



Escuela de Ingeniería en Computación
Investigación de Operaciones

Rutas Óptimas
Algoritmo de Floyd

Grupo 40
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1 Floyd's Algorithm

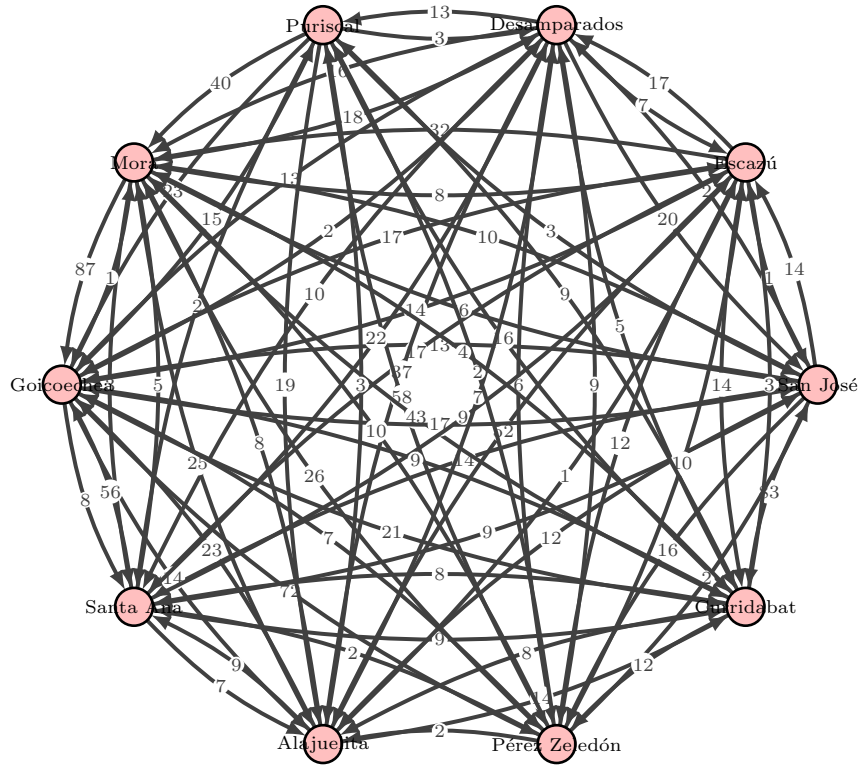
This program consists of Floyd's algorithm to obtain the shortest path between any pair of nodes in a graph with weighted distances. Floyd's algorithm compares the distance between any two given nodes and by passing through another city in between, if the result is less than the original then it chooses the shortest one. After contemplating all nodes in the graph, the graph is guaranteed to have all the shortest distances between any two nodes in the graph. These changes are recorded in another matrix called P that helps determine the shortest path between any two nodes.

2 Robert W. Floyd (1936–2001)



Robert Willoughby Floyd was a computer scientist that lived from 1936 to 2001. He made great advances in computer science and developed an algorithm to find the shortest paths between any two nodes for a directed graph. He was awarded a Turing Award in 1978.

3 Initial Graph



4 Table D_0

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	14	2	∞	10	13	14
Escazú	1	0	17	∞	32	17	17
Desamparados	20	7	0	13	16	13	10
Puriscal	3	∞	3	0	40	23	2
Mora	6	8	18	∞	0	87	3
Goicoechea	17	14	2	15	1	0	8
Santa Ana	9	9	22	∞	5	56	0
Alajuelita	∞	1	7	3	8	23	9
Pérez Zeledón	2	10	9	2	10	7	2
Curridabat	∞	3	∞	9	4	9	8

5 Table P_0

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	0	0	0	0	0	0
Escazú	0	0	0	0	0	0	0
Desamparados	0	0	0	0	0	0	0
Puriscal	0	0	0	0	0	0	0
Mora	0	0	0	0	0	0	0
Goicoechea	0	0	0	0	0	0	0
Santa Ana	0	0	0	0	0	0	0
Alajuelita	0	0	0	0	0	0	0
Pérez Zeledón	0	0	0	0	0	0	0
Curridabat	0	0	0	0	0	0	0

