WebGIS for Geography, the science of where, with…

School of Business and Law

Problem 1: What is the optimal path between Shiding, Taiwan, and the remaining 9 cities based on the average travelling time by car?

Network Analysis: Dijkstra Shortest Path (Part III)

c:\inetpub\wwwroot\executable\dijkstra_final.exe d:\data\57220798dijkstra.txt d:\data\57220798dijkstra.out

The distance from the root (node 1) to vertex 2 is 13 (shortest path: 1, 2)

The distance from the root (node 1) to vertex 3 is 12 (shortest path: 1, 3)

The distance from the root (node 1) to vertex 4 is 45 (shortest path: 1, 4)

The distance from the root (node 1) to vertex 5 is 190 (shortest path: 1, 5)

The distance from the root (node 1) to vertex 6 is 269 (shortest path: 1, 3, 6)

The distance from the root (node 1) to vertex 7 is 217 (shortest path: 1, 4, 7)

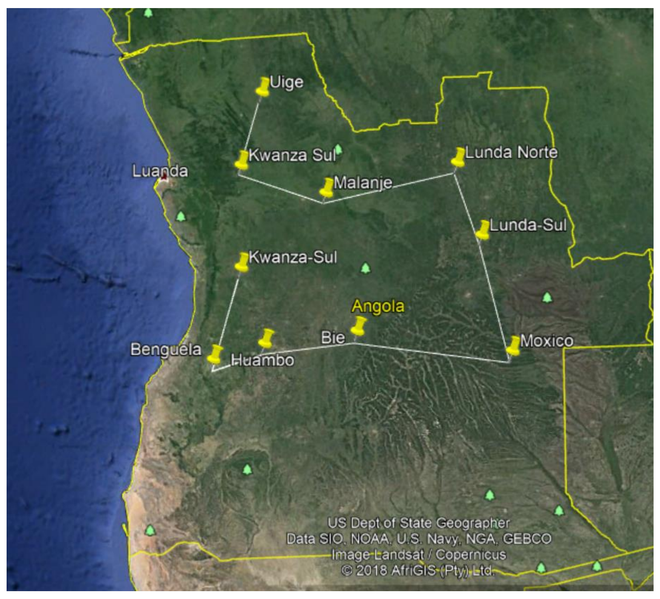
The distance from the root (node 1) to vertex 8 is 290 (shortest path: 1, 3, 8)

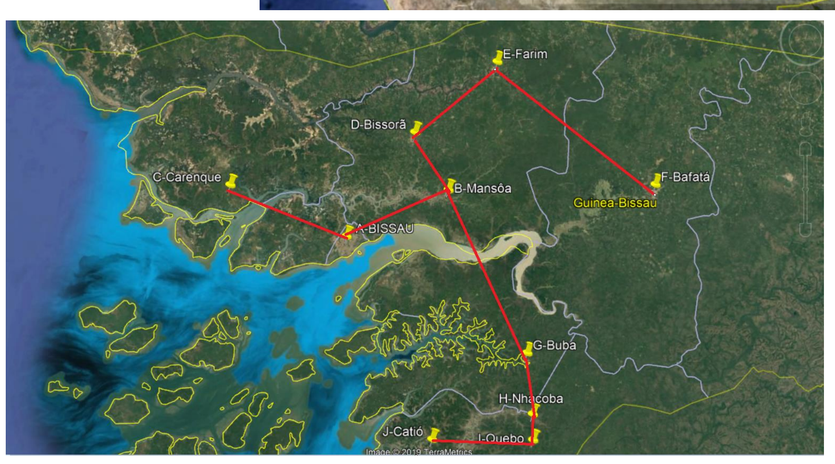
The distance from the root (node 1) to vertex 9 is 295 (shortest path: 1, 3, 8, 9)

The distance from the root (node 1) to vertex 10 is 285 (shortest path: 1, 4, 7, 10)

According to Dijkstra algorithm, for instance, the time car cost between Shiding (1) and Mudanwan (10) is 285 minutes via Lucky Art (4) and Sanxiantai (7) cities.

Problem 2: How can I connect 10 Angola cities with Internet cables, for example, or Guinea Bissau ones with the minimal cost?





Network Analysis: Prim Minimum Spanning Tree (Part III)

c:\inetpub\wwwroot\executable\prim.exe d:\data\300267743prim.txt d:\data\300267743priml.out

>Adding node A

>Adding edge A-B

>Adding edge B-D

>Adding edge D-E

>Adding edge A-C

>Adding edge B-G

>Adding edge G-H

>Adding edge H-I

>Adding edge I-J

>Adding edge E-F

Total distance: 338

Network Analysis: Kruskal Minimum Spanning Tree (Part III)

c:\inetpub\wwwroot\executable\kruskal.exe d:\data\287956025kruskal.txt d:\data\287956025kruskal.out

Minimal Spanning Tree Edges:

F = ((V7,V8), (V3,V4), (V0,V1), (V0,V2), (V6,V7), (V8,V9), (V4,V5), (V2,V3), (V5,V6))

Minimal Spanning Tree Weight = 2172

As another limitation of myGeoffice©, it is up to the user to create the graphic map layout based on previous outcomes.

