Maps and Navigation in Spatial Cognition

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Project Abstract:

The purpose of our study is to compare the cognitive processes used to solve spatial problems on a large scale (moving through space) and on a small scale (on a sheet of paper). We are using a problem called the Traveling Salesperson Problem (TSP), in which the participant is asked to find the shortest path that travels to multiple destinations before returning home. Previous research has indicated that humans do surprisingly well on this mathematically complex task, producing nearly optimal solutions quickly and easily. Most previous research on this problem has used computerized or paper versions of the TSP, in which the entire problem is presented visually at a small scale. Therefore, it is possible that good solutions are produced perceptually by the visual system. We are testing this explanation by asking participants to solve a navigational version of the TSP, in which they physically travel between remembered locations (e.g. familiar campus landmarks) that are not all visible. This will help us better understand the relationship between spatial navigation and visuospatial problem solving in humans, and also about the strategies used by humans to solve the TSP.

Traveling Salesperson Problem

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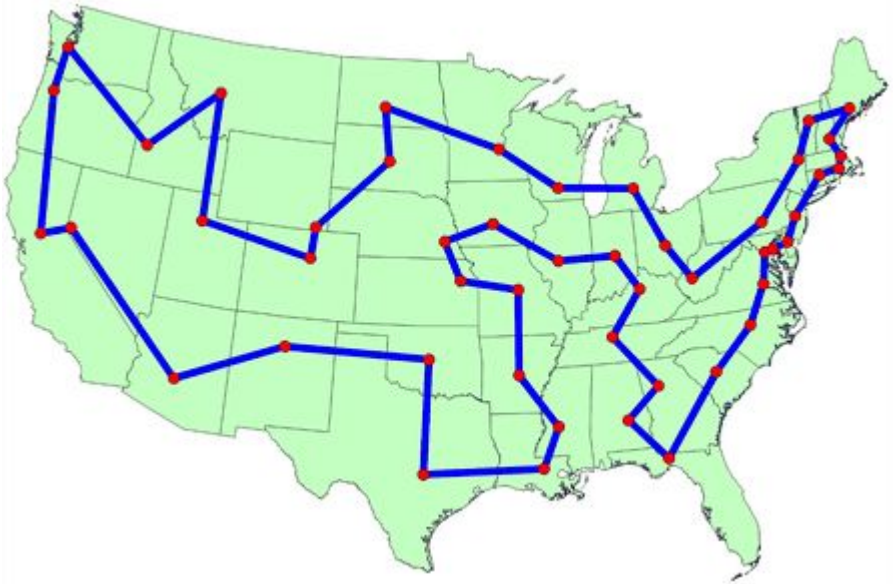
- What is the Traveling Salesperson Problem (TSP)?
  - Goal: find the shortest route possible between locations with the same start & end point
- Why TSP?
  - Useful tool for studying spatial memory and planning



Traveling Salesperson Research

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- Previous TSP Research
  - Rats & Translational Work
  - College Students - paper & online

- Our Research
  - Online & navigation convergence
  - Use TSP to compare visual and large scale spatial & planning memory

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Methods

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- Two Groups : Map or no map
- All given set of places to go on campus

- Goal : find the shortest route between all (TSP)
  - GPS : FitBit
- Post-Navigation Q's
  - Spatial relationships between places on campus

Research Questions

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1. Are solutions on small and large scale similar?

2. Are different strategies employed on the large scale TSP?

3. Does having a map change the strategies?

Contribution to Field

- Our Goal: compare spatial decision-making at a large scale with decision-making on the standard paper task
- Allow for better interpretation translational TSP data
- Increase understanding of different types of spatial cognitive processing in humans
- Our Future Directions
    - Spatial navigation and aging / cognitive decline interactions

Thank you!

Research Team: Rachel Conley, Olivia Fox, Kanan Levy

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