6 Table D_1

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	14	2	∞	10	13	14
Escazú	1	0	3	∞	11	14	15
Desamparados	20	7	0	13	16	13	10
Puriscal	3	17	3	0	13	16	2
Mora	6	8	8	∞	0	19	3
Goicoechea	17	14	2	15	1	0	8
Santa Ana	9	9	11	∞	5	22	0
Alajuelita	∞	1	7	3	8	23	9
Pérez Zeledón	2	10	4	2	10	7	2
Curridabat	∞	3	∞	9	4	9	8

7 Table P_1

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	0	0	0	0	0	0
Escazú	0	0	1	0	1	1	1
Desamparados	0	0	0	0	0	0	0
Puriscal	0	1	0	0	1	1	0
Mora	0	0	1	0	0	1	0
Goicoechea	0	0	0	0	0	0	0
Santa Ana	0	0	1	0	0	1	0
Alajuelita	0	0	0	0	0	0	0
Pérez Zeledón	0	0	1	0	0	0	0
Curridabat	0	0	0	0	0	0	0

8 Table D_2

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	14	2	∞	10	13	14
Escazú	1	0	3	∞	11	14	15
Desamparados	8	7	0	13	16	13	10
Puriscal	3	17	3	0	13	16	2
Mora	6	8	8	∞	0	19	3
Goicoechea	15	14	2	15	1	0	8
Santa Ana	9	9	11	∞	5	22	0
Alajuelita	2	1	4	3	8	15	9
Pérez Zeledón	2	10	4	2	10	7	2
Curridabat	4	3	6	9	4	9	8

9 Table P_2

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	0	0	0	0	0	0
Escazú	0	0	1	0	1	1	1
Desamparados	2	0	0	0	0	0	0
Puriscal	0	1	0	0	1	1	0
Mora	0	0	1	0	0	1	0
Goicoechea	2	0	0	0	0	0	0
Santa Ana	0	0	1	0	0	1	0
Alajuelita	2	0	2	0	0	2	0
Pérez Zeledón	0	0	1	0	0	0	0
Curridabat	2	0	2	0	0	0	0

10 Table D_3

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	9	2	15	10	13	12
Escazú	1	0	3	16	11	14	13
Desamparados	8	7	0	13	16	13	10
Puriscal	3	10	3	0	13	16	2
Mora	6	8	8	21	0	19	3
Goicoechea	10	9	2	15	1	0	8
Santa Ana	9	9	11	24	5	22	0
Alajuelita	2	1	4	3	8	15	9
Pérez Zeledón	2	10	4	2	10	7	2
Curridabat	4	3	6	9	4	9	8

11 Table P_3

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	3	0	3	0	0	3
Escazú	0	0	1	3	1	1	3
Desamparados	2	0	0	0	0	0	0
Puriscal	0	3	0	0	1	1	0
Mora	0	0	1	3	0	1	0
Goicoechea	3	3	0	0	0	0	0
Santa Ana	0	0	1	3	0	1	0
Alajuelita	2	0	2	0	0	2	0
Pérez Zeledón	0	0	1	0	0	0	0
Curridabat	2	0	2	0	0	0	0

12 Table D_4

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	9	2	15	10	13	12
Escazú	1	0	3	16	11	14	13
Desamparados	8	7	0	13	16	13	10
Puriscal	3	10	3	0	13	16	2
Mora	6	8	8	21	0	19	3
Goicoechea	10	9	2	15	1	0	8
Santa Ana	9	9	11	24	5	22	0
Alajuelita	2	1	4	3	8	15	5
Pérez Zeledón	2	10	4	2	10	7	2
Curridabat	4	3	6	9	4	9	8

13 Table P_4

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	3	0	3	0	0	3
Escazú	0	0	1	3	1	1	3
Desamparados	2	0	0	0	0	0	0
Puriscal	0	3	0	0	1	1	0
Mora	0	0	1	3	0	1	0
Goicoechea	3	3	0	0	0	0	0
Santa Ana	0	0	1	3	0	1	0
Alajuelita	2	0	2	0	0	2	4
Pérez Zeledón	0	0	1	0	0	0	0
Curridabat	2	0	2	0	0	0	0

