M. F. Carrasco-Harris

February 7, 2020

A Greener Justice

Introduction

Access to green space in urban areas improves human health and wellbeing, community engagement, and urban biodiversity. However, poorer neighborhoods tend to have less access to parks and green spaces, creating ecological injustice that further hinders low-income residents experiencing the same urban amenities richer neighborhoods have. Yet, neighborhoods tend to gentrify if land use changes and parks or green space are incorporated. Hence, the solution may unintentionally push out the residents the park was meant to serve. An alternative may be to create pocket parks.

Pocket parks are small parks that reutilize abandoned urban space (i.e., vacant lots, old fields). The primary goal is to provide a safe and comfortable public location where neighbors can be outside and engage with others. Pocket parks that incorporate native landscaping may also attract local fauna (birds, lizards, insects) to use the space, increasing urban biodiversity. The requirements can vary drastically in terms of initial cost, recurring maintenance, and function. For example, parks can be landscaped completely if in a vacant field, or only include potted plants if the park is situated between buildings. Some neighborhoods may maintain community gardens within the park. Pocket parks may provide similar functionality as a community center, but have the added benefits from bringing residents outside. Further, for mid- and large-size cities that are already overdeveloped, they may be the most cost-effective solution.

Memphis is a mid-size city located off the Mississippi River in Shelby County, Tennessee, USA. It is the second largest city in the state, with a population of over 650,000 residents, and over 1,300,000 in the metropolitan area. Memphis grew quickly during the 1930s—1970s, expanding east from the Mississippi. Memphis played a prominent role during the Civil Rights era, and the repercussions of its dark antebellum history can be seen in the racial, civil, and educational inequalities. Like many other cities, the rapid expansion and complicated history of segregated housing developments (red-lining) have lead to distinct differences between neighborhoods in the city.

The general goal of this project is to provide data that would be used by urban planners, city stakeholders, politicians, and community members to jointly decide and advocate for more outdoor recreational opportunities in the form of pocket parks. The first objective will be to use the Foursquare venues category to determine the location of parks and outdoor recreational features in Memphis. I will also consider community center locations, and I will segment neighborhoods using machine-learning techniques to determine priority areas for pocket parks.

Data

Data was collected from various online sources. Memphis neighborhoods and their 5-digit zip codes were acquired from TripSavvy.com. Memphis zip codes can be found in many places, but citizens frequently identify with their neighborhood name more than their number, hence neighborhoods grouped into zip code was important to help characterize the dataset. Although Memphis is a large metropolitan areas, only neighborhoods within and adjacent to the I-240 highway loop were retained.

Foursquare location data was used to acquire venues by their zip code/neighborhood location. Outdoor recreational features (venue categories) in Memphis included parks, trails, rivers, scenic lookouts, playgrounds, and gardens. Other venue categories were used to characterize the neighborhoods in clustering techniques. Community center data was also acquired from data.memphistn.gov. The center name and its zip code for neighborhoods of interest were kept.

Methodology

A map was created to better visualize the neighborhoods of interest and to determine the appropriate radius for the Foursquare venue search. After some iterations of radius size, it was determined a radius of 1,500 meters would be appropriate, as this would reduce the overlap in zip code areas, in particular in the Western portion of Memphis, and is also a reasonable walking or travelling distance (Fig. 1). Zip codes were maintained in the entire dataset because some neighborhoods (in particular suburbs and Eastern Memphis) cover multiple zip codes. Venues were grouped by their neighborhood/zip code and the count data for total venues was reviewed. A dataframe containing the top ten venues per neighborhood/zip code area was created to evaluate the most popular venues.

