Finite State Machines and COVID-19

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Summary

Finite State Machines and COVID-19

1. Finite State Machines (FSMs)
    - Inputs, outputs, and states
    - State diagram
    - Transitions
2. **COVID-19 as an FSM**
    - Python3 exercise, apply concepts to real world
    - Object-oriented design
    - Game theory, rules of the game
3. Results
    - Exponential growth
    - Social distancing
    - Second waves

Finite State Machines

Finite State Machines

Finite State Machine: is a mathematical model of computation. It is an abstract machine that can be in exactly one of a finite number of states at any given time.

1. FSM can change from one state to another in response to inputs (transitions)
2. Requires initial state and mapping of inputs to transitions

- Inputs - a small list of binary bits
- Outputs - a small list of binary bits
- States - $2^n - 1$ states represented by n bits

Finite State Machines

The State Diagram: table or chart defining input-transition map.

input	state	next state	output
0	00	11	1
1	00	01	1
0	01	00	1
1	01	10	1
0	10	00	1
1	10	01	1
0	11	11	0
1	11	01	1

Finite State Machines

The State Diagram: table or chart defining input-transition map.

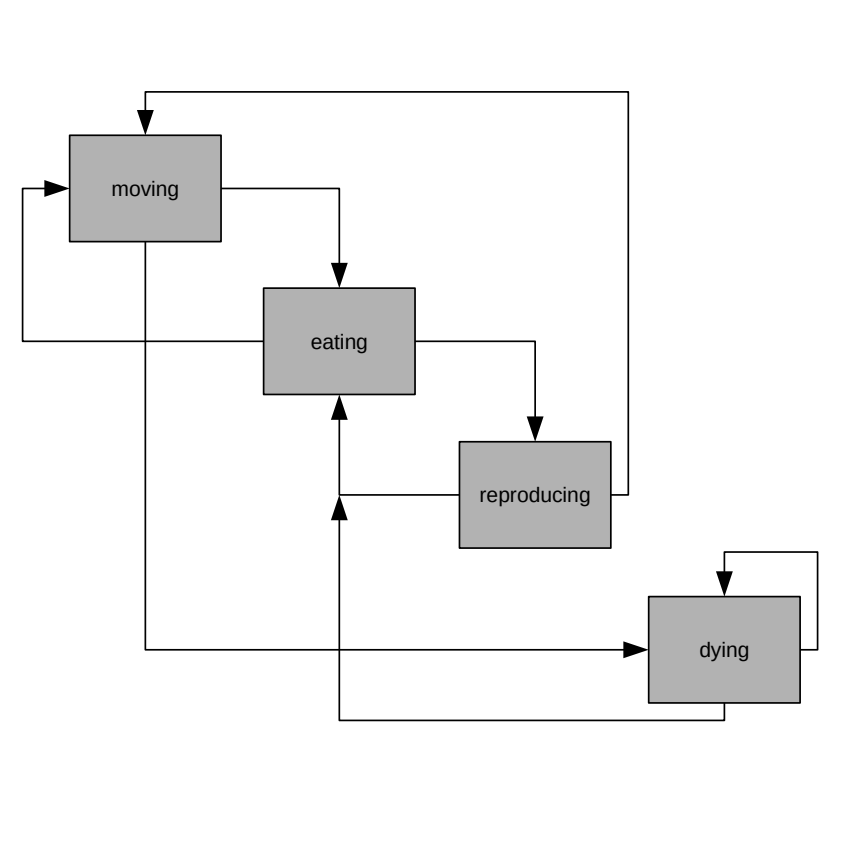

Figure 1: A state-diagram for our virus model.