14 Table D_5

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	9	2	15	10	13	12
Escazú	1	0	3	16	11	14	13
Desamparados	8	7	0	13	16	13	10
Puriscal	3	10	3	0	13	16	2
Mora	6	8	8	21	0	19	3
Goicoechea	7	9	2	15	1	0	4
Santa Ana	9	9	11	24	5	22	0
Alajuelita	2	1	4	3	8	15	5
Pérez Zeledón	2	10	4	2	10	7	2
Curridabat	4	3	6	9	4	9	7

15 Table P_5

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	3	0	3	0	0	3
Escazú	0	0	1	3	1	1	3
Desamparados	2	0	0	0	0	0	0
Puriscal	0	3	0	0	1	1	0
Mora	0	0	1	3	0	1	0
Goicoechea	5	3	0	0	0	0	5
Santa Ana	0	0	1	3	0	1	0
Alajuelita	2	0	2	0	0	2	4
Pérez Zeledón	0	0	1	0	0	0	0
Curridabat	2	0	2	0	0	0	5

16 Table D_6

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	9	2	15	10	13	12
Escazú	1	0	3	16	11	14	13
Desamparados	8	7	0	13	14	13	10
Puriscal	3	10	3	0	13	16	2
Mora	6	8	8	21	0	19	3
Goicoechea	7	9	2	15	1	0	4
Santa Ana	9	9	11	24	5	22	0
Alajuelita	2	1	4	3	8	15	5
Pérez Zeledón	2	10	4	2	8	7	2
Curridabat	4	3	6	9	4	9	7

17 Table P_6

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	3	0	3	0	0	3
Escazú	0	0	1	3	1	1	3
Desamparados	2	0	0	0	6	0	0
Puriscal	0	3	0	0	1	1	0
Mora	0	0	1	3	0	1	0
Goicoechea	5	3	0	0	0	0	5
Santa Ana	0	0	1	3	0	1	0
Alajuelita	2	0	2	0	0	2	4
Pérez Zeledón	0	0	1	0	6	0	0
Curridabat	2	0	2	0	0	0	5

18 Table D_7

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	9	2	15	10	13	12
Escazú	1	0	3	16	11	14	13
Desamparados	8	7	0	13	14	13	10
Puriscal	3	10	3	0	7	16	2
Mora	6	8	8	21	0	19	3
Goicoechea	7	9	2	15	1	0	4
Santa Ana	9	9	11	24	5	22	0
Alajuelita	2	1	4	3	8	15	5
Pérez Zeledón	2	10	4	2	7	7	2
Curridabat	4	3	6	9	4	9	7

19 Table P_7

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	3	0	3	0	0	3
Escazú	0	0	1	3	1	1	3
Desamparados	2	0	0	0	6	0	0
Puriscal	0	3	0	0	7	1	0
Mora	0	0	1	3	0	1	0
Goicoechea	5	3	0	0	0	0	5
Santa Ana	0	0	1	3	0	1	0
Alajuelita	2	0	2	0	0	2	4
Pérez Zeledón	0	0	1	0	7	0	0
Curridabat	2	0	2	0	0	0	5

20 Table D_8

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	9	2	15	10	13	12
Escazú	1	0	3	16	11	14	13
Desamparados	8	7	0	13	14	13	10
Puriscal	3	10	3	0	7	16	2
Mora	6	8	8	13	0	19	3
Goicoechea	7	9	2	14	1	0	4
Santa Ana	9	8	11	10	5	22	0
Alajuelita	2	1	4	3	8	15	5
Pérez Zeledón	2	3	4	2	7	7	2
Curridabat	4	3	6	9	4	9	7

21 Table P_8

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	3	0	3	0	0	3
Escazú	0	0	1	3	1	1	3
Desamparados	2	0	0	0	6	0	0
Puriscal	0	3	0	0	7	1	0
Mora	0	0	1	8	0	1	0
Goicoechea	5	3	0	8	0	0	5
Santa Ana	0	8	1	8	0	1	0
Alajuelita	2	0	2	0	0	2	4
Pérez Zeledón	0	8	1	0	7	0	0
Curridabat	2	0	2	0	0	0	5