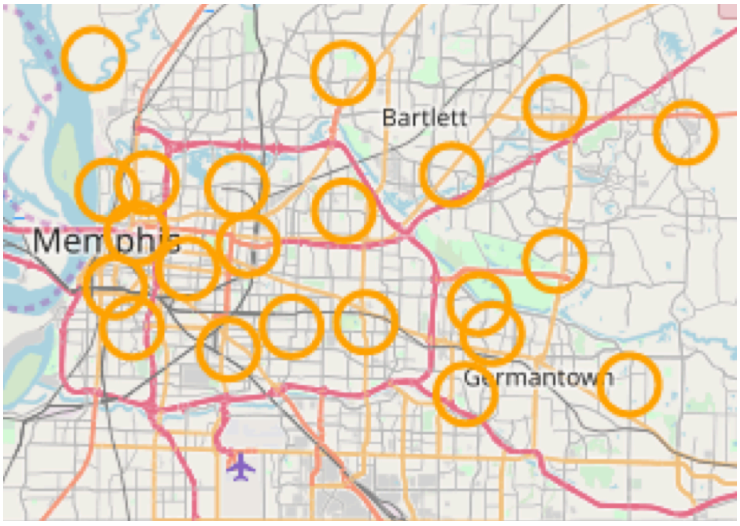

Fig 1. Memphis neighborhoods of interest represented by yellow circles (radius – 1,500 m).

Neighborhoods with and without parks were of interest, so a dataframe containing only neighborhoods that contained some type of outdoor recreational feature were created. After reviewing the features within the 198 categories, outdoor features

included: park, trail, scenic lookout, outdoors & rec, garden, and dog run. Since community centers are also places that neighbors can engage, community centers were included in the dataset and grouped by their zip code to determine how many there were per zip code area.

Communities without parks were isolated, and the mean for all categories were used in Kmeans clustering using Scikitlearn to group neighborhoods into one of four clusters. Communities were also clustered by the location of their non-park venues using DBSCAN.

Results

Grouping of initially acquired data showed that some neighborhoods in Memphis have many more venues on Foursquare than others (i.e., Midtown – 100, Frayser – 1). This suggests the data is biased. Frayser is a large community with restaurants and neighborhood amenities. However, areas like Midtown and Downtown are popular with tourists and more likely to have Foursquare activity. Whereas suburbs like Germantown are less likely to have active Foursquare users. Nonetheless, I continued with the dataset.

Table 1. Neighborhoods in Memphis, TN.

Neighborhoods with no parks	Number of Community Centers	KMeans Cluster	DBSCAN Cluster
Cordova	0	0	0
Midtown	0	0	1
North Memphis	3	2	1
Kingsbury	2	3	1
University of Memphis Area	1	0	1
Orange Mound	2	0	1
East Memphis	0	0	2
Berclair	2	0	3
Frayser	2	1	-1
Raleigh	2	0	4
Bartlett	0	0	5

There were 198 unique venue categories represented among the twenty-two neighborhoods queried in Memphis. There were 11 neighborhoods that had parks and 11 that did not have parks represented in the Foursquare location data set (Table 1). Several of those neighborhoods also did not have community centers listed on the Memphis government website. Based on Figure 2, it appears that most community centers are centered within the I-240 highway loop. There are eleven areas with community centers, and seven of those have no park (Table 1; Fig. 2).

The most common cluster (0; Table 1) was characterized by having many restaurants. The other clusters were singlets. Cluster 1 included only Frayser, which only had one venue listed in Foursquare (Disc Golf). In reality, Frayser has various restaurants and would probably be better classified the main cluster. Cluster 2 included Golf course and a basketball court, distinguishing features but not community amenities

that are free. Cluster 3 had the Zoo as its 7th most common venue (there is only 1 zoo in Memphis), which is free to Tennessee residents part of the year.

Results of a DBSCAN geographical cluster analysis shows that Cordova, Bartlett, East Memphis, Frayser, and Berclair, and Raleigh have venues that are relatively geographically isolated (Table 1). As expected, there is more geographic connection within the loop neighborhoods since their areas are smaller.

