SIR Model - Mass Tests

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Overview

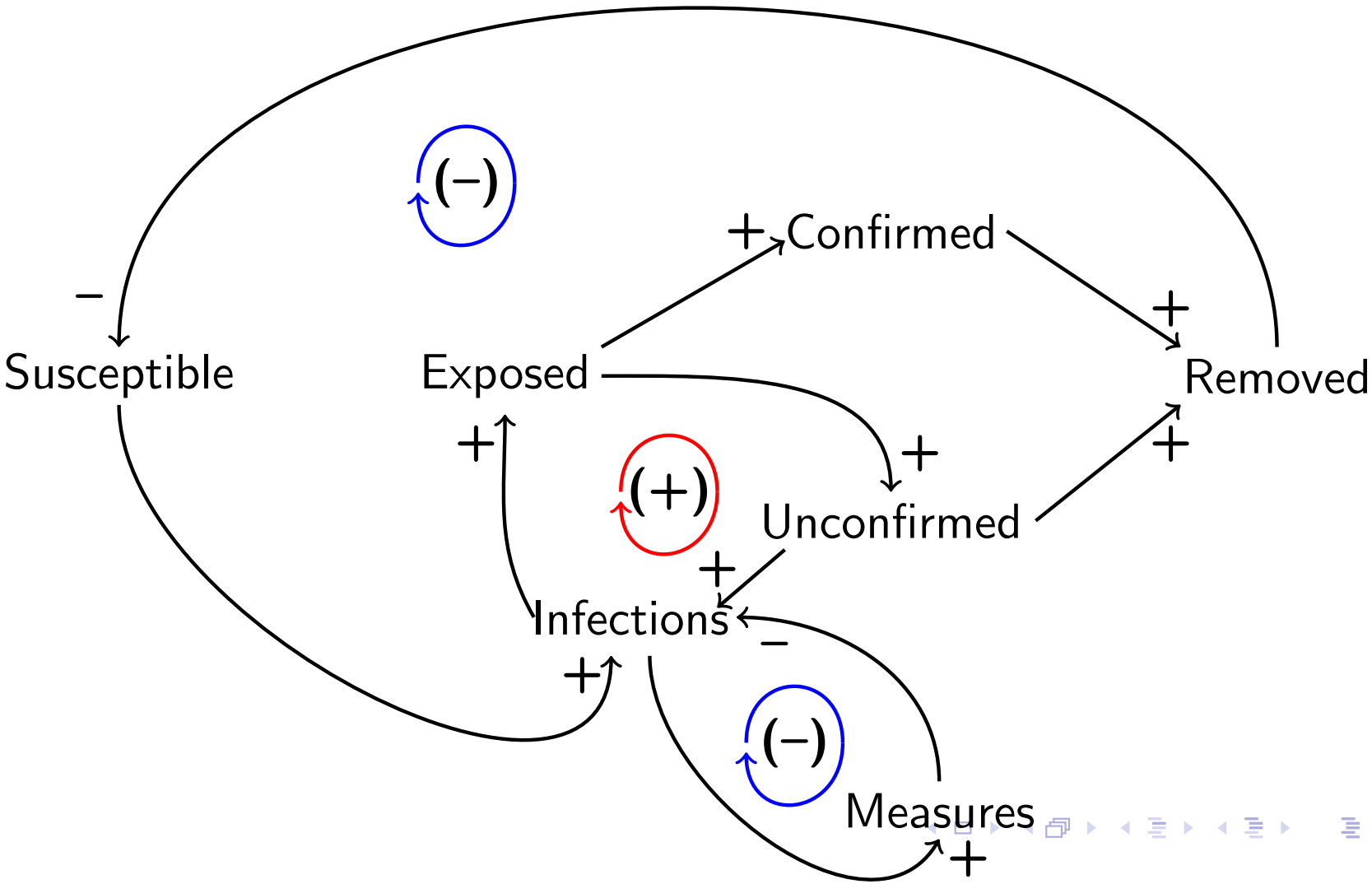
Motivation

- Covid-19 plaguing the world
- Nationwide mass tests in winter
- Goal: reduce number of unconfirmed cases
- Alternative to lockdown measures