COVID-19 as an FSM

COVID-19 as an FSM

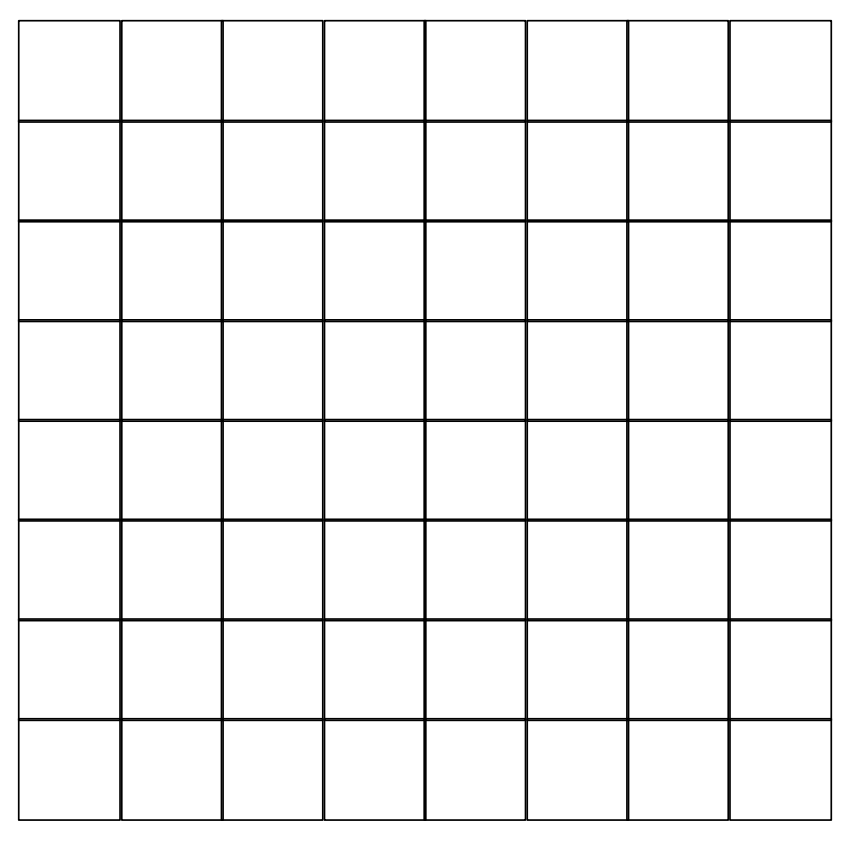

Figure 2: The basic grid where the FSMs live.

COVID-19 as an FSM

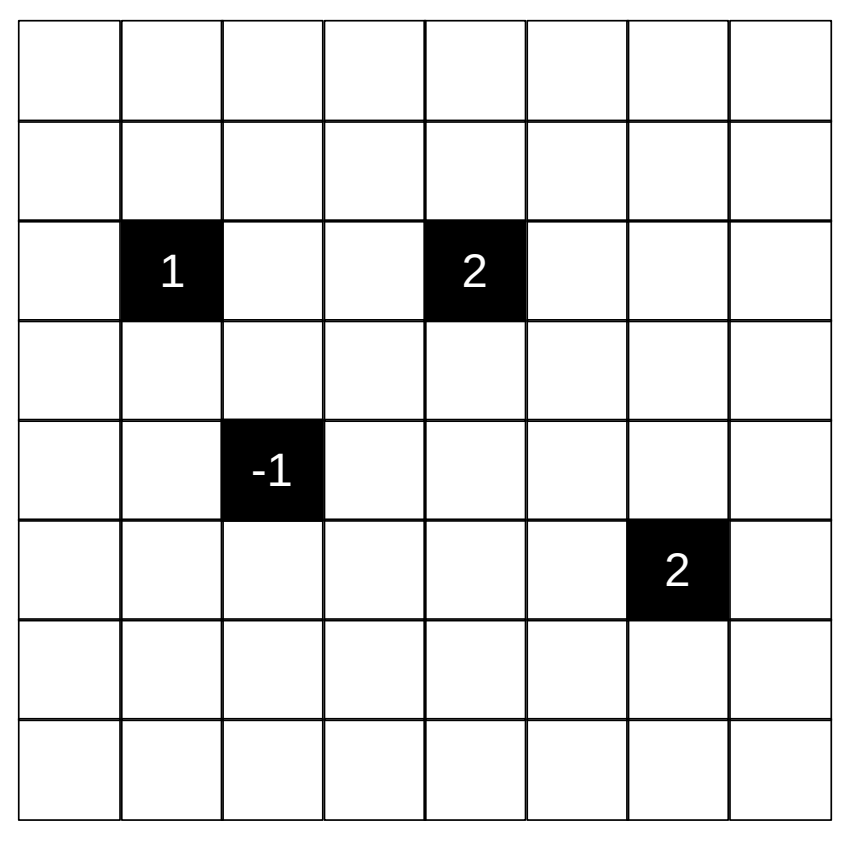

Figure 3: The basic grid where the FSMs live.

