Matlab 2017 - Ants Behaviour and Traffic/City Network Development

- **Group Name: Mantlab**
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- **Project Title: Ants trailing behaviour compared to the building of the road system between cities**

General Introduction

Ant colonies have a very interesting practise to build food supply chains. Although a single ant itself has quite limited abilities, the colony as a whole can arrange itself in a very sophisticated network depending on the initial state of their environment. The interactions of the individuals lead to a more efficient solution for the colony by optimizing path lengths and choosing between a variety of food sources.
In our project we would like to reproduce the behaviour of a single ant colony. Furthermore, we want to investigate how multiple ant colonies interact with each other. We are especially interested in the equilibrium state, which this system tends towards and how close the resemblance to real world traffic and city networks is. Once we run the model with two ant colonies we hope to see a resemblance to the historic development of the road network between cities.

The model
Variables (indep/dep):

- Importance of cities (dep)
- Distances between them (indep)
- Fluctuation (dep)

Model good abstraction?

- Our model allows us to simplify the connection between cities by ignoring small towns.

Fundamental questions

- In what kind of network do collaborative friendly ant colonies interact with each other?
- How does this kind of network translate to our real world traffic and city network development?

We plan to find the solution to the first question by implementing a model, with the specifications outlined in the paper “Trail Formation in Ants” from the suggested project page. Question 2 will be answered by comparing the result of our model with a network of a few large cities in the real world.

Expected results
Ants make the decision to follow a route based on the amount of pheromone on the trails. This causes trails with lots of traffic to continue growing. Therefore we expect that large cities, which already have lots of traffic to them to grow even further.

References

- Base project (Camazin2001, chapter13, Trail Formation in Ants)
- Michelin roadmap
- Biologically Inspired Model of the Swiss Railroad Network Depending on Population Growth Paper