

# **PAROS: Pareto Optimal Route Selection**

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### **Contribution:**

- Compute route skyline queries on traffic network graphs by using multiple road attributes like distance, time, height, amount of traffic lights, crossings, etc.
- Analyze the algorithm and resulting routes in terms of benchmark information like runtime , amount of visited nodes, total nodes in skyline paths and all attributes of the search
- Visualize the resulting attribute weightings for each route for up to three attributes using simplex controls
- Visualize resulting routes on real world maps
- Fast painting of large graphs as map overlay to indicate possible connections



#### Architecture:

- Pluggable architecture that allows the easy extension and integration of algorithms into the graphical user interface with a minimum overhead
- Easy integration of any Web Map Service (WMS) (like NASA, OpenStreetMap, ... ) for map visualization



## Data (OpenStreetMap):

 Topologically Integrated Geographic Encoding and Referencing system (TIGER), produced by the US Census Bureau

### **Data conversion and Enrichment:**

- Extraction and conversion of relevant sub maps from OpenStreetMap XML into PAROS data format for more reasonable handling of big data
- Conversion of OpenStreetMap ways into subsections for more efficient routing
- Elevation data from the Shuttle Radar Topography Mission (SRTM) to achieve a full 3d profile for routing (Resolution: ~90m x 90m with a deviation of ±6m)





- Data entered from more than 250,000 users worldwide (GPS tracks, points of interest, street names, house numbers, more streets, one way restrictions, ...)
- Various additional attributes like type of street, number of lanes, speed restrictions, bridges, tunnels, barriers, points of interest (schools, museums, libraries, atm, banks, doctors, parking lots, street names, house numbers, ...)

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20	2,0700 NII	0,0095 H	30,9900 m		Key				Value	Value			
20	3,2515 NH	0,0701 H	90,2720 III		# of podes in paths				98 / 949	987949 = 10%			
20	1,9540 km	11, 17,33 D	31,5300 m		# of notes in poors				40	40			
28	1,6939 KM	U,1741 N	32,4100 m		# of points	# of veference points				10			
29	3,4624 km	0,0712 h	98,1920 m										
30	2,0069 km	0,0948 h	32,1900 m		# of visited	# of visited nodes				/03 / 949 = /4%			
31	3,4992 km	0,0754 h	98,1920 m		Runtime				1.425 m:	1.425 ms			
32	2,0952 km	0,1061 h	29,8500 m										
33	1,6730 km	0,1699 h	32,4100 m										
34	3,2237 km	0,0740 h	98,2720 m		Path Statistics								
35	3,4844 km	0,0681 h	98,1920 m		Path:	26	27	28	29	30	31	32	
36	2,0566 km	0,0891 h	31,1100 m		NODES	22	10	18	44	17	43	10	
37	1,6889 km	0,1577 h	35,9100 m			1	17	10		17	т <u>л</u>		
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39	1.7310 km	0.1548 h	33.9300 m	<b>×</b>									
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