COVID-19 as an FSM

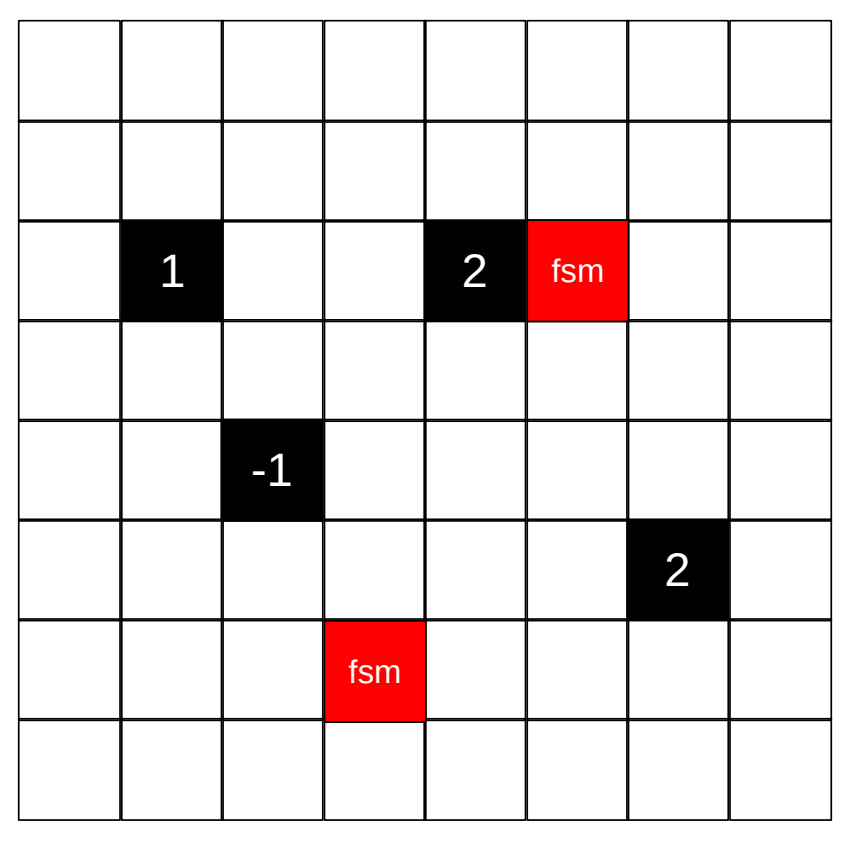

Figure 4: The basic grid where the FSMs live.

COVID-19 as an FSM

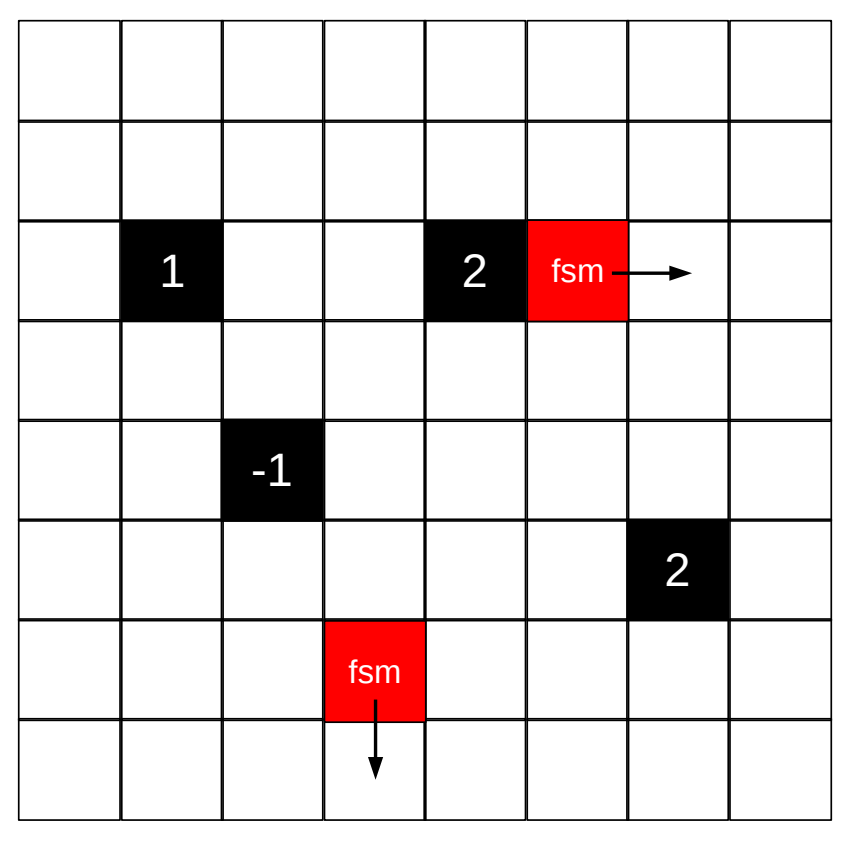

Figure 5: The basic grid where the FSMs live.

