Geog 176A: Introduction to GIS, Fall 2014
Prof. Dr. Werner Kuhn and Teaching Assistants

Lab 5: Event

Objectives

Through this lab, you will gain a deeper understanding of the concept of an event (in geographic space) by experimenting with event data in the key application area of sensor networks.

Tasks

Provide a technical report (as a single pdf uploaded in GauchoSpace) with precise answers to the following questions. Purple asterisks (*) indicate that the question requires a screenshot!

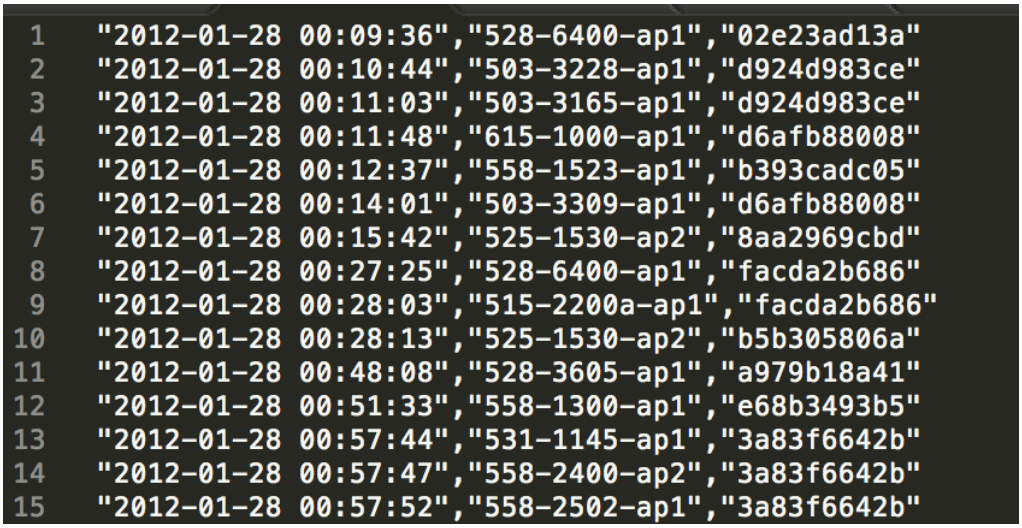
1. **Visualize** the campus network data using this web application on different days of the week beginning on Sunday. These data are records of the times and positions of all wireless connections on campus from a seven day period in early 2012. Each of these connection events implies the presence of a person connecting a mobile device at a certain place and time to a wireless access point located in a building.
    a. Change the days of the week by changing the *start_at_percentage* value. In your own words, what do the flashing dots represent?
    b. Do you notice any interesting trends from the simulation?
    c. Take a screenshot* at a particular moment and discuss what you observe in that.

2. **Plot** the event data by importing *events_by_day.csv* into MATLAB
    a. Generate a bar graph.
    b. Judging by the shape of your histogram, on which day of the week do most connection events fall? How were you able to infer which day is represented by the numbers 0 through 6?

3. **Plot** the event data *events_by_minute.csv* as a histogram using the default parameters in the MATLAB script provided on Gauchospace.
    a. During which hour do you see most connecting activity*?

b. Enable the high resolution plot and run the program again. In what time slot do you see the most activity now? What do you think is happening on campus at this time?
c. Modify the *offset* parameter (between 0 and 1) until the highest peak on the high-res plot is roughly centered within the hourly-resolution histogram bar that contains it. Explain why the offset value you chose is better for visually representing this specific data for an hourly-resolution.
d. Set the *number of bins* parameter value to 4 and change the *offset* value back to zero. What is the graph failing to convey about the event data at this low temporal resolution? Does it still convey anything significant at this low resolution?
e. Assume that no more than one event occurs during any given second. Imagine what the histogram plot might look like at the very high temporal resolution of one-second intervals. When the resolution is so high, what sort of visual information do we lose with respect to histograms? Why is it better to quantize event data for analysis than to leave it in the form of a collection of single data points?

4. Make sure you **understand** the nature of the data.
    a. Which of the following concepts could the data be seen as describing (multiple choices are possible): locations, fields, objects, or networks? Explain.
    b. If you only use the above concepts to describe an event, what aspect(s) of the data would you be missing?
    c. List all properties and relations of the connection events that are recorded in the data set. Which ones are temporal and which ones are thematic?



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1   "2012-01-28 00:09:36","528-6400-ap1","02e23ad13a"
2   "2012-01-28 00:10:44","503-3228-ap1","d924d983ce"
3   "2012-01-28 00:11:03","503-3165-ap1","d924d983ce"
4   "2012-01-28 00:11:48","615-1000-ap1","d6afb88008"
5   "2012-01-28 00:12:37","558-1523-ap1","b393cadc05"
6   "2012-01-28 00:14:01","503-3309-ap1","d6afb88008"
7   "2012-01-28 00:15:42","525-1530-ap2","8aa2969cbd"
8   "2012-01-28 00:27:25","528-6400-ap1","facda2b686"
9   "2012-01-28 00:28:03","515-2200a-ap1","facda2b686"
10  "2012-01-28 00:28:13","525-1530-ap2","b5b305806a"
11  "2012-01-28 00:48:08","528-3605-ap1","a979b18a41"
12  "2012-01-28 00:51:33","558-1300-ap1","e68b3493b5"
13  "2012-01-28 00:57:44","531-1145-ap1","3a83f6642b"
14  "2012-01-28 00:57:47","558-2400-ap2","3a83f6642b"
15  "2012-01-28 00:57:52","558-2502-ap1","3a83f6642b"
```

5. **Produce trajectories** of devices over a certain time period using this web application. First controlling the *traveled_in_minutes* variable, first plot two devices over a 60 minute time interval. Next, increase the interval to 360 minutes and update the emulation. What differences do you notice in the trajectories? Do you think that the trajectories are affected by the campus road network? How so?

6. **Import** *Time_Animation.lpk* (layer package) into ArcMap. This data set contains a pre-symbolized Time Layer along with the campus building footprints and their centroids. Add a light gray base map beneath your package layers. Zoom your extent to the building that you identify as Davidson Library*.
    a. Turn on the Time Slider panel. You are referencing time enabled data. In options under Time Display, ensure that the time step interval is set to 0.5 hours. Also ensure that the Start Time is 1/28/2012 at 8:00 AM and that the End Time is 2/4/2012 at 7:30 PM. How could you change these presets to animate a single day of the week?
    b. Close the Options window and play through your animation, either by pressing Play or by clicking through the time series frame by frame. Identify a time that illustrates a significant event*. Report the time and place of the event and speculate as to why this may have occurred. How do you know that this may be a significant event?
    c. Why is animating event data useful? Can you think of another example of a type of event that would be well-represented by an animation?

7. **Assess** the need for improving the campus access point infrastructure, based on the frequency of connections in certain buildings (and assuming that all access points have equal capacity).