

A smartphone app selecting locations for city cleaners

Group member:

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Background of app design

- Serious situation for the government fighting against littering
- Limited number of cleaners working for the city
- Eager to find elaborated methods to increase cleaner's efficiency
- Citizens' awareness of keeping the city clean
- 311 Calls for littering: a good resource for data analysis



[Plot Link:](https://publicworks.baltimorecity.gov/solid-waste)

<https://publicworks.baltimorecity.gov/solid-waste>

Data source of our app

Data implemented in the app so far:

1. Daily 311 call data of Baltimore City for littering [available online](#)
2. Google Map API used to determine the location of reported litters

	SRRecordID	ServiceRequestNum	SRTYPE	MethodReceived	CreatedDate	SRStatus	StatusDate
1	5004M00000ZwOmQAN	19-00711545	TRM-Street and Crosswalk Markings	Phone	10/21/2019 11:49:49 AM	Open	10/21/2019 11:50:08 AM
2	5004M00000ZwOMIQAN	19-00711544	ECC-Information Request	Phone	10/21/2019 11:49:46 AM	New	10/21/2019 11:49:45 AM
3	5004M00000ZwOMdQAN	19-00711543	ECC-Information Request	Phone	10/21/2019 11:49:42 AM	New	10/21/2019 11:49:42 AM
4	5004M00000ZwOMTQA3	19-00711542	SW-Dirty Alley	Internal	10/21/2019 11:49:33 AM	New	10/21/2019 11:49:33 AM
5	5004M00000ZwOM4QAN	19-00711541	SW-Bulk Scheduled	Phone	10/21/2019 11:48:51 AM	New	10/21/2019 11:48:51 AM
6	5004M00000ZwOLpQAN	19-00711540	ECC-Information Request	Phone	10/21/2019 11:48:43 AM	Closed	10/21/2019 11:48:42 AM

ZipCode	Neighborhood	CouncilDistrict	PoliceDistrict	PolicePost	Latitude	Longitude	GeoLocation
21215	Mondawmin	7	Western	NA	39.3181508270367	-76.6523595419497	(39.31815082703674, -76.65235954194969)
NA		NA		NA	NA	NA	
NA		NA		NA	NA	NA	
21224	Patterson Park Neighborhood	1	Southeastern	NA	39.2934775451335	-76.5707896672377	(39.29347754513347, -76.57078966723772)
21206	Cedonia	2	Northeastern	NA	39.3343309898252	-76.5353533356622	(39.33433098982521, -76.53535333566221)
NA		NA		NA	NA	NA	

Tidy data

- Select rows related to street cleanliness
- Pick up columns “SRRecordID”, “StatusDate”, “GeoLocation”
- Obtain the distance between each pair using Google Map API

Input, Output & Flow of experience

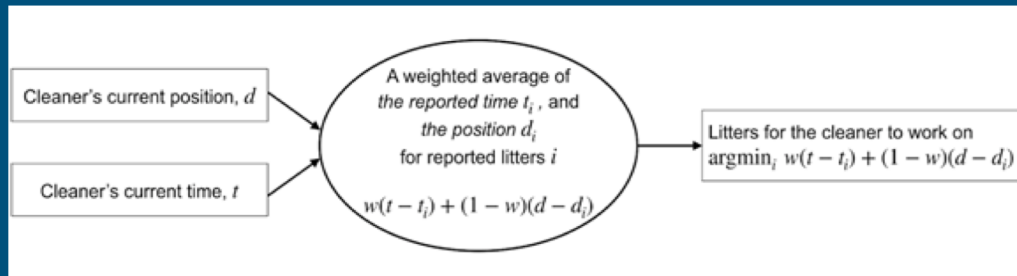
Data input:

- User's current location
- User's current time

Output of our app:

- Current location (green triangle)
- Recommended next work location (red star)
- All other work location (yellow dot)

Flow of Experience:



Ways to collect/present data

- Collect 311 call data from the local government database every day
- Set up Google Map API for obtaining location information or enabling navigation for cleaners
- Use Greedy Algorithm to search for a reported litter on file balancing urgency (t) and distance (d)
- Navigate the cleaner to the reported litter location via Google Map API data

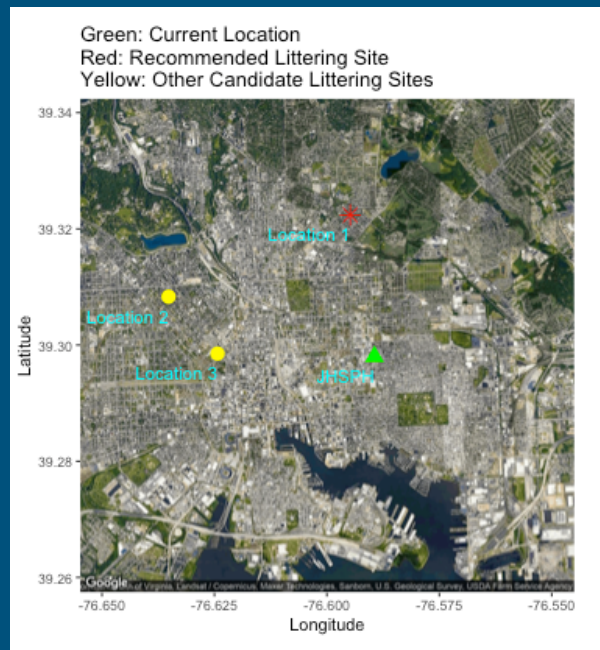
Our Goal: Reduce 311 calls of littering in Baltimore City by 5% each year in the next 5 years

Target audience: city cleaners

Use case

A Shiny App: https://erjiacui.shinyapps.io/data_sprint/

- Suppose cleaner starts his/her work at JHSPH
- Every time one work is finished, update current location and current time to get next recommended work location
- May have new littering sites as time goes by



Discussion: How the app may fail

- The internet may fail in some locations at the city (metro stations, etc.)
- Cleaners may not have their smartphones available all the time at work

Annual budget

Fixed cost

- Server: \$1000/yr
- Maintenance: \$500/yr
- Location: \$2400/yr
- Technician salary: $\$1000/\text{mo} * 12 \text{ mo} = \$12000/\text{yr}$
- Number of technician: 2

Variable cost

- Google Dynamic Maps price per thousand inquiries: \$5.6
- Estimated volume of inquiries : 300,000

Total cost: \$29580/yr

Thank You!