COVID-19 as an FSM

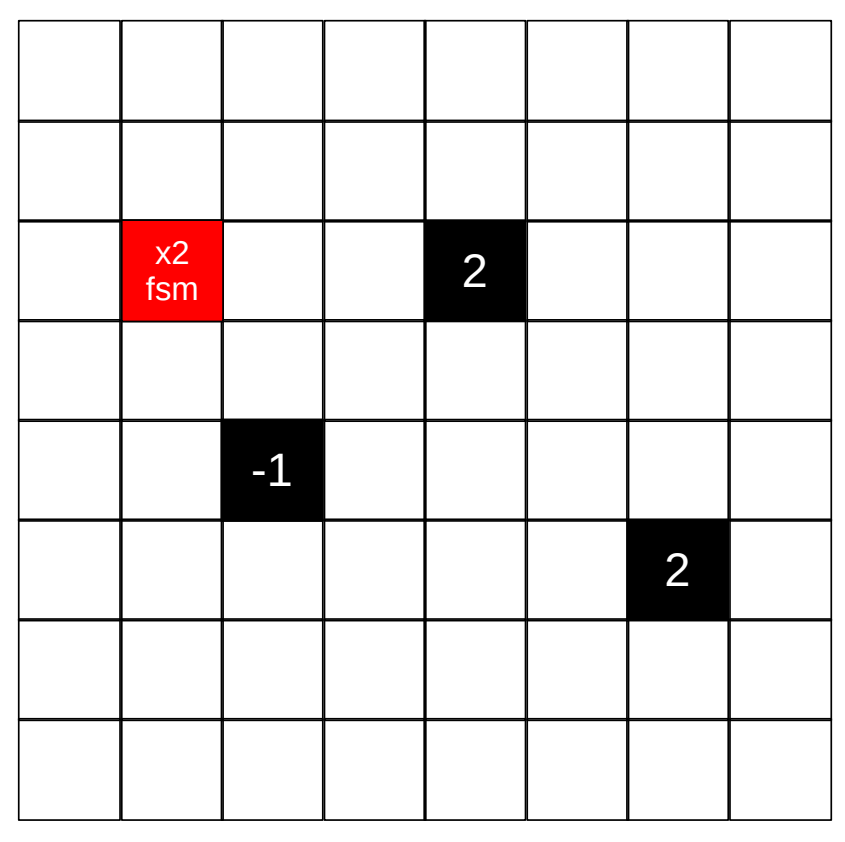

Figure 6: The basic grid where the FSMs live.

