

sdmay19-18: Real time Route Optimization

Report 1

January 15 - February 15

Team Members

Junjie Wen — *Backend Developer; Data Analytics Lead*

Zhanghao Wen — *Web Developer*

Yuhang Xie — *Web Developer; UI Lead*

Xinhe Yang — *Web Developer*

Tianhao Zhao — *Communication Leader; Technical Writing*

Summary of Progress this Report

1. Currently we are able to display raw data from server directly without any storage and analysis process, and display the data after analyzed the raw data, which requires both backend computation and front-end display.
2. We finish up manager's view on map: they can access all types of information including history data points showing on the map.
3. Initial molding for front-end display to access analyze historical data, which allows user to pick specific data range to get information needed.
4. Analyze real situation and practical meaning of our project – how our products can help fleets performance.



This is our record functions of our project. It can record location history records diminish over a certain time. Those history data store on the backend database. We can just click the export history button and select the range of time then a record page will show up with history moving path on google map. The reason it looks very disordered because we are using the simulator data to display. We will try to use the real data to replace it after we get the actual data from client.

Pending Issues

- Actual data and data range:
Actual data will be given but not sure when. And the data will not be live data. Recently we are working on pass simulated data to front end and store them into database in the server as well as analyze those data and improve front end search feature which allows users to search information based on picked date range.
 - Location history records diminish over a certain time (eg. after 1 yr)
 - Mark road task done/undone (color)
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Plans for Upcoming Reporting Period

492 Timeline	Date/Task	Major Events	Test	Implementation	Meeting Discussions/Decisions	All Tasks list
4-Feb	Week 4			Color identification(road task done/undone)	functionality requirement	Color identification(road task done/undone)
11-Feb	Week 5		Designing test scenarios	road temp, weather conditions		road task reappear with calculation
18-Feb	Week 6			truck speed and other algorithms		road temp, weather conditions
25-Feb	Week 7	Meeting with Client		test plan		truck speed and other algorithms
4-Mar	Week 8			road task reappear with calculation		suggestion ways of using materials
11-Mar	Week 9			suggestion ways of using materials		truck materials capacity(runtime on material)
18-Mar	Spring Break			truck materials capacity(runtime on material)		refine display
25-Mar	Week 10			test and analyze the result		test plan
1-Apr	Week 11			refine display		test and analyze the result
8-Apr	Week 12					
15-Apr	Week 13	Final Poster Due 4/15				
22-Apr	Week 14					
29-Apr	Week 15	Final Report Due 4/30				

Figure: Timeline

Design new algorithm and data analysis based on new information provided by client.

Make data simulator more authentic and realistic.

Organize and store result of analysis into database.

Q1. Threshold of the amount of snow on road and judging criteria

Based on the “general recommendations for deicing” from <<Municipal Snow and Ice Control>> (This is a resource the APWA (American Public Works Association) published for municipal snow and ice control), the specific threshold is unsure and determined by supervisor. Here are two forms for decision making.

CITY OF WEST DES MOINES
DEPARTMENT OF PUBLIC WORKS

SNOW AND ICE CONTROL PROCEDURES

RECOMMENDED USE OF DEICERS

Pavement Temperature	Type of Precipitation	Road Surface Condition	Plow	Salt/Deicers
Near 30°	Sleet/Freezing Rain Snow	Wet Pavement/Icing Slush	No Yes	In most cases (Supervisor Discretion) In some cases (Supervisor Discretion)
20°- 30°	Sleet/Snow	Slush/ Snow	Yes	In most cases (Supervisor Discretion)
15°- 20°	Snow	Dry Pavement/Slick Areas	Yes Yes	In most cases (Supervisor Discretion)
Below 15°	Snow	Dry Pavement	Yes	Supervisor discretion. May cause additional accumulations on some pavement surfaces.

These rates are not fixed values, but rather the middle of a range to be selected and adjusted by an agency according to its local conditions and experience.

