

Modeling Activity (2019): Urban Operations Research

Prepared by:

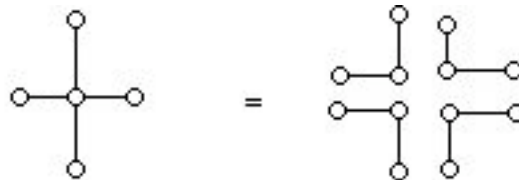
Joseph Malkevitch
Department of Mathematics
York College (CUNY)
Jamaica, New York 11451

email:

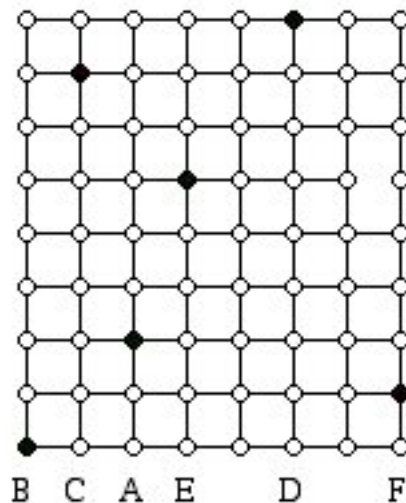
malkevitch@york.cuny.edu

web page:

<http://york.cuny.edu/~malk/>



In the graph below, dots with 4 edges are designed to represent street corners as suggested by the schematic diagram above.



The names associated with the black dots in the grid are shown at the bottom of the grid.

a. The "HOP ON-HOP OFF" bus company wants to design a simple circuit C (which does not pass through a dark dot point) of grid points with the shortest length, so that the sum of the distances from the dark dot points in the grid graph above to some point of C is as small as possible. The bus can travel in either direction on the edges of the graph. Find C , and what is the value of the sum of the distances for this choice of C ?

b. Find a short simple circuit C' so that instead of the sum of the distances from the black points being minimized, the maximum distance from a point on C' is minimized. How does the length of C compare with C' ?

c. Discuss variants of the problems above, perhaps the case where C goes through some dark dot points,

Comment:

Dark dots represent important tourist attractions in the area the bus "serves."

Note, doing this problem requires some, but minimal experience with "taxicab" distance. As variant problems one can ask for the circuit C to be at distance
a. at most 1 from the circuit C b. at most k from from the circuit C . What about allowing (realistic or not) a bus to move along a "path" rather than a circuit. This would mean that the bus would at some corner turn around and go back the way it came.