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Problem A: Group Affinity and Fashion Sense

Melissa Dozeman, Sebastien Lescoulie, and Molly Schmidt

Professor Norma Ortiz-Robinson

Grand Valley State University

Introduction

- Societies influence behavior, such as how we style our appearance
- example: people trying to oppose mainstream fashion dress similarly and become hipsters
- Focus on change of appearance through group interaction

Factors Considered

- The people in the established groups
- The interactions between individuals
- How likely someone is to change their appearance
- Time it takes for the population to change
- How many people will change

Fashion Contagion

- Fashion styles spread throughout a population similar to how a disease would
- Two groups: those with the style and those without the style (infected and susceptible to being infected)
- Fashion is visual: an interaction between groups occurs when one person with the fashion style and another without the style see each other in person or when the person without the style sees images of the other via social media
- An interaction has a chance of influencing the person without the style to adopt it (infection)
- A person with the style may stop wearing it after a period of time (recovering from an infection)

Assumptions

- Same number of interactions per month for each individual
- No limit to the amount of changes an individual can undergo
- The likelihood of adopting the style is the same for each individual
- The likelihood of abandoning the style is the same for each individual
- No delay in change
- Population remains constant
- The most appropriate unit of time for our model is months

Model

- Based on the SIS model

$$\frac{ds}{dt} = -\beta si + \gamma i$$
$$\frac{di}{dt} = \beta si - \gamma i$$

- Where s is the proportion of the population susceptible to adopt the style,
  i is the proportion of the population with the style,
  β is the average rate at which an interaction between a susceptible individual and an individual with the style results in the susceptible individual adopting the style,
  γ is the average rate that those with the style stop wearing it,
  and $s+i=1$

Additional Issue: Outcomes of the Model

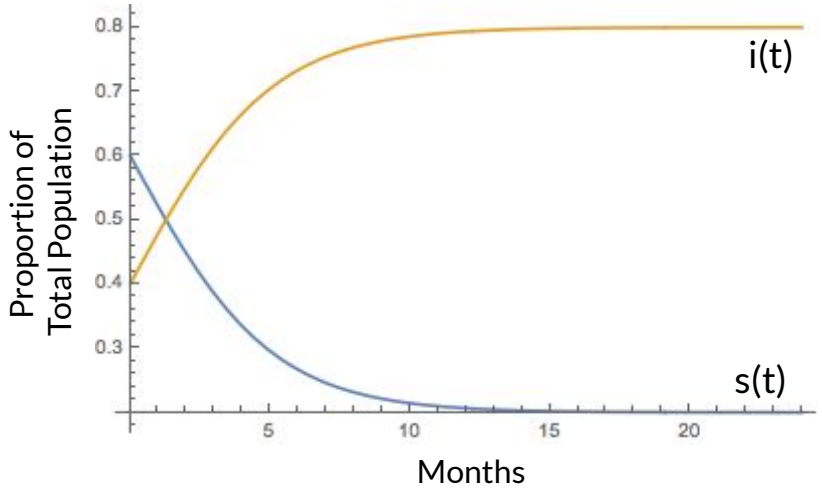
- The system will always approach the equilibrium state where i(t) = 1— γ/β and s(t) = γ/β.
- Note that this steady state depends only on γ and β.
- When $\gamma \geq \beta$, this steady state is i(t)=0 and s(t)=1 which represents the fashion style completely dying out.
- For any particular γ and β, the system will always reach the same steady state no matter what the starting population proportions are, though it may take longer to reach the equilibria if the starting proportions are quite different from the equilibria.

Scenarios and Solutions

Scenario 1:

β = .5, γ = .1 , s(0) = .6, i(0) = .4

Populations approach equilibria of s(t) = .2 and i(t) = .8, and it takes around 10 months to get close to equilibrium.

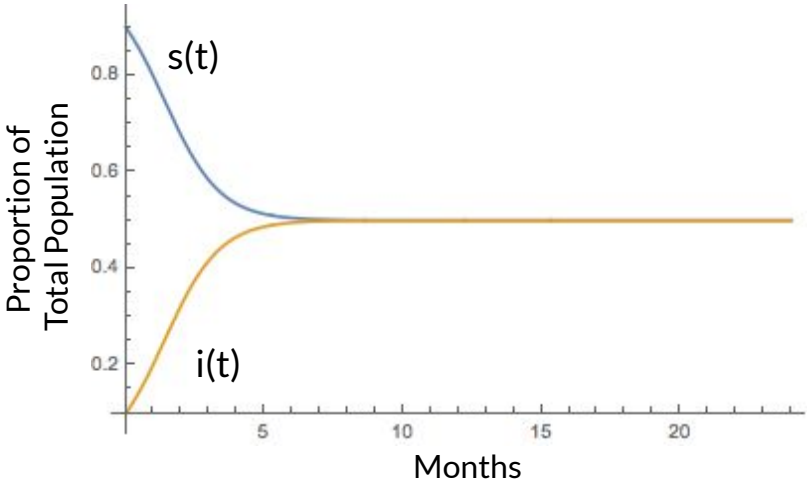


Scenarios and Solutions

Scenario 2:

β = .4, γ = .2 , s(0) = .9, i(0) = .1

Populations approach equilibria
s(t) = .5 and i(t) = .5, and it takes around
7 months to get close to equilibrium.

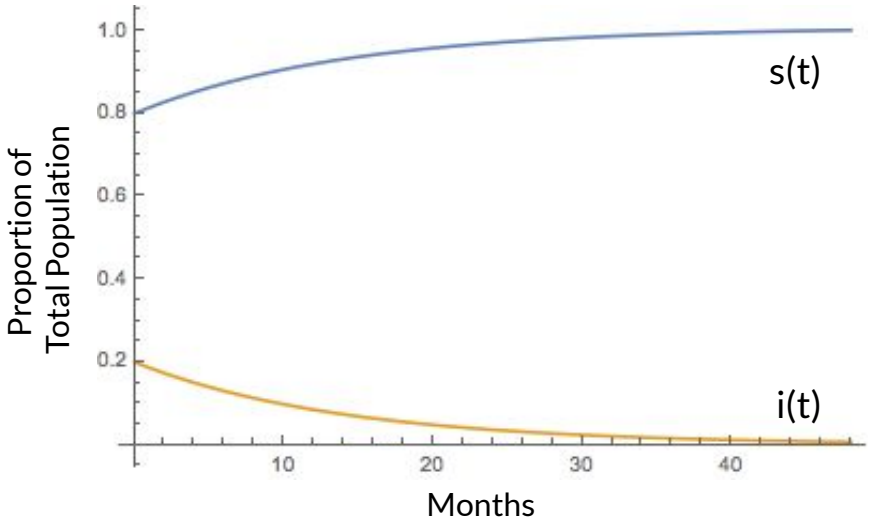


Scenarios and Solutions

Scenario 3:

β = .01, γ = .083 , s(0) = .8, i(0) = .2

Populations approach equilibria of s(t) = 1 and i(t) = 0, and it takes around 30 months to get close to equilibrium.



Concluding Remarks

Once again, in our analysis of a model that was inspired by the similarity of fashion and disease in the way they spread, the prevalence of a fashion style within a population will always reach an equilibrium state of either disappearing or remaining a constant proportion that is dependent on the ratio of β and γ.

One thing that our model does not consider is the influence from sources outside the population such as advertisements or popular media like television. These could be something to look into in the future.

References

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Any Questions?