22 Table D_9

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	9	2	10	10	13	10
Escazú	1	0	3	11	11	14	11
Desamparados	8	7	0	8	13	13	8
Puriscal	3	10	3	0	7	16	2
Mora	6	8	8	13	0	19	3
Goicoechea	7	9	2	10	1	0	4
Santa Ana	9	8	11	10	5	22	0
Alajuelita	2	1	4	3	8	15	5
Pérez Zeledón	2	3	4	2	7	7	2
Curridabat	4	3	6	9	4	9	7

23 Table P_9

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	3	0	9	0	0	9
Escazú	0	0	1	9	1	1	9
Desamparados	2	0	0	9	9	0	9
Puriscal	0	3	0	0	7	1	0
Mora	0	0	1	8	0	1	0
Goicoechea	5	3	0	9	0	0	5
Santa Ana	0	8	1	8	0	1	0
Alajuelita	2	0	2	0	0	2	4
Pérez Zeledón	0	8	1	0	7	0	0
Curridabat	2	0	2	0	0	0	5

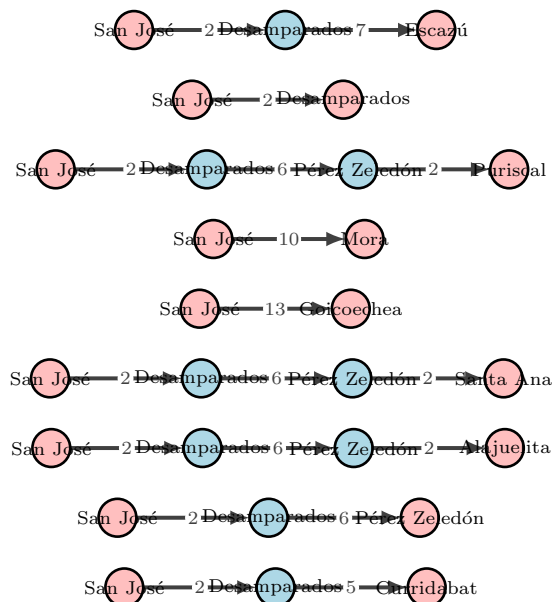
24 Table D_{10}

D	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	9	2	10	10	13	10
Escazú	1	0	3	11	11	14	11
Desamparados	8	7	0	8	9	13	8
Puriscal	3	10	3	0	7	16	2
Mora	6	8	8	13	0	19	3
Goicoechea	7	9	2	10	1	0	4
Santa Ana	9	8	11	10	5	18	0
Alajuelita	2	1	4	3	8	15	5
Pérez Zeledón	2	3	4	2	7	7	2
Curridabat	4	3	6	9	4	9	7

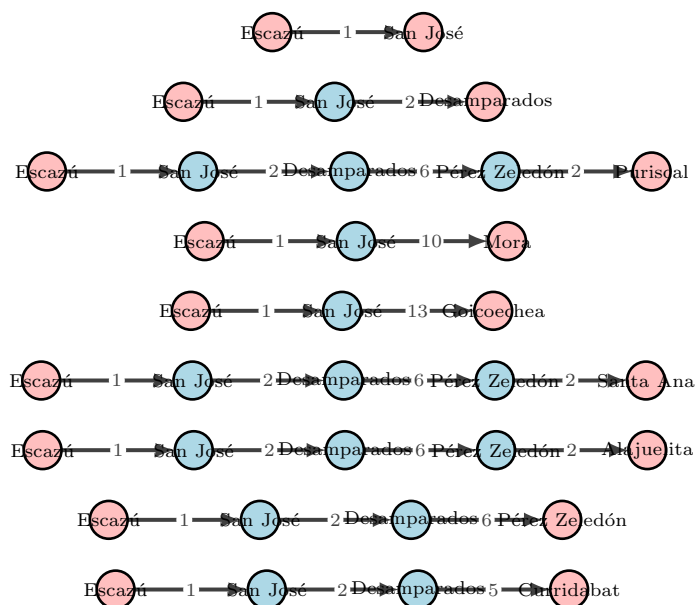
25 Table P_{10}

P	San José	Escazú	Desamparados	Puriscal	Mora	Goicoechea	Santa Ana
San José	0	3	0	9	0	0	9
Escazú	0	0	1	9	1	1	9
Desamparados	2	0	0	9	10	0	9
Puriscal	0	3	0	0	7	1	0
Mora	0	0	1	8	0	1	0
Goicoechea	5	3	0	9	0	0	5
Santa Ana	0	8	1	8	0	10	0
Alajuelita	2	0	2	0	0	2	4
Pérez Zeledón	0	8	1	0	7	0	0
Curridabat	2	0	2	0	0	0	5

