LAPORAN TUGAS BESAR II

IF4021 PEMODELAN DAN SIMULASI

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I. Deskripsi Model

1. Cluster
   Bentuk cluster yang digunakan pada pemodelan ini menggunakan bentuk persegi dengan panjang sebesar 2 x radius.

2. Agent
   Agent memiliki properties seperti num_interact_days (jumlah hari agent telah berinteraksi dengan agent lain yang memiliki kemungkinan terpapar COVID19), num_treated_days (jumlah hari agent telah dirawat setelah divonis positif COVID19), have_vaccine? (agent telah menjalani vaksin atau belum), untreated? (agent belum menjalani perawatan), ever_interact_with_positive? (agent apakah pernah berinteraksi dengan positif COVID19), ever_pass_cluster? (agent apakah pernah melewati area cluster).

   Tipe agent yang digunakan pada pemodelan ini terbagi menjadi 3 yaitu:
   a. Agent yang negatif COVID19
      Agent ini memiliki warna hijau yang menandakan tidak terpapar COVID19.
   b. Agent yang positif COVID19
      Agent ini memiliki warna merah yang menandakan positif COVID19.
   c. Agent yang pernah berinteraksi
      Agent ini memiliki warna selain hijau dan merah yang menandakan pernah berinteraksi dengan agent lain yang memiliki kemungkinan positif COVID19.

3. Event Infeksi
   Event ini akan melakukan pengecekan kepada agent yang pernah berinteraksi apakah agent tersebut berinteraksi di area cluster atau di luar area cluster. Setelah itu akan dilakukan pengecekan apakah agent tersebut pernah berinteraksi dengan agent lain yang terbukti divonis positif COVID19, jika terbukti benar maka setelah 14 hari status agent tersebut akan ditentukan dengan variable %infectiousness. Persentase ini bergantung pada tingkah laku agent, jika agent pernah melakukan interaksi dengan agent lain di area cluster maka nilai %infectiousness akan bertambah sebesar 10%, sedangkan jika agent telah divaksin maka kemungkinan terpapar COVID19 menjadi 5%.

4. Event Penyembuhan
   Event ini akan melakukan pengecekan kepada agent yang terpapar COVID19 dan telah dirawat selama lebih dari atau sama dengan 28 hari apakah telah sembuh atau belum. Penentuan apakah agent tersebut sembuh atau belum bergantung pada variable %cure. Jika agent tersebut tidak sembuh maka akan ada penentuan apakah agent tersebut meninggal atau tidak. Penentuan apakah agent tersebut meninggal atau tidak bergantung pada variable %death.

