







Faculty of Computer Science Workflow Systems and Technology Group

# Visual analytics and sonification for data analysis

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### **Data Transformation and Preparation**





### **Improve Filtering Speed: Materialized Views + Functions**







### **Visualization + sonification**





#### Static mode

- Visualization: Details on individual accidents for selection, e.g.
  - Location (circle position)
  - Number of injured/killed: circle size/opacity/frame thickness
  - Involved factor: fill color
  - Motorist/bike/pedestrian involved: circle frame color
  - Detailed data on click
- Sonification: Acoustic summary of current display (selected time frame, applied filters), for example:
  - Number of injured/killed for current selection: pitch range of continuous sine wave





#### Animation mode

Both modalities: details on individual accidents

- Visualization: same data as in static mode
  - Focus: location/severity/type of accident
- Sonification: number of injured/killed for current accident: mapped to continuous sine wave & pitch of short acoustic notification
  - Focus: development over time: severity and temporal distances between accidents, distribution over day/night cycle...





#### Are there accident-free/exceptionally safe roads?







#### **Alternative:**

• SQL query: compare all streets with accidents to street DB Visualization possible (not implemented)





Where are the most dangerous spots?







#### What factors have the biggest influence on accident probability?



#### motorist killed 0/0

### Factors

103,474 Driver Inatiention/Distraction   43,426 Faigued/Drowsy   37,700 Failure to Yield Right-of-Way   29,411 Other Vehicular   23,500 Backing Unsafely		635,644 Unspecified
43,426 Faigued/Drowsy   37,700 Failure to Yield Right-of-Way   29,411 Other Vehicular   23,500 Backing Unsafely	103,474	Driver Inatlention/Distraction
37,700 Failure to Yield Right-of-Way   29,411 Other Vehicular   23,500 Backing Unsafely	43,426	Fatigued/Drowsy
29,411 Other Vehicular 23,500 Backing Unsafely	37,700	Failure to Yield Right-of-Way
23,500 Backing Unsafely	29,411	Other Vehicular
	23,500	Backing Unsafely
20,452 Turning Improperty	20,452	Turning Improperly
19,011 Lost Consciousness	19,011	Lost Consciousness
15,099 Prescription Medication	15,099	Prescription Medication
11,156 Traffic Control Disregarded	11,156	Traffic Control Disregarded
10,888 Driver Inexperience	10,888	Driver Inexperience
9,236 Outside Car Distraction	9,236	Outside Car Distraction
8,803 Physical Disability	8,803	Physical Disability
8,528 Pavement Slippery	8,528	Pavement Slippery
6,412 Alcohol Involvement	6,412	Alcohol Involvement
6,289 Following Too Closely	6,289	Following Too Closely
5,182 Oversized Vehicle	5,182	Oversized Vehicle
4,551 Passenger Distraction	4,551	Passenger Distraction



Can you observe an unusual/significant increase or decrease in accidents anywhere? What actions or events caused it?







Weekdays







#### **Related Intersections (Top 25)**

- TILLARY STREET: 676
- FLATBUSH AVENUE EXTENSION: 675



## **Project Description**



picture to commercial investors in spite of the exceptional access to public transit, its key location across the river from Lower Manhattan and rising housing prices.

Studies have shown that better streets and quality public space result in greater retail activity – research in London showed consumers who walked to retail spent over 40% higher than those traveling by car. Clearly the walking environment offers the key to Brooklyn's future. In nearby Bryant Park, in Manhattan, major reconstructions led that area to outperform surrounding property markets by up to 225 percent.

#### **Project Schedule**

	Start	End
Planning/Scope Development	June-06	November-09
NEPA	November-09	June-10
Preliminary Engineering	June-10	December-10
Final Design	December-10	May-11
Federal Approval of Plans, Specifications and		
Estimates	June-11	June-11
Procure Contractor	.luly-11	December-11
Construction	December-11	June-13

#### Estimated Job Creation through Project

This preject is actimated to preduce 040 jobs through primary applearment on the preject.



Can you observe an unusual/significant increase or decrease in accidents anywhere? What actions or events caused it?

Cluster #4482: increase in accidents



















#### Increasing number of accidents



**Related Intersections (Top 25)** 

JAMAICA AVENUE: 415

- PENNSYLVANIA AVENUE: 339
- BUSHWICK AVENUE: 74

Off Street Adresses (Top 25)

80 JAMAICA AVENUE: 3



#### What could the city change or improve?

- Look at most dangerous clusters → usually intersections and/or crossing of speedway and normal road
  - Measures like Flatbush Avenue Extension/Tillary Street improvement
    - Simplify street geometry
    - Create protected space for pedestrians and cyclists (widened sidewalks, removed lanes etc)





#### What should drivers do differently?

- Pay attention especially at dangerous intersections and/or dangerous weather conditions (factor "pavement slippery" in January …)
- Further recommendations difficult due to incomplete factor data





#### Interesting facts:

• Weekdays in relation to deadly accidents





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Weekdays











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### NYC Accident Explorer

Filter accidents by typing here...

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Casualty Type: motorist\_killed



#### Timeline



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Weekdays





Factors (Top 20)

Vehicle Types



#### **Vehicle Types**

		558,217	PASSENG
	257,654		SPORT U
87,188	_		UNKNOW
53,406			TAXI
42,497			VAN
37,907			OTHER
23,695			SMALL CO
22,196			PICK-UP 1
22,160			BUS
21,078			LARGE C
20,631			BICYCLE
14,500			LIVERY V
8,055			MOTORC
3,058			AMBULAN
1,174			FIRE TRU
468			SCOOTER
120			PEDICAB

# NGER VEHICLE UTILITY / STATION WAGON DWN COM VEH(4 TIRES) IP TRUCK COM VEH(6 OR MORE TIRES) \_E VEHICLE RCYCLE ANCE Why no police cars? RUCK ſER

### **Time of Day**





#### Things we would have liked to implement:

- More data sources
  - bicycle parking stations
  - subway exits
  - public events
  - ...
- Integration of visualization/sonification and explorer
- Menu for mapping of data to visual/acoustic properties
- More charts and graphics
- More sophisticated sonification





#### Thank you for your attention!

Try it yourself:

Explorer:

#### http://btw.lab.indygemma.com/conrad/explorer

Visualization/Sonification: http://btw.lab.indygemma.com/tobias/vis (Careful: large time frame selection may lead to performance problems and browser crashes, best performance with Google Chrome)