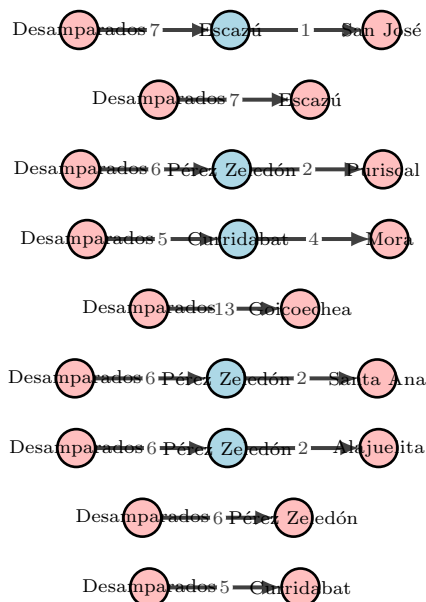
Current city: San José



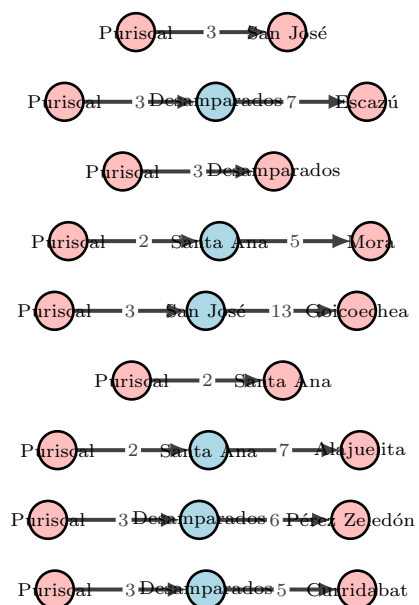
Current city: Escazú



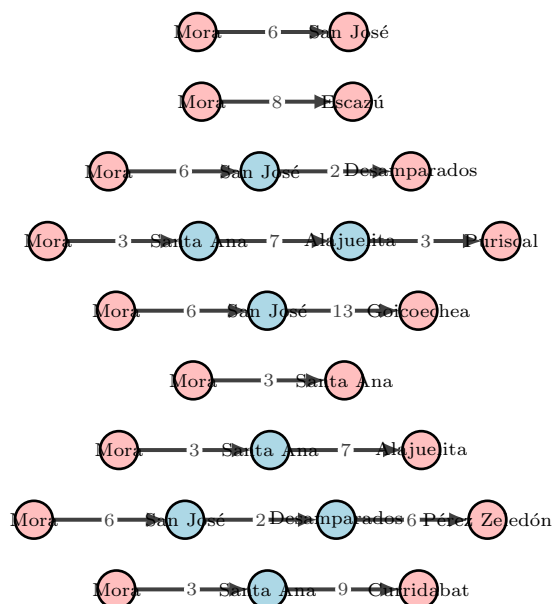
Current city: Desamparados



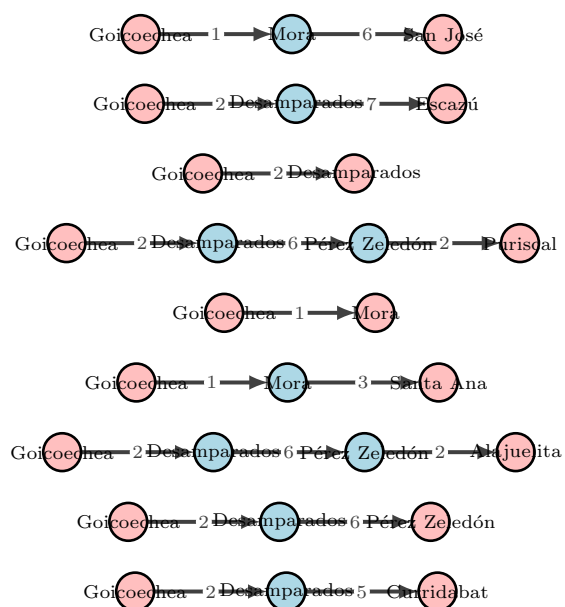
Current city: Puriscal



