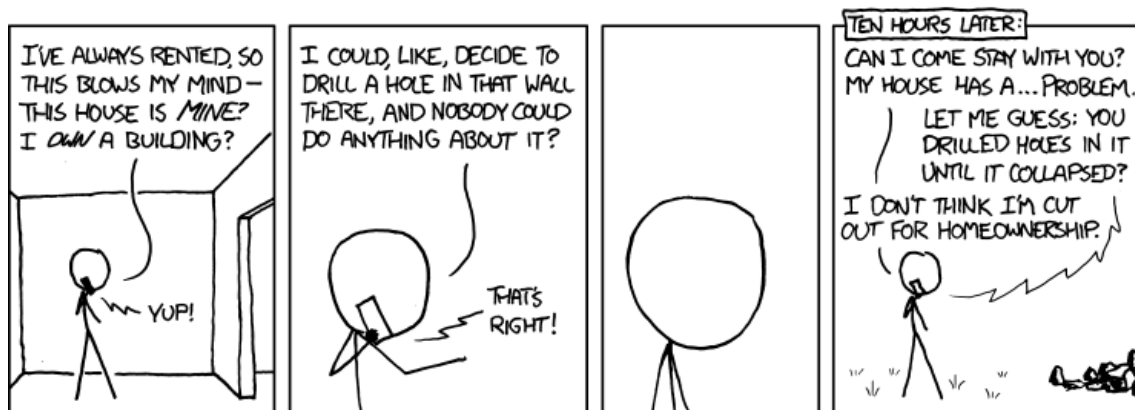


# Case Study: Rental Prices

CITS4403 - Computational Modelling Assignment

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xkcd.com/905

# 1 Introduction

Finding a place to live in while renting can be very difficult. Expensive places all seem to be grouped together, right next to each other and all occupied while cheaper places are on the outskirts of town and relatively empty. A good way to look at why this happens is by using agent based models.

Simulating population movements using an agent based model is nothing new. Thomas C. Schelling's "Dynamic Models of Segregation", published in 1971, was one of the first to do this. His model had two agents that both behaving the same way. They would move if they were "unhappy" because they were outnumbered by the other agent.

Simulating a city of people moving around to houses with changing rent prices is non-trivial. You need to manage several variables such as rent and occupancy, as well as determine who is going to move into each house at the end of each month.

- Looking at rental prices
  - By simulating people
  - Seeing why expensive houses are close together
- 
- Simulating population movements using agent based models is nothing new.
  - Thomas C. Schelling published "Dynamic Models of Segregation" in 1971
  - Two Agents, both acted the same way
  - Moved around grid system preferring to not be outnumbered by other agent
  - This model has two agents, People and the Houses they live in.
  - Each agent has its own rules and interacts with each other

# 2 Implementation

- Agent based model
  - Two agents that interact
  - Houses and People
  - Both act depending on the other
- 
- Named Tuples
  - Good for simple data structures that we want to pass around - Like Coordinates

```
1 import collections
2
3 Coordinates = collections.namedtuple('Coordinates', 'x y')
```

## 2.1 Agents

### House

- Have a price and possibly an occupant
- Increase rent after certain amount of time
- Decrease rent to try and get people to rent it

### People

- Similar to real people
- Have an income
- Have a bank balance
- Pay rent every month
- Can only move when rent agreement finishes
- Unlike real world
- No share houses
- No income increases
- Don't have sentience

## 2.2 Managing the Agents

### City

- Manages all the houses
- Makes sure rent changes

### Population

- Manages all the people
- Makes sure they are happy
- Make sure they move if they aren't
- Each step updates rent of old houses, moves people, then updates rent of occupied houses

## 3 Exercises

**Exercise 1:** *Randomly give people an income based off of Bureau of Statistic data.*

**Exercise 2:** *Modify the program to take city size and population size as arguments. See what happens when you increase and decrease the population.*

**Exercise 3:** *Modify the program so that there is a hole in the center of the City. Experiment with different City and population sizes and see how it changes.*