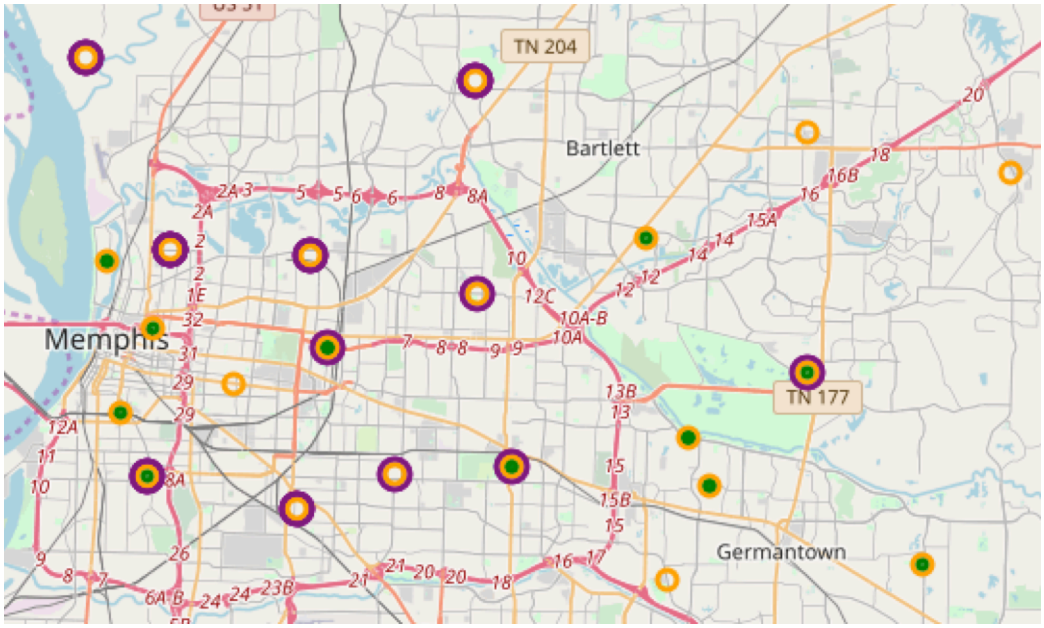

Fig 2. All Memphis neighborhoods represented by yellow circles. Neighborhoods with parks (1,500 m radius) in the Foursquare location data have a green inner circle. Locations with community centers have a purple outer ring.

Discussion

The goal of this capstone project was to characterize Memphis neighborhoods and determine the best places for pocket parks. Based on the location data from Foursquare, community data from the government, and the results of Kmeans and DBSCAN clustering, it appears that there are several areas in Memphis that would be good candidates for pocket parks. Berclair appears to be geographically isolated from the rest of the group, although the area is best characterized by food venues (in particular Mexican restaurants). It has no parks but several community centers. Pocket parks in vacant lots would improve the community's access to outdoor recreational activities. In fact, the neighborhood has been trying to add a green median to a busy road to draw neighbors, but the business of the road detracts from the appeal.

According to the results, Cordova, Bartlett, and East Memphis would be good areas for pocket parks because they do not have community centers, and are each a distinct

geographical area. It should be noted, however, that these areas in Memphis do have parks that are not accounted for within the Foursquare location data (and are clearly visible in the map as green spaces. Frayser is also geographically isolated and appears to be a community that would benefit from pocket parks to enhance the community amenities that are already there (2 centers).

According to these analyses, midtown may be the best place for pocket parks because there are no parks and no community centers. Further, it is geographically clustered to other neighborhoods, which means potential users could come from other nearby areas that also don't have parks, such as residents from the University of Memphis area. Although midtown has many venues, these are often venues where residents must make a purchase to enjoy the venue, making it inherently geared towards those with more disposable income.

Conclusion

Some neighborhoods have been identified as potential candidates for pocket parks, which would improve community member's wellbeing and engagement. These include Cordova, Midtown, East Memphis, and Bartlett, as well as a few others. However, limitations should be noted. The Foursquare API was not the ideal database for park location data in Memphis. Future studies should select a more appropriate database for this type of study. Further, other datasets such as income by zip code would enhance the ability to make inferences to neighborhoods that would be benefit from more from pocket parks. Lastly, a dataset that pinpoints vacant land or public lots would provide specific locations in which stakeholders could develop pocket parks. Nevertheless, there are many areas in Memphis where pocket parks would be of value to the residents.