Project 3 / Network Vis

CS 6965 - Advanced Data Visualization

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How to view the project:

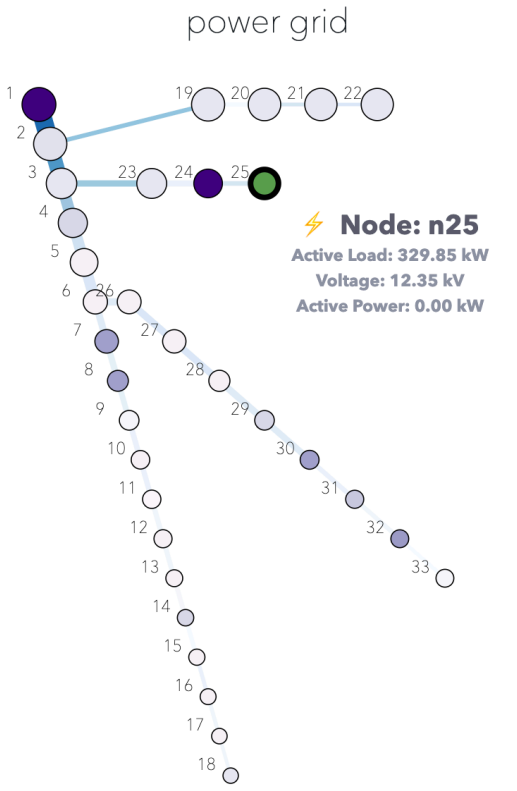
- Launch the project using python:

```
$ cd path/to/power-trans-network
# for python 2
$ python -m SimpleHTTPServer 8080
# for python 3
$ python -m http.server 8080
```

- Project is on GitHub, but is currently in a private repository to protect the data. Once we are allowed to make this public, the project will be served via GitHub pages at this url: https://mkcyoung.github.io/power-trans-network/
- A demo video is also attached.

Visualizing power system network

The power net was visualized using a simple node-link graph design which preserved the connectivity of the data provided. The nodes are power stations and the links are the lines connecting them.

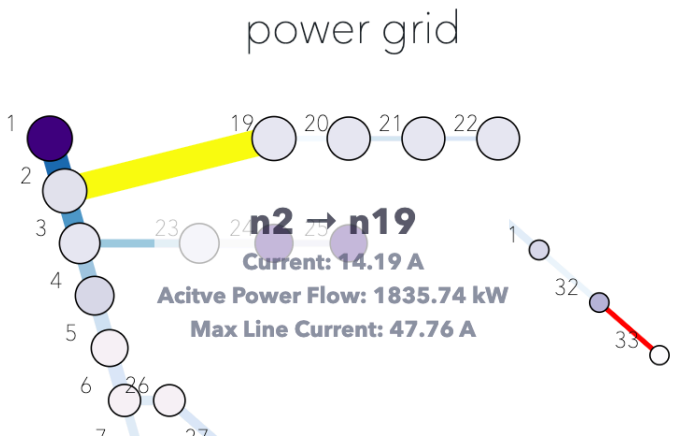


Node feature encodings:

- Size of circle: The voltage value of the station (kV)
- Color: The active load of the station (kW)
- Tooltip: On mouseover, a tooltip appears containing all of the metrics of that station. If the node is a charging station, a lightning bolt appears next to the name, and the corresponding node in the trans network is also highlighted.

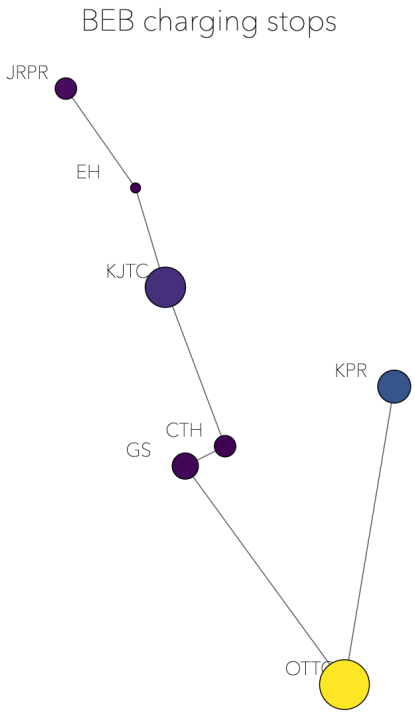
Link feature encodings:

- Line thickness: Current (A)
- Color: active power flow (kW)
- Tooltip: On mouseover, the line is highlighted yellow, and a tooltip appears listing all of the features for that line.
- Red highlight: If the current reaches 90% of the max line current, then the line changes to red.