According to Kruskal algorithm, the budget cost to connect the 10 inner cities of Angola is 2,172,000 Euros and, for the Guinea Bissau case, the total cost for this infrastructure becomes 338,000 Euros.

Problem 3: The probability of a major hurricane hits one of the 10 major cities of South Florida, USA, is 19% per year. What is the likelihood of this Mother Nature event for next year?

Binomial Probabilities for Discrete Random Events (Part I)

p Probability of a Sucess Outcome (use DOT for real values): 0.19

N Number of Trials (only non-negative integers): 10

Reset Submit

Binomial Probabilities Distribution for Discrete Random Events (Part II)

P(X=0) = 0,121576654590569
P(X=1) = 0,285179807064299
P(X=2) = 0,301023129678982
P(X=3) = 0,188294303338293
P(X=4) = 7,72936492098549E-02
P(X=5) = 2,17567308886999E-02
P(X=6) = 4,25285891857302E-03
P(X=7) = 5,70048109015079E-04
P(X=8) = 5,01431207004005E-05
P(X=9) = 2,6137703520099E-06
P(X=10) = 6,131066257801E-08

According to the Binomial or Bernoulli distribution, for instance, the chances of three major hurricanes hits one of these 10 cities of Southern Florida equals 18.829%. As expected, the sum of all these partial probabilities is one.

Problem 4: Considering a 1.666% probability that Papua New Guinea will be hit by a Tsunami, what is the likelihood of this event will arrive within 10 years?

Geometric Probabilities for Discrete Random Events (Part II)

P(x=1) = 0,01666 ; Cumulative = 0,01666
P(x=2) = 0,0163824444 ; Cumulative = 0,0330424444
P(x=3) = 0,016109512876296 ; Cumulative = 0,049151957276296
P(x=4) = 1,58411283917769E-02 ; Cumulative = 6,49930856680729E-02
P(x=5) = 1,55772151927699E-02 ; Cumulative = 8,05703008608428E-02
P(x=6) = 1,53176987876584E-02 ; Cumulative = 9,58879996485012E-02
P(x=7) = 0,015062505925856 ; Cumulative = 0,110950505574357
P(x=8) = 1,48115645771312E-02 ; Cumulative = 0,125762070151488
P(x=9) = 1,45648039112762E-02 ; Cumulative = 0,140326874062765
P(x=10) = 1,43221542781143E-02 ; Cumulative = 0,154649028340879
P(x=11) = 0,014083547187841 ; Cumulative = 0,16873257552872
P(x=12) = 1,38489152916915E-02 ; Cumulative = 0,182581490820411
P(x=13) = 1,36181923629319E-02 ; Cumulative = 0,196199683183343

According to the Geometric distribution, the probability of the first Tsunami hitting Indonesia in 10 years is 15.46%.

Problem 5: According to Forbes (2017), from 1959 to 2015, 1525 jet airliner accidents happened, involving 29165 on-board fatalities. What is the probability in each year to have 14 airplane crashes?

Poisson Probabilities for Discrete Random Events (Part I)

Average Number of Events (L): 27

Reset Submit

Poisson Probabilities for Discrete Random Events (Part II)

P(x=0) = 1,87952881653908E-12
P(x=1) = 5,07472780465552E-11
P(x=2) = 6,85088253628496E-10
P(x=3) = 6,16579428265646E-09
P(x=4) = 4,16191114079311E-08
P(x=5) = 2,24743201602828E-07
P(x=6) = 1,01134440721273E-06
P(x=7) = 3,90089985639194E-06
P(x=8) = 1,31655370153228E-05
P(x=9) = 3,94966110459684E-05
P(x=10) = 1,06640849824115E-04
P(x=11) = 2,61754813204645E-04
P(x=12) = 5,88948329710452E-04
P(x=13) = 1,22320037709094E-03
P(x=14) = 2,35902929867538E-03
P(x=15) = 4,24625273761569E-03
P(x=16) = 7,16555149472647E-03
P(x=17) = 0,011380581785742

According to the Poisson distribution (27 crashes per year), the probability in each year having 14 planes accidents equals 0.00235%.

Problem 6: Is there any spatial-time interaction between snake bites and rainfall in Bondowoso, Indonesia (589 miles²)?

Second-Order Interaction for Events Count (Part II)

Region 1 (Snake Bites)	Region 2 (Rainfall from January to December)
3	340
4	310
6	330
7	250
6	200
5	100
9	50
6	50
3	80
2	160
5	280
4	330

M1 Product= 4,24611001534078E-04 M2= 4,01325882095113E-04

According to the Second-order interaction for events, there is a negative correlation between rainfall and snake bites along the 12 months of the year.

FDCT Project (Application for Promotion of Science in Schools 0192/2018/PS): Luis Chan, Ashley Tak, Yoyo Augusto, Peggy Ieong, Alvin Fai, Cailyn Ian, Ermelinda Almeida, Rosiane Veiga, Dario Nunes, Vimaldo Viegas & Joao Negreiros. International Academic Conferences of Teaching, Learning and E-learning (IAC-TLEl), Vienna – Austria, July 5-6, 2019.