Final Project: Green Space Calculator

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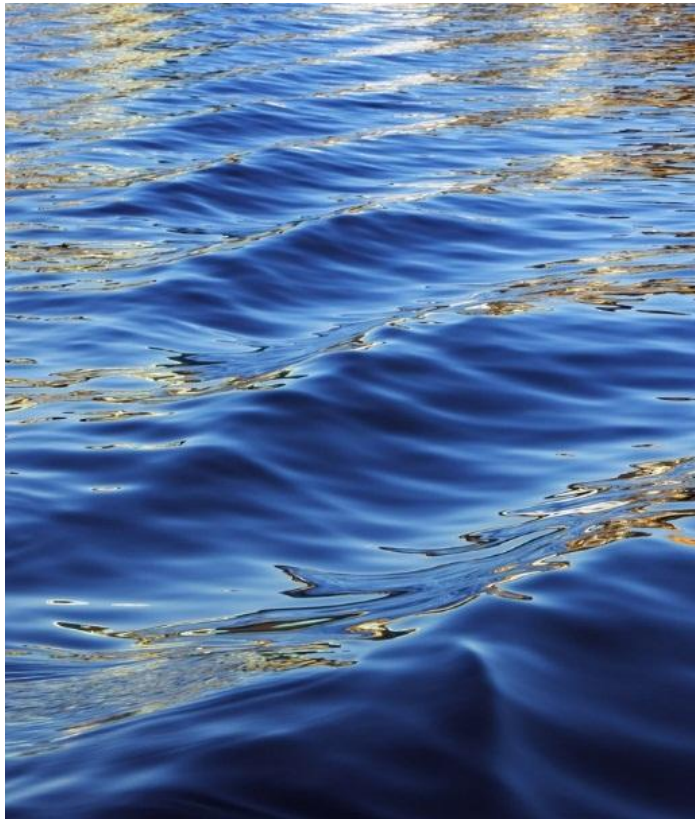


Problem: Urban Heat Islands

Urban heat islands (UHI) are a phenomenon where urban areas are hotter than the surrounding areas due to:

- materials such as concrete and asphalt trapping and then releasing heat

- the lack of evapotranspiration caused by a deficiency in green spaces

Why Should We Care About Urban Heat Islands?

Urban heat islands are important because they:

- cause health problems
- increase the cost of energy
- compound with the problem of global warming

Summary of Findings

- Tucson is one of ten cities that became more than 4 degrees Fahrenheit hotter during the last 48 years (Davis, 2019).

- Midtown Tucson and areas on the east side include four census tracts where the heat island effect raised temperatures by 9.5 degrees (Davis, 2024).

- Heat island effect is the number one reason Southwestern cities are experiencing massive spikes in temperature (Davis, 2019).

Current Software Solutions

- Through the Tucson Million Trees initiative, the city plans to plant 1 million trees in the next five years (Khan).

- They use a Geographical Information Systems dashboard to determine which areas would most benefit from more trees in the most equitable way (Khan).

- Although Tucson does not use it, there already exists a Weather Research and Forecasting model and an urban canopy model (WRF-UCM) that models how urban heat islands are affected by trees, soil, grass, and other factors (Loughner 1775).

Software Solution

Like the WRF-UCM my program would model how green spaces affect UBIs, but it would also automatically find the best locations for them determined by various factors that include:

- whether the land is private or public
- where would be the least cost
- where water usage would be least

Design Approach

After finding that a model of how green spaces affect urban heat islands already existed, my process of planning consisted of thinking about ways to improve that existing model such as:

