

# Temporal Distance Map

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Access to  
Web  
ApplicationQR Code  
Access to the  
github  
repository

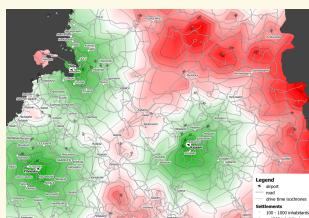
## Abstract

The temporal distance map developed by Blake Albert, Christian Panici, and Nigel Castelino sought to give end users the ability to visualize maps based on the time needed to travel to different points from a center point. The project was largely a success; however, the efficacy to the project's public access and appeal is called into question based on the usage of the Mathematica and Wolfram API, so in order to make the map more accessible this project aims to make a temporal distance map using free code and APIs provided by the python language and Bing Maps API respectively. This in turn allows a wider audience to enjoy the unique visualization of maps based on travel time, rather than physical distance.

## Background & Influence

### Why is our map different?

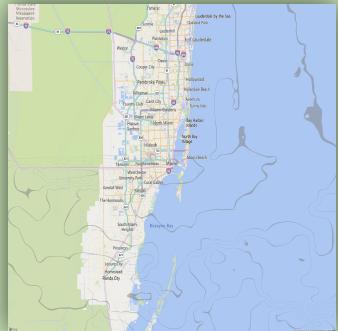
It is a relatively novel idea to display an area in relation to its travel time. For instance, isochrone maps depicted below attempt to showcase travel time using varying color. However, the temporal distance map serves to illustrate these distances in a much more visually apparent manner.



**Example of an Isochrone map:** A map that serves to portray travel time using color

## Acknowledgements

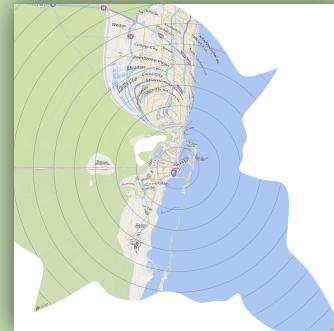
Our deepest thanks to Blake and Christian for taking the time out of their day to assist us on the translation of the code-base, as well as to the Microsoft Bing Maps Developer Sales team for allowing us to use their API under an educational/non-profit account.



### Untransformed Map of Miami

#### Map of Miami with Contours

Each contour represents all physical distances that are 15 minute intervals away.



### Transformed Map of Miami

#### Map of Miami transformed to display proportionate travel time within Miami

The previous contours form concentric circles to aid visualization of travel time.



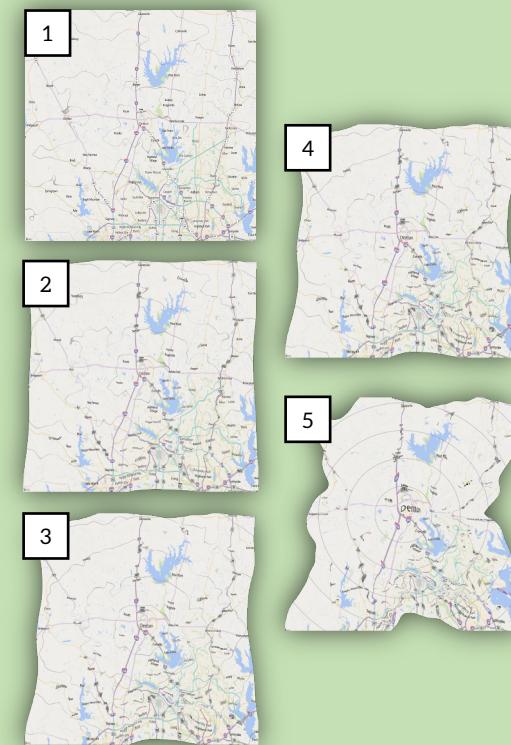
**Transformation Maps of Various Areas**  
Transformed versions of Los Angeles, London, and Washington D.C.

Each area shifts based on the travel obstacles in the area

## Animation Frames

Frame-by-Frame depiction of the transformation of the DFW metroplex centered on the University of North Texas

The contours slowly begin to align while the map forms to fit the newly created concentric circles.



## Method

1. Select a central coordinate and grab a static map of the region
2. Create a mesh of points
3. Use the Bing Distance Matrix to calculate travel time from the center to each point
4. Move the mesh of points to align with their travel time
5. Utilize the resulting mesh to transform the original static image

## Impact

- Allows people to visualize maps based on travel time
- Gives visual feedback to those in EMT services the shortest routes needed
- Gives visualization to those in the commercial sector of the shortest paths for things like shipping routes
  - This especially comes in handy during times of emergency like the 2020 COVID-19 virus outbreak
- The free nature of the code allows anyone to change it based on their specific needs with little to no effort