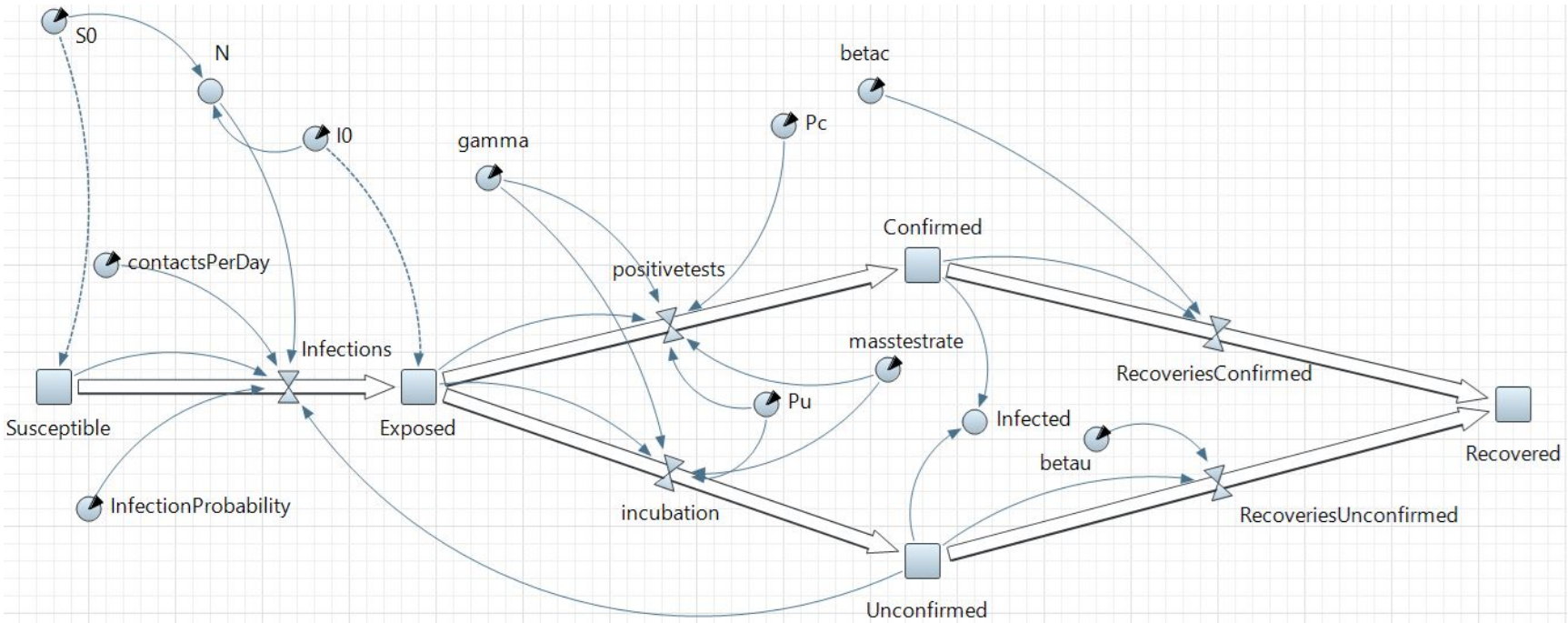
Model Description

- SIR - Susceptible-Infectious-Recovered
- Compartment Exposed: freshly infected but not yet infectious - SEIR Model
- Split Infectious into Confirmed and Unconfirmed
- Only Unconfirmed contribute to infections
- Recovered people do not contribute anymore

Causal Loop Diagram



AnyLogic Implementation



Masstests and Lockdown

Masstests:

- A portion of people move directly from the Unconfirmed to the Confirmed compartmet
- The flow from the Exposed compartmet is changed accordingly for the duration
- Occur cyclically

A lockdown occurs:

- When a certain number of people are infected (Confirmed + Unconfirmed, „Dunkelziffer“)
- Lockdown measures reduce number of contacts
- Lift of lockdown in two steps - „Lockdown light“

Lockdown numbers

Nr. Infected	-	$\geq 45,000$	$\leq 10,000$	$\leq 5,000$
contacts per Day	14	2	6	9

Table: Numbers for first lockdown

Nr. Infected	-	$\geq 115,000$	$\leq 30,000$	$\leq 20,000$
contacts per Day	9	3	6	9

Table: Numbers for other lockdowns

Here the $-$ column means number of contacts per day before the respective lockdown.

Results

Number of days in lockdown between 12.12.2020 and 28.01.2022 assuming no vaccinations.

	30 days	21 days	14 days	7 days
35% participation	124	88	83	44
50% participation	88	81	61	11
70% participation	79	49	11	8
90% participation	40	7	7	6

Table: Days of lockdown with different participation rate and interval between masstests

To compare: without any masstests at all the number of days in lockdown would be 168.

The End