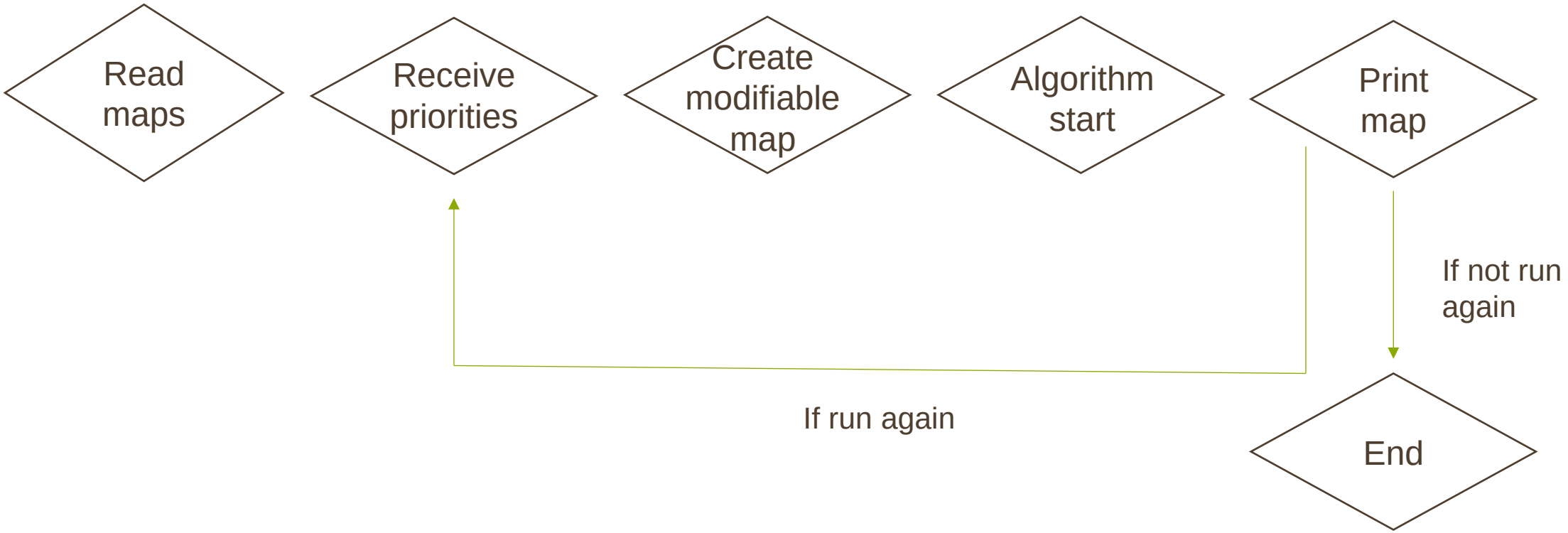
- automatically finding the most effective locations for green spaces
- making new maps based on the model
- being able to specify what factors should be prioritized i.e., cost

Real World Application

The following is an example of how the program might be structured:

- reads data from maps containing temperature, population density, building material, building density, and water systems
- creates a temperature map that can be modified as needed as the model works
- algorithm that uses research of most effective green space size and placement modifies map
- models the changes to temperature and updates the map accordingly
- displays map to user

Structure of Program Flowchart

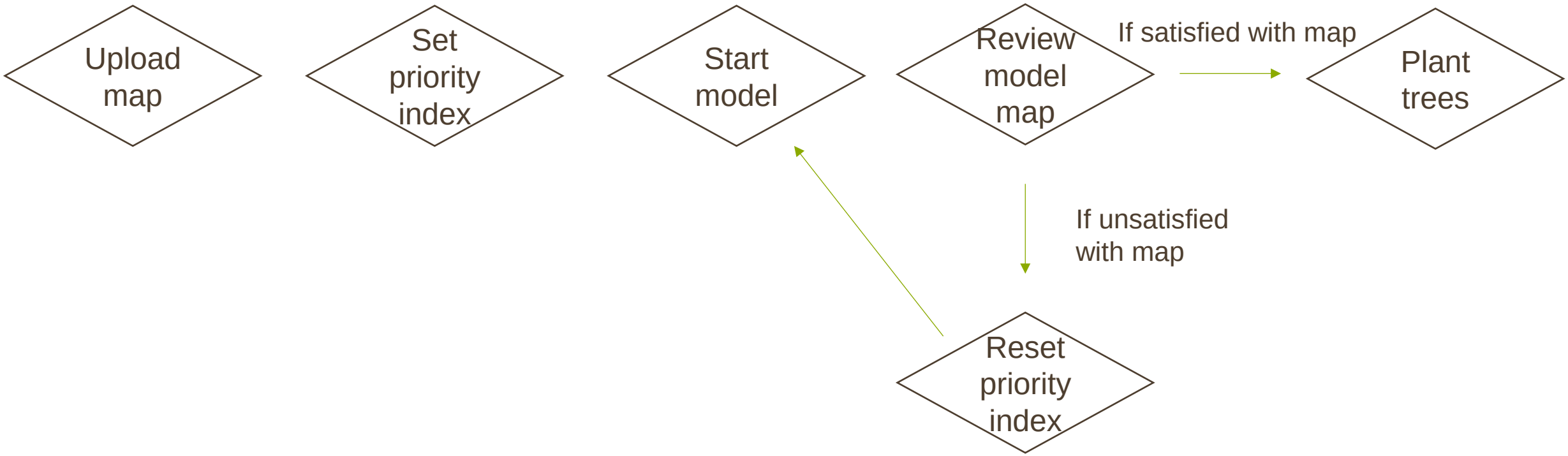


User Interaction

The model would prompt the user to enter the following information:

