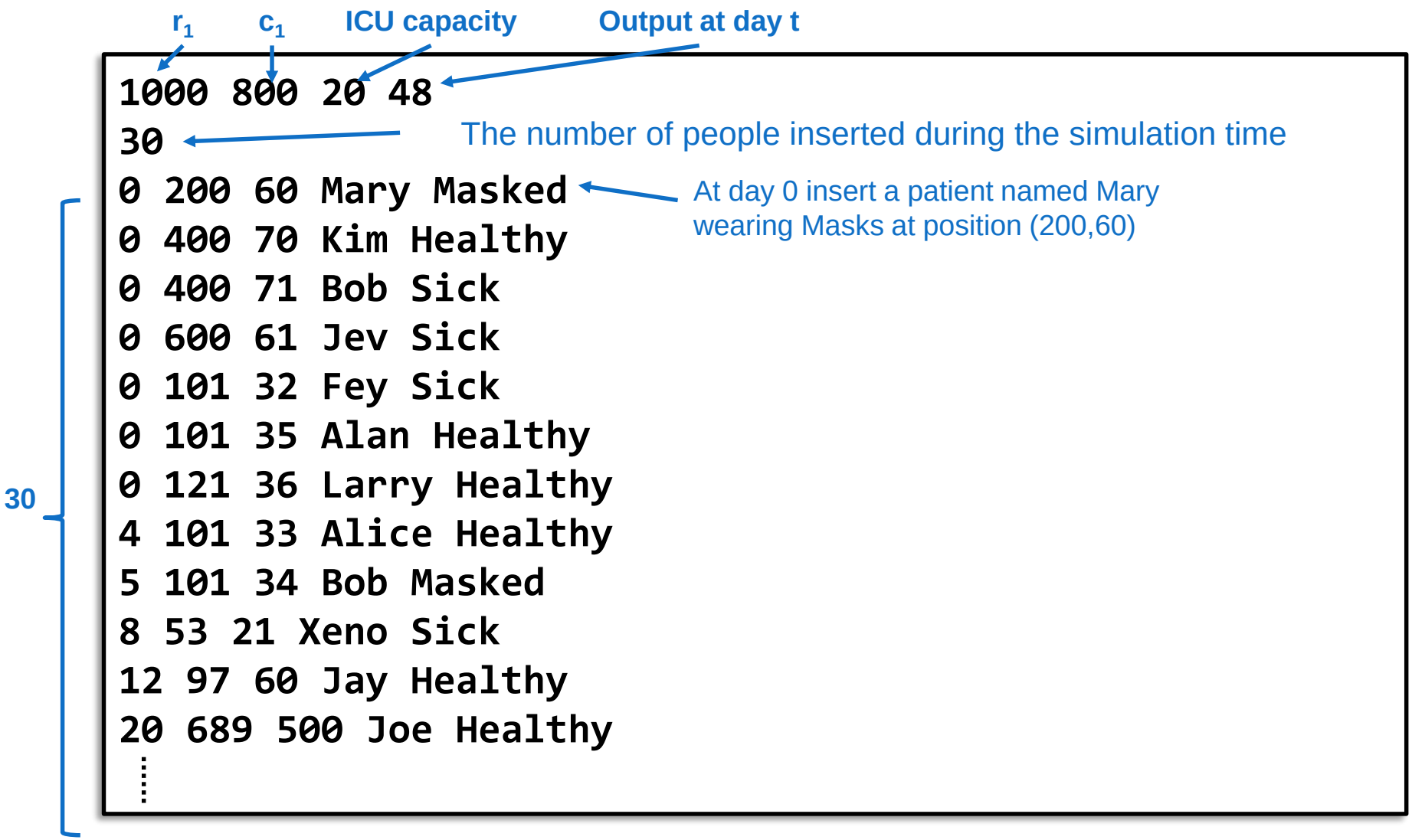
- Assume we have the following matrix at day 0:

| | | |
|---|---|---|
| | Bob, Sick | |
| | Alice, Healthy | |
| | | |

- Alice will become sick at day 1
- Assume three sick neighbors are inserted at day 1, the recovery time of Alice will be 14+4*7=42
  - However, If ICU capacity is 0, Alice will die at day 8

| | | |
|---|---|---|
| | Bob, Sick | |
| Steven, Sick | Alice, Sick | John, Sick |
| | Xeon, Sick | |

# Input Samples



# Output Sample

```
80%
Mary Jev Fey Alan Larry Alice Bob Xeno Jay Joe Kay Sim
Alex Kobe Fan Bill Sandy Mickey
```

Sorted from Matrix row 0 col 0 -> row 0 col 1 -> …ro1 col 0 -> …

# Restriction

- You should not use STL to write your homework assignments.