Visualizing transportation system network

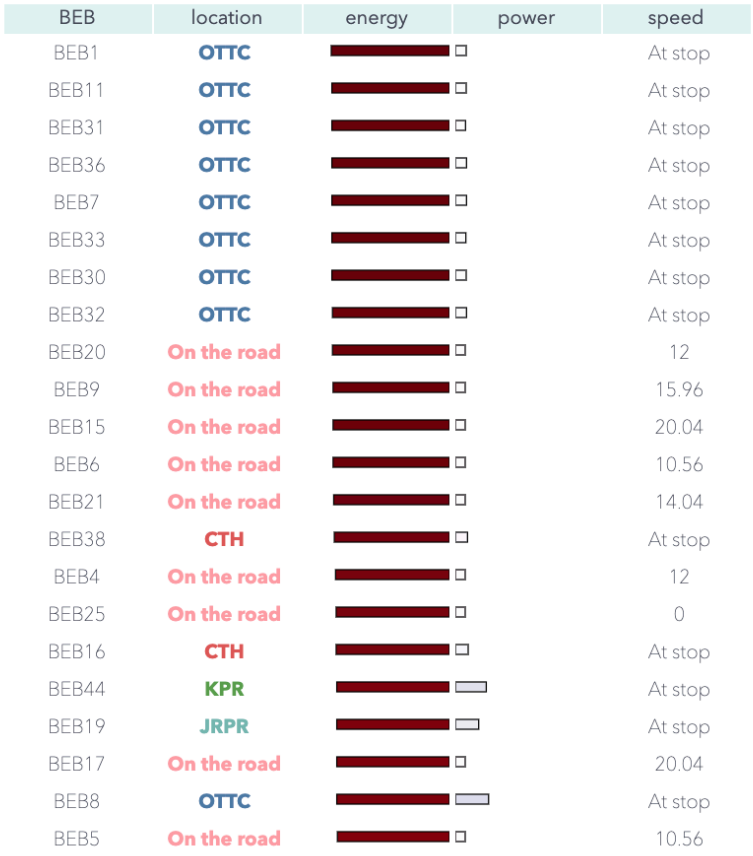
Similar to the power network, the transportation network was visualized using a node-link graph. The nodes here are the 7 BEB charging stops, and the links are the connections between them, which can roughly be interpreted as the roads connecting them. The layout of the graph was intended to mirror the actual layout of the stations in park city.



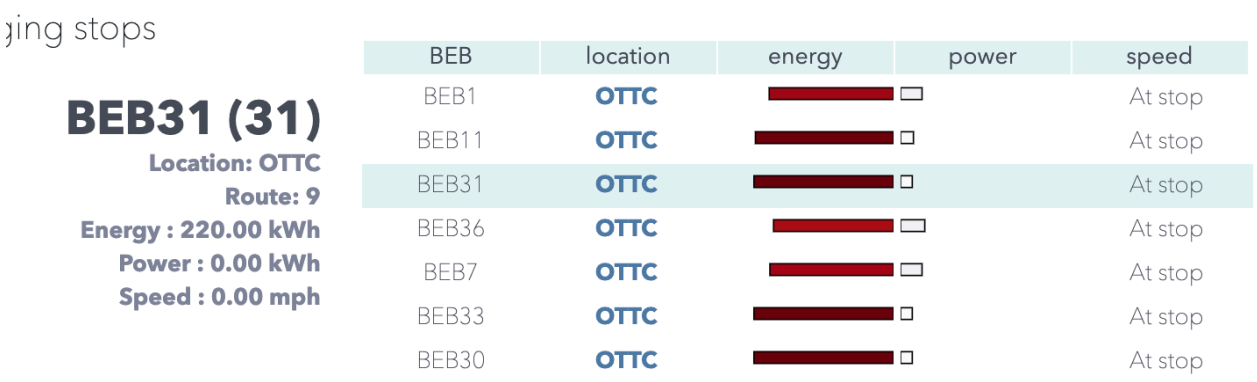
Node feature encodings:

- Circle size: the number of busses present at the station at a given time
- Color: the active power (kW) of the charging stations
- Tooltip: On mouseover, a tooltip pops up listing all of the data at the node, and the corresponding node in the power system highlights as well.

BEB locations + BEB energy and power profiles:
The BEB locations, energy, power, and speed were all visualized using a table. The table is sortable by clicking on any of the headers. The energy and power profiles were visualized using a “bikini” or “diverging” bar chart. The location name is colored by the stations corresponding categorical color. Additionally, by hovering the mouse over the cells of the table, a tooltip detailing all of the BEB’s data at a given time pops up, and the nodes where the bus is currently at highlight as well. All of the data updates on change of the slider bar.