COVID-19 as an FSM

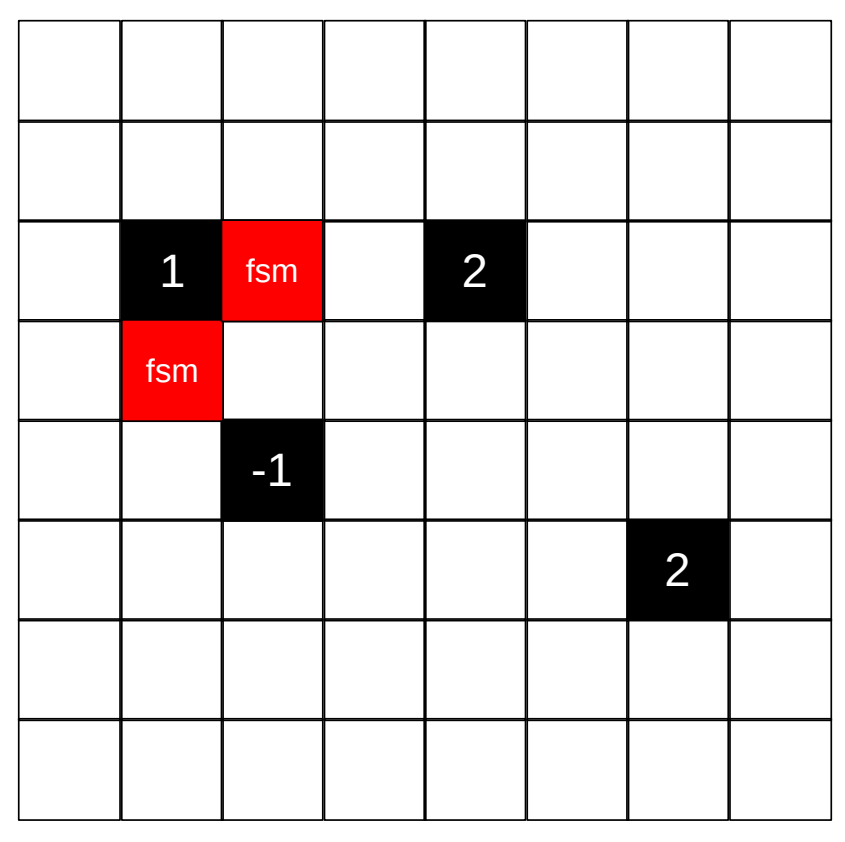

Figure 7: The basic grid where the FSMs live.

Results

Results

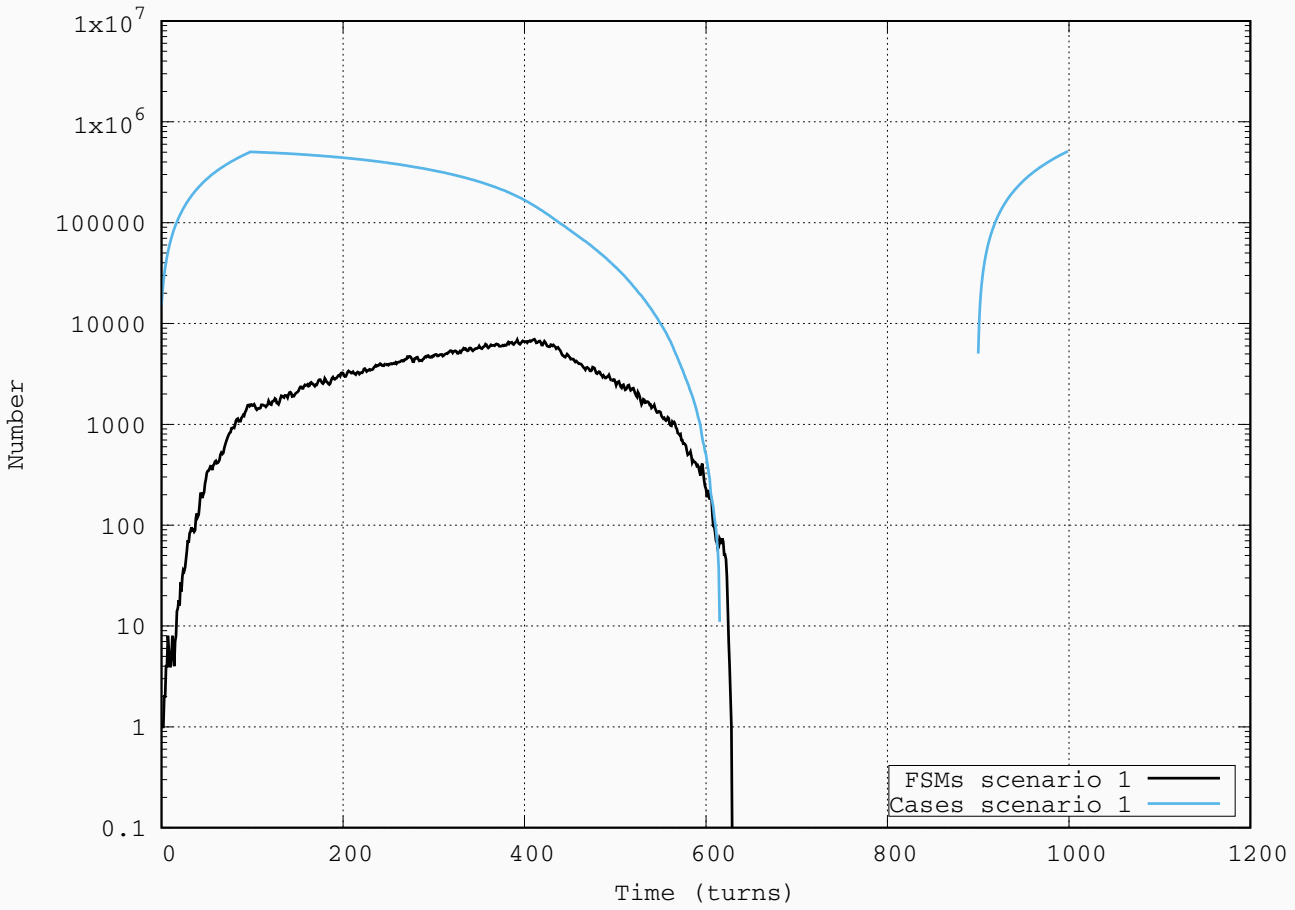

Figure 8: Scenario 1.