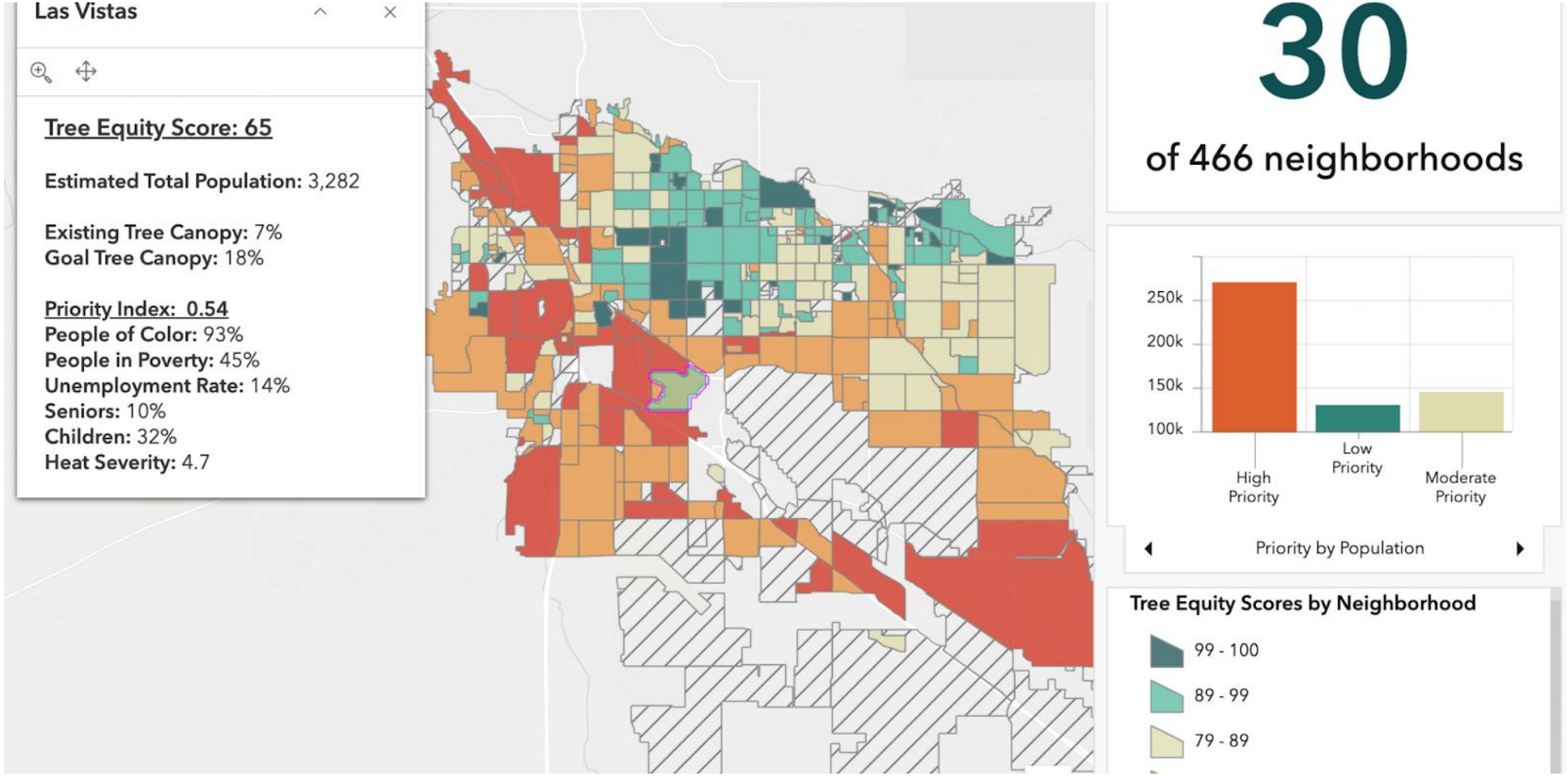
- where temperature decreases are wanted
- how much they want the temperature to be decreased
- what factor(s) should be prioritized:
  - cost
  - water usage
  - most people affected

User Flowchart



Example:

This is the Tucson Million Trees Dashboard. My program would have a similar display, only it would have additional information.



Open Questions

Future questions to explore:

- how accurate this program would be
- if something like this has been attempted before
- if it would be more effective than current solutions

Works Cited

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