

Die Sims – Almost Normal Family Life

We are looking at a normal family of mom, dad and son. Mom is the heart of the family, and her mood does not only depend on the current mood of her husband and son, but also on the state of their savings account. Dad is the bread-earner of the family and his mood depends on that of his wife and on his employment status. The son is just beginning puberty, knowing only the two extreme emotional states of being in love or heartbroken. The family peace is fragile, they are often on the verge of falling apart by either the parents getting divorced or they being broke.

Master Addition:

The family also recently got a cat from a pet shelter, to help them get rid of the mice that scare mom.

Your assignment:

Build a simulation model and perform experiments to solve the following tasks. The basic time unit is a day.

1. As a first task you should answer the following questions under the assumption that family life progresses without any interventions for a whole year:
 - a. What is the probability that...
 - The Sims family will be broke?
 - The parents will get a divorce?
 - None of the two things happen within a year?
 - b. For how long will the father be unemployed on average?
 - c. How much money will be spent on damaged school property?
 - d. How often does mom encounter a mouse? (Master Addition)
 - e. How many mice does the cat eat in the course of the year? (Master Addition)
2. Add interaction possibilities to your simulation, in order to test and use the interventions to influence the family peace (in a positive way :-)).
3. Your main goal is to keep the family happy together for 7 years, until the son has finished Junior High and High School. Then he will be old enough to move out and go to college. Your second task is therefore to devise a strategy for using the available interventions, maximizing the probability to stay happy together for 7 years in a row.

Details of the family interactions:

Threats to the family peace

If both moms and dads mood falls below 0 they will get a divorce, ending your task.

When the family's savings account balance falls below -500 credits, they are officially broke and have to declare bankruptcy. Thus they will not be able to send their son to college, which will end your task.

Mom

Mom is the heart of the family and has an initial mood of 5 units. Her mood can vary between exceedingly happy (10) and totally devastated (-10) and is dependent on several factors. It increases proportionally to both dads and sons mood with a proportionality constant of 0.005. However, since she is responsible for the finances, it also depends on the family savings. Her mood decreases if the savings fall below 500 credits, proportional to the difference to 500 credits. Her mood increases accordingly when above 500 credits. The proportionality constant for both cases is 0.0002.

Dad

Dad is the main bread-earner of the family and works as a freelance IT-consultant. His mood may also vary between the extremes 10 and -10 and his initial mood is also 5 units. Since he is a freelancer, he is not regularly employed, but has periods of random unemployment. A single job lasts for a random period of time, which can be estimated from the file [EmploymentSamples](#), which contains 500 samples of employment durations of similar freelancers. After finishing one job he will immediately find a new one with probability 0.8. Otherwise he will be unemployed for a period with random duration between 5 and 15 days, after which he will find a job with probability 0.6. His mood only depends on two factors. It increases proportionally to moms mood with a proportionality constant of 0.005 and it decreases due to frustration when he is unemployed with a rate of 0.1.

Son

The son is a teenager and currently only knows two mood extremes, nothing in between. He can be either in love (mood=10) or heartbroken (mood=-10). When he is heartbroken he will fall in love at a rate of 0.04. When in love he will become heartbroken at a rate of 0.05. Currently he is madly in love. His school calls at random intervals about once every month, but the single calls are completely independent of each other. When he is heartbroken, he will have damaged property with a value of 170 credits that needs to be paid for.

Financial situation

When the father is employed, he earns a steady 15 credits a day. Otherwise they have to rely on social security, which pays 5 credits per day. The family expenses have a steady rate of 11 credits per day. The current account balance is 1000 credits.

Details Master Addition – Cat and Mice (to be implemented using agent based modeling)

We assume the house to have an area of 500x500 pixels (50x50 meters) of continuous space, omitting any obstacles such as walls or furniture. We also neglect any day / night rhythm as well as employment dynamics and assume that mom and the cat are interacting constantly without interruptions.

Due to their property bordering on cornfields, mice find their way into the house at random intervals with a fixed rate of 0.1 / day. The mice move randomly around the house with a speed of 0.0006 km/h. Initially there is one mouse in the house, which was also the reason for getting the cat. Mom moves around the house in a random way, with a speed of 0.0005 km/h. When mom sees a mouse within a 5 m radius, she is startled into screaming. Her mood instantly decreases by 0.1 and she stops moving for 5 model time units (days).

The cat living in the house patrols the area with a speed of 0.001 (randomly or according to a pattern, if you like ;)). When the cat encounters a mouse within a 5 m radius, it eats the mouse. When mom screams, the cat comes running in anticipation of a mouse to catch.

Interventions

As an unconventional therapist, you have some very strange ideas on how to keep and improve the family peace. Here are your six suggestions:

1. Buy Flowers

Dad may buy flowers for his wife, which will cost him 20 credits and increase mom's mood immediately by 1 unit.

2. Take a Drink

Dad going out for a drink with his friends will cost 10 credits and increase his mood immediately by 1 unit, at the same time decreasing mom's mood by 2 units, because she does not like her husband to drink.

3. Play the Lottery

They may also try their chances in the lottery: Playing the lottery once costs 1 credit. The chances of winning 10,000 credits are 1 in 100,000.

4. Arrange a Date

Mom is very keen on keeping her family happy. Therefore she might arrange a date for her son. This is quite expensive at 30 credits, but it will take him immediately from heartbroken to in love. If he already is in love, the money spent will have no effect.

5. Work Overtime

When dad is employed, he can decide to work overtime, earning an additional 5 credits per day to improve the financial situation. However, since he is away from home for longer, working

overtime decreases mom's mood at a rate of 0.05. His decision to work overtime is cancelled, when he goes into unemployment.

6. **Take a Part-time Job**

When dad is unemployed, mom can take on a part-time job. This will increase the income by 5 credits per day. However, since it challenges his position as the bread earner, it further decreased dad's mood at a rate of 0.05. As soon as he is back in employment, she will drop her part-time job to be there for her family.