Results

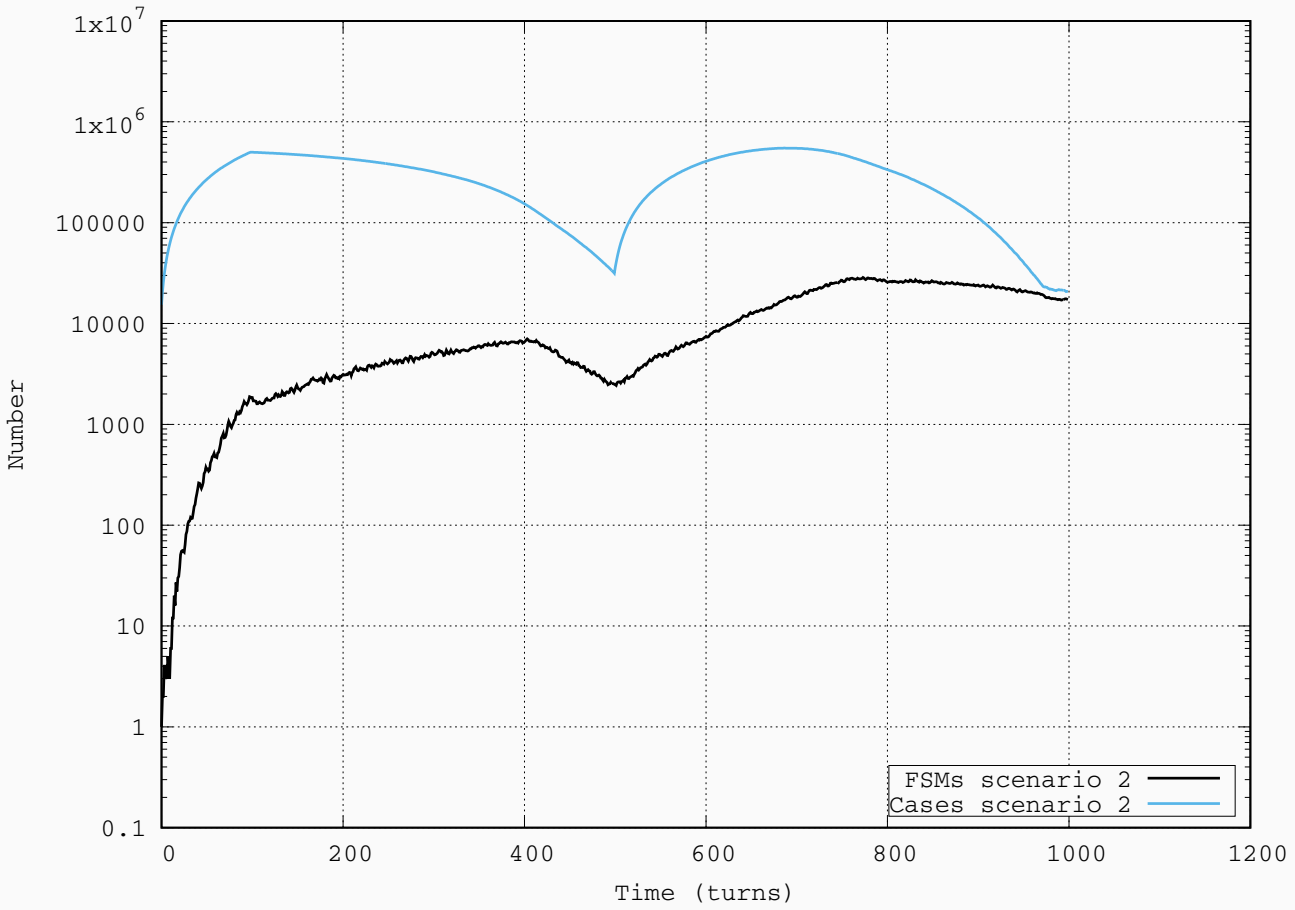

Figure 9: Scenario 2.

Conclusion

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