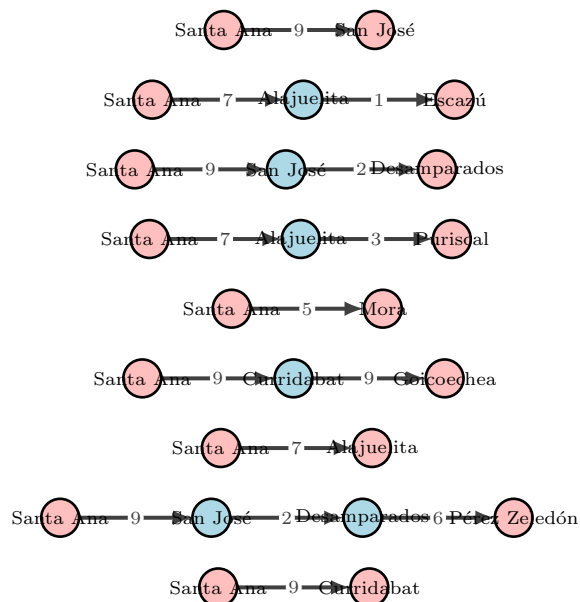
Current city: Mora



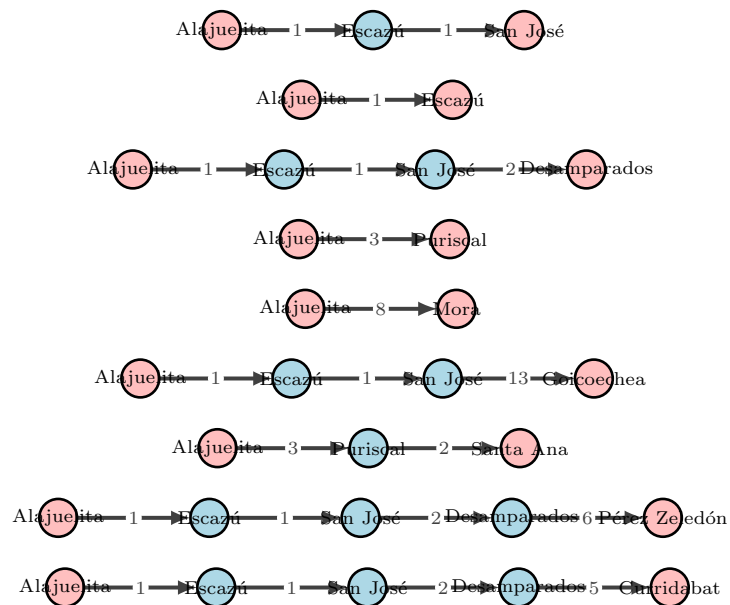
Current city: Goicoechea



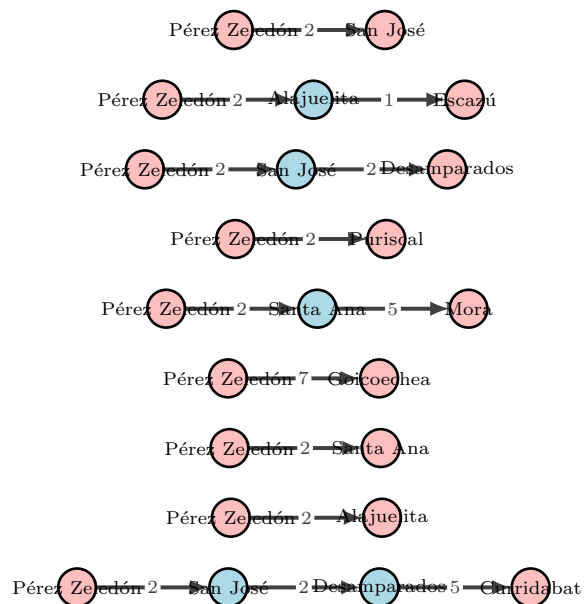
Current city: Santa Ana



Current city: Alajuelita



Current city: Pérez Zeledón



Current city: Curridabat