BEB	location	energy	power	speed
BEB1	OTTC			At stop
BEB11	OTTC			At stop
BEB31	OTTC			At stop
BEB36	OTTC			At stop
BEB7	OTTC			At stop
BEB33	OTTC			At stop
BEB30	OTTC			At stop
BEB32	OTTC			At stop
BEB20	On the road			12
BEB9	On the road			15.96
BEB15	On the road			20.04
BEB6	On the road			10.56
BEB21	On the road			14.04
BEB38	CTH			At stop
BEB4	On the road			12
BEB25	On the road			0
BEB16	CTH			At stop
BEB44	KPR			At stop
BEB19	JRPR			At stop
BEB17	On the road			20.04
BEB8	OTTC			At stop
BEB5	On the road			10.56

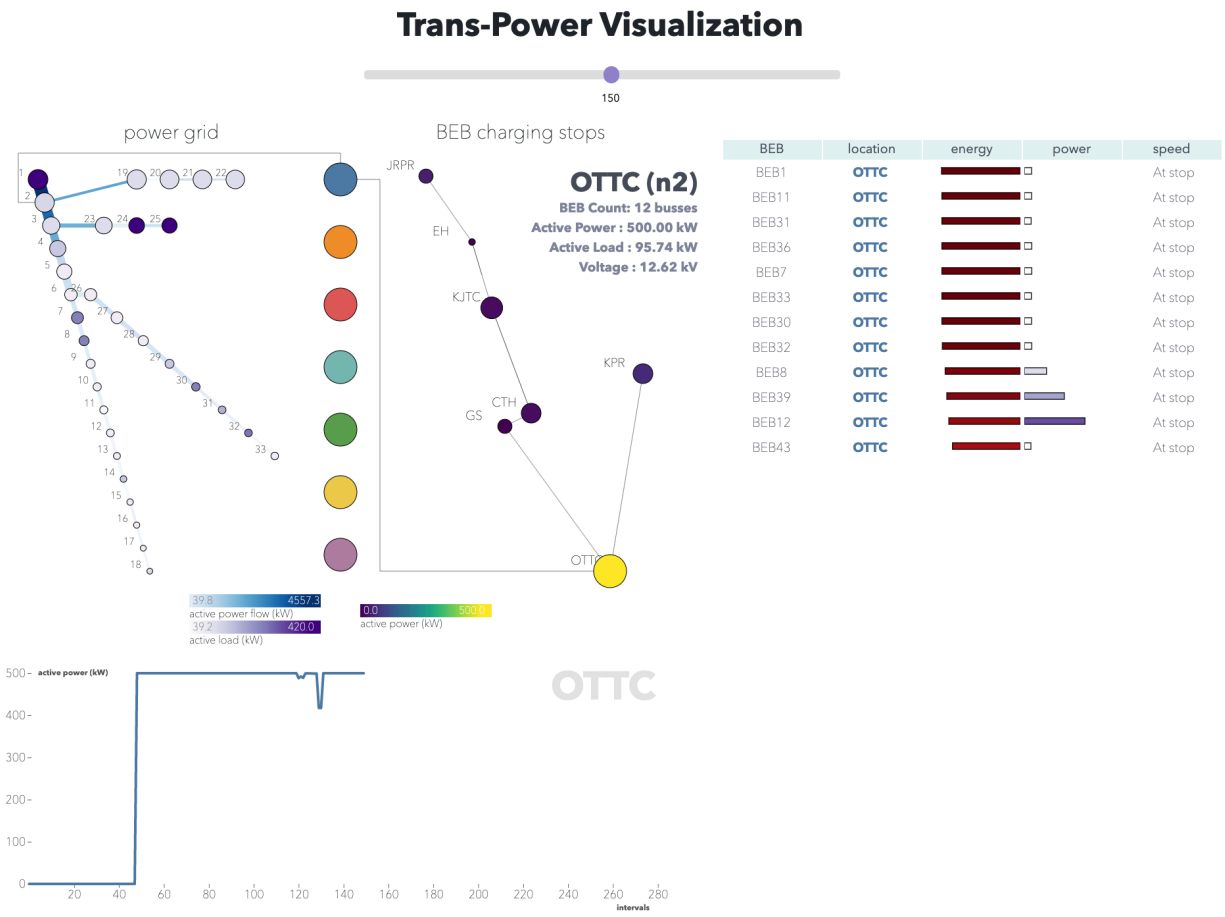


BEB	location	energy	power	speed
BEB1	OTTC			At stop
BEB11	OTTC			At stop
BEB31	OTTC			At stop
BEB36	OTTC			At stop
BEB7	OTTC			At stop
BEB33	OTTC			At stop
BEB30	OTTC			At stop

Interdependency

The interdependency of the networks was visualized by creating an interface between the two networks consisting of the 7 charging stations lined up in a column. Each station was given its own color. Upon mouseover on one of the interface circles, the lines from that circle move to connect the related power station and BEB stop nodes. The nodes in the networks also change to the color of the interface circle to further emphasize their relatedness. A tooltip also appears that combines all of the trans+power data of a given charging station.

When the interface circles are clicked, the bus table updates to include only the busses present at that station. Additionally, a chart below the networks which shows active power (kW) over time populates with that station's data.



Time varying + Enhanced interactive visualization

All of the features described thus far update to include the data at any given time in the provided dataset. The time is changed by a slider bar located at the top of the vis. The table sorting by header allows the user to quickly gain insights about the BEBs and potentially spot problems as they arise. The max line current highlighting also provides the user with an advanced warning which could indicate an issue with the power lines.