Population Modeling with Markov Chains, Maple and MATLAB

1 Polls in La-La Land

The Situation: Suppose the residents of La-La Land tend to be quite indecisive when it comes to politics, and they are constantly "flip-flop"-ing when it come to the mayoral candidate they support. There are three candidates in the race, one each for the Red Party, the Blue Party, and the Green Party. In particular, each day

- 3% of the Red Party candidate supporters switch to supporting the Blue Party candidate;
- 15% of the Green Party candidate supporters switch to supporting the Blue Party candidate;
- 3% of the Blue Party candidate supporters switch to supporting the Red Party candidate;
- 10% of the Green Party candidate supporters switch to supporting the Red Party candidate;
- 10% of the Blue Party candidate supporters switch to supporting the Green Party candidate;
- 5% of the Red Party candidate supporters switch to supporting the Green Party candidate;

La-La Land has 700 registered voters. Suppose that on October 31, there were 350 people in favor of the Blue Party candidate, 300 people in favor of the Red Party candidate, and 50 people in favor of the Green Party candidate. Elections this year in La-La Land are held on November 25^{th}. Who will win?

Suggestions:

- Set up the problem as a system of equations where

$$\begin{aligned} B(n) &= \text{the number of people in favor of the Blue Party candidate after } n \text{ days} \\ R(n) &= \text{the number of people in favor of the Red Party candidate after } n \text{ days} \\ G(n) &= \text{the number of people in favor of the Green Party candidate after } n \text{ days} \end{aligned}$$

- Rewrite the system as a matrix problem.
- Use Maple and/or MATLAB to calculate the results of the election (provided everyone with an opinion votes).
- Plot the numbers of each candidate's supporters as the month of November continues.
- Consider the eigenvalues and eigenvectors of your voter matrix to determine if the population will ever settle on one candidate, or find a definite opinion.