Pavement Temp. (°F) and Trend (↑↓)	Weather Condition	Maintenance Actions	Lbs/one-lane mile			
			Salt Pre-wetted/ Pretreated With Salt Brine	Salt Pre-wetted/ Pretreated With Other Blends	Dry Salt*	Winter Sand (abrasives)
>30° ↑	Snow	Plow treat intersections only	80	70	100*	Not Recommended
	Frz. rain	Apply Chemical	80	70	100*	Not Recommended
30° ↓	Snow	Plow & apply chemical	80	70	100*	Not Recommended
	Frz. rain	Apply Chemical	150	130	180*	Not Recommended
25-30° ↑	Snow	Plow & apply chemical	120	100	150*	Not Recommended
	Frz. rain	Apply Chemical	150	130	180*	Not Recommended
25-30° ↓	Snow	Plow & apply chemical	120	100	150*	Not Recommended
	Frz. rain	Apply Chemical	160	140	200*	400
20-25° ↑	Snow or frz. rain	Plow & apply chemical	160	140	200*	400
20-25° ↓	Snow	Plow & apply chemical	200	175	250*	Not Recommended
	Frz. rain	Apply Chemical	240	210	300*	400
15-20° ↑	Snow	Plow & apply chemical	200	175	250*	Not Recommended
	Frz. rain	Apply Chemical	240	210	300*	400
15-20° ↓	Snow or Frz. rain	Plow & apply chemical	240	210	300*	500 for frz. rain
0-15° ↑↓	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	300	Not Recommended	500 spot treat as needed
< 0°	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	400**	Not Recommended	500 spot treat as needed

*Dry salt is not recommended. It is likely to blow off the road before it melts ice.

**A blend of 6-8 gal/ton MgCl₂ or CaCl₂ added to NaCl can melt ice as low as -10°.

Q2 Example of the priority for clearing streets

The information about each road with its corresponding priority and length can be given and so the amount of materials needed to clean roads could be calculated. At the current point we may think about load in all needed data from book menu to database and make all decisions electronically.

**CITY OF WEST DES MOINES
PARKS DEPARTMENT**

SIDEWALKS AND TRAILS

Priority	Location	Approximate Length (feet)
1.	A. City Parking Lot-200 Block 4th Street	310
	4th Street	260
	Elm Street	350
	Pedestrian Walkway to 5th Street	
	B. City Parking Lot-200 Block 6th Street	
	6th Street	250
	Pedestrian Walkway to 5th Street	290
	C. City Parking Lot-100 Block 6th Street	
	6th Street	
	Pedestrian Walkway to 5th Street	100
D.	City Parking Lot-100 Block 4th Street	290
	4th Street	
	Pedestrian Walkway to 5th Street	
	E. City Parking Lot-300 Block 6th Street	
	6th Street	
2.	School Crossing Guard Locations:	
	Clear guard parking areas and sidewalk access to street at all corners	
	A. 8th Street & Ashworth Road	
	B. 8th Street & Grand Avenue	
	C. 8th Street and Vine Street	
	D. 22nd Street and Ashworth Road	
	E. 50th Street and Ashworth Road	
	F. 50th Street and Woodland Avenue	
	G. Valley West Drive and Giles/Western Hills	
	H. 39th Street and Western Hills Drive	
	I. 56th Street and Highland Court	
3.	Ashworth Road Pedestrian Bridge/I-35	
4.	Ashworth Underpass & Sidewalks	5,715
5.	Knolls/Crossroads Trail (S. of Aspen to Crossroads School)	
6.	50th Street Trail (Crossroads School to I-80)	
7.	Prairie View/E.P. True Parkway Area	
8.	S. 35th Street, Sidewalk & Trail	
9.	Mills Civic Parkway Trail/Sidewalk-- Law Enforcement Center to 60th Street	
10.	Mills Civic Parkway Underpass	
11.	Mills Civic Parkway –Sidewalk along Ashawa Park	

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Junjie Wen	Store truck simulator data on database and create a record API for front-end	11	11
Zhanghao Wen	Analyze documentation from client and provide us about Threshold of the amount of snow on road and judging criteria	10	10
Yuhang Xie	Create record page to display history of truck's path on google map in range of time	12	12
Xinhe Yang	Design the History route record page and display it on Google Map, which was appeared on the main page	10	10
Tianhao Zhao	Negotiate needs between team, advisor and client. Provide project functionalities for the team and corrections for projects	10	10