**20/11/11 UPDATE**

The script “abmtest.py” stored on the git repository “lewisbdg/lewisbdg\_project” is a very basic model exploring possible directions for future models. The script works as follows:

1. A table of state data, including lat/long coordinates, is read. This table was found online at: <https://github.com/jasperdebie/VisInfo/blob/master/us-state-capitals.csv>.
2. Each state is assigned a random climate score between -1 (bad) and +1 (good).
3. A function is defined to calculate distance between any two states using their lat/long coordinates.
4. The agent class is defined, with properties:
   1. Initial state at beginning of simulation,
   2. Alarm threshold: if this is greater than the state’s climate score, an agent will make the decision to migrate,
   3. Knowledge: an agent’s knowledge of each state’s climate will be more accurate for closer states and tend to 0 (no knowledge) for more distant states.
   4. History: a record of an agent’s state of residence. At the beginning of the simulation, this is an array of just the agent’s origin state.
5. A number of agents (currently 10) are generated for each state. Each agent in the same initial state begins with the same knowledge, but their alarm threshold is different and randomly generated. This means some agents will choose to migrate while some will not, even though they share the same information.
6. The simulation runs over 10 years, starting from year 1.
   1. At the beginning of each year, agents will choose to migrate or remain based on their alarm threshold. Agents that choose to migrate will decide their destination based on their knowledge. Agents will choose to travel to the state with the largest positive *perceived* difference in climate score, per unit distance. In practice, this means that agents may choose to travel further to more unknown states (where their knowledge of the climate is close to 0) if all surrounding states have very low climate scores. This is very unlikely in the current setup however.
   2. For the remainder of the year, agents will randomly interact with each other (currently fixed to 200 interactions). Each interaction causes agents to exchange information, shifting their own knowledge slightly towards the other’s. The amount this knowledge shifts can be modified.
   3. This repeats for 9 more years.

**RESULTS ON NEXT PAGE**

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Figure : Final state distribution for agents. Dark red-dark green represents state climate score. States with 5 or fewer agents at end of simulation are grouped in "other".

From figure 1, more than 50% of agents end the simulation in dark green states, with >75% in green states. This differs from their initial states, which we expect to be roughly distributed between dark red/light red/light green/dark green states.

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Figure : Number of movers each year.

From figure 2, there are NO movers from year 5 onward, with the vast majority of moves happening in the first year. There will be roughly 300 moves in each simulation for 500 agents. This is to be expected – there is roughly a 50% chance any given agent will be satisfied by their state’s climate score and choose to never migrate. However, we want to avoid all agents “settling” by year 3 as this behaviour is not reflected in reality.

**NOTABLE SHORTCOMINGS/IMPROVEMENTS:**

* Knowledge sharing needs more work. Currently all knowledge is equally valuable in interactions – it would be good to make it so that other agents learn more from “certain” knowledge – e.g. climate data for the interacting agent’s former state – than “uncertain” knowledge. There is also the possibility of adding long distance interactions (phone, etc.), trust levels (agents are more likely to listen to family members), and one-way communication (news broadcasts, etc.)
* Climate rating needs to be linked to the real world.
* No personality types for agents.
* The migration decision always happens if the climate score is above a certain threshold – add other variables i.e. wealth, occupation that affect this decision to migrate.
* Each state’s climate rating is fixed – add fluctuations.
* Add “willingness to travel” i.e. some agents may be willing to travel across the country, some may want to remain close. This can be tied to personal characteristics e.g. wealth, family ties, etc.