II. Source Code

```
globals [
  populations
  death
  init_people
  is_there_positive?
```

```
   is_there_cluster?
   cluster_coordinate
   vaccine_quota
]

turtles-own [
  num_interact_days
  num_treated_days
  have_vaccine?
  untreated?
  ever_interact_with_positive?
  ever_pass_cluster?
]

to setup
  clear-all
  reset-ticks
  set init_people []
  set cluster_coordinate []
  set vaccine_quota ((%vaccination * population / 100) - num_cluster)
  create-turtles population
  [
    setxy random-xcor random-ycor
    set shape "person"
    set color green
    set num_interact_days 0
    set num_treated_days 0
    set have_vaccine? false
    set untreated? true
    set ever_interact_with_positive? false
    set ever_pass_cluster? false
  ]
  draw-grid
  let cluster_left num_cluster
  let colors base-colors
  while [cluster_left > 0]
  [
    set is_there_cluster? false
    ask turtle random population
    [
      foreach cluster_coordinate
      [
        [coordinate] ->
          ifelse (abs ((item 0 coordinate) - (pxcor)) >= (2 * radius)) or (abs ((item 1 coordinate) -
(pycor)) >= (2 * radius))
          [
            ; do nothing
          ]
          [
            set is_there_cluster? true
          ]
```

```
    ]
    if not is_there_cluster?
    [
      draw-cluster pxcor pycor
      set cluster_left cluster_left - 1
      set cluster_coordinate lput (list pxcor pycor) cluster_coordinate
    ]
    set color one-of remove red remove green colors
    set colors remove color colors
    set init_people lput who init_people
  ]
]
vaccinate
set populations population
set death 0
set is_there_positive? false
end

to draw-grid
  ask patches
  [
    sprout 1
    [
      set color gray
      set heading 0
      fd 0.5
      rt 90
      pen-down
      repeat 4
      [
        fd 0.5 rt 90 fd 0.5
      ]
      die
    ]
  ]
end

to draw-cluster [cx cy]
  ask patch cx cy
  [
    sprout 1
    [
      set color yellow
      set heading 0
      fd radius
      lt 90
      pen-down
      repeat 4
      [
        fd radius
        lt 90
```

```
      fd radius
    ]
    die
  ]
 ]
end

to vaccinate
  while [vaccine_quota > 0]
  [
    ask turtle random population
    [
      if (color != blue) and (not have_vaccine?)
      [
        set have_vaccine? true
        set vaccine_quota (vaccine_quota - 1)
      ]
    ]
  ]
end

to check_position [who_turtle]
  foreach cluster_coordinate
  [
    [coordinate] ->
    ask patch (item 0 coordinate) (item 1 coordinate)
    [
     sprout 1
     [
      set heading 0
      fd (radius - 0.5)
      lt 90
      fd (radius - 0.5)
      set heading 90
      let counter 1
      repeat (2 * radius)
      [
       if any? turtles-here with [who = who_turtle]
       [
        ask turtle who_turtle
        [
         set ever_pass_cluster? true
        ]
       ]
       repeat ((2 * radius) - 1)
       [
        fd 1
        if any? turtles-here with [who = who_turtle]
        [
         ask turtle who_turtle
         [
```

```
          set ever_pass_cluster? true
        ]
       ]
      ]
      ifelse (counter mod 2) != 0
      [
        rt 90
        fd 1
        rt 90
      ]
      [
        lt 90
        fd 1
        lt 90
      ]
      set counter (counter + 1)
    ]
    die
   ]
  ]
 ]
end

to infect
  set is_there_positive? false
  ask turtles with [color != green and color != red]
  [
    let current_turtle who
    let current_color color
    ask other turtles-here with [color = green]
    [
     set color current_color
     create-link-with turtle current_turtle
     let found? false
     check_position who
     if found?
     [
       set ever_pass_cluster? true
     ]
    ]
    ask link-neighbors
    [
     ask turtle who
     [
      if color = red
      [
       set is_there_positive? true
      ]
     ]
    ]
    if is_there_positive?
```

```
      [
        set ever_interact_with_positive? true
      ]
    ]
    ask turtles with [(color != green and color != red) and num_interact_days >= 14]
    [
      let infectiousness_rate %infectiousness
      ifelse ever_interact_with_positive?
      [
        if ever_pass_cluster?
        [
          set infectiousness_rate (infectiousness_rate + 10)
        ]
        if have_vaccine?
        [
          set infectiousness_rate 5
        ]
        ifelse random 100 < (infectiousness_rate)
        [
          set color red
        ]
        [
          ask my-links
          [
            die
          ]
          set color green
          set num_treated_days 0
          set num_interact_days 0
          set untreated? true
          set ever_interact_with_positive? false
          set ever_pass_cluster? false
        ]
      ]
      [
        ask my-links
        [
         die
        ]
        set color green
        set num_treated_days 0
        set num_interact_days 0
        set untreated? true
        set ever_interact_with_positive? false
        set ever_pass_cluster? false
      ]
    ]
end

to cure
  ask turtles with [color = red and num_treated_days >= 28]
```

```
  [
    ifelse random-float 100 < %cure
    [
      ask my-links
      [
       die
      ]
      set color green
      set num_treated_days 0
      set num_interact_days 0
      set untreated? true
      set ever_interact_with_positive? false
      set ever_pass_cluster? false
    ]
    [
      if random-float 100 < %death
      [
        set populations (populations - 1)
        set death (death + 1)
        die
      ]
    ]
  ]
end

to treat
  ask turtles with [color = red and untreated?]
  [
    set untreated? false
  ]
end

to increment_num_days
  ask turtles with [color = red and not untreated?]
  [
    set num_treated_days (num_treated_days + 1)
  ]
  ask turtles with [color != green and color != red]
  [
    set num_interact_days (num_interact_days + 1)
  ]
end

to go
  if (count turtles with [color = red] = populations) or (count turtles with [color = green] =
populations) or (ticks > 14 and not any? turtles with [color = red])
  [
    stop
  ]
  ask turtles with [color != red]
  [
```

```
    rt random-float 180 lt random-float 180 fd 1
  ]
  foreach init_people
  [
    ? -> ask turtle ?
    [
      if num_interact_days >= 14
      [
        set color red
        set init_people remove ? init_people
      ]
    ]
  ]
  infect
  treat
  cure
  increment_num_days
  tick
end

to-report %infected
  ifelse any? turtles
  [
    report count turtles with [color = red]
  ]
  [
    report 0
  ]
end
```

III. Tampilan Layar Program

setup

go

population

300

Jumlah populasi

%infectiousness 30

Tingkat penularan dalam persentase (%)

%cure 80

Tingkat penyembuhan dalam persentase (%)

%death 10

Tingkat kematian dalam persentase (%)

%vaccination 20

Tingkat vaksinasi dalam persentase (%)

radius 2.5

Radius cluster

num_cluster 2

Jumlah cluster

Jumlah Terinfeksi	Hari	Populasi	Kematian
0	0	300	0

Persebaran COVID19

350

Populasi

0

0 Hari 0

Negatif COVID19
Positif COVID19
Pernah Berinteraksi