

解中国351个城市的TSP旅行商问题

```
local mol = libminoptlab
local inja = require('package.inja')
local plt = require('package.plot')

local city = {{31.24916171, 121.487899486}, {23.8878061038, 100.092612914}, {26.8753510895, 100.229628399},
{25.1204891962, 99.1779956133}, {25.5968996394, 100.223674789}, {24.441239663, 98.5894342874},
{25.8606769782, 98.8599320425}, {23.3740868504, 104.246294318}, {25.0491531005, 102.714601139},
{27.3406329636, 103.725020656}, {22.7887777801, 100.98005773}, {25.5207581429, 103.782538888},
{25.0663556742, 101.529382239}, {24.3704471344, 102.545067892}, {23.3677175165, 103.384064757},
{22.0094330022, 100.803038275}, {27.8310294612, 99.7136815989}, {41.0223629468, 113.112846391},
{39.6831770068, 106.831999097}, {46.0837570652, 122.048166514}, {40.6471194257, 109.846238532},
{49.2016360546, 119.760821794}, {40.8283188731, 111.66035052}, {40.7691799024, 107.42380672},
{42.2971123203, 118.930761192}, {43.633756073, 122.260363263}, {39.8164895606, 109.993706251},
{43.9397048423, 116.027339689}, {38.8430752644, 105.695682871}, {39.9299857781, 116.395645038},
{26.0911937119, 119.337634104}, {22.3748329286, 114.130474436}, {38.9658447898, 121.360525873},
{22.7288657203, 114.246701335}, {21.9464822541, 111.590952812}, {43.8719883344, 126.564543989},
{43.1755247011, 124.391382074}, {42.8964136037, 129.485901958}, {45.1360489701, 124.832994532},
{45.6210862752, 122.840776679}, {41.945859397, 126.435797675}, {42.9233026191, 125.133686052},
{41.7363971299, 125.942650139}, {43.8983376071, 125.313642427}, {29.6009576111, 103.760824239},
{29.5994615348, 105.073055992}, {27.8923929037, 102.259590803}, {30.8009651682, 106.105553984},
```

{28.7696747963, 104.633019062}, {31.8691891592, 106.757915842}, {32.4410401584, 105.81968694},
{30.4639838879, 106.635720331}, {31.1311396527, 104.402397818}, {30.6799428454, 104.067923463},
{26.5875712571, 101.722423152}, {28.8959298039, 105.443970289}, {30.0551441144, 101.969232063},
{30.0611150799, 103.841429563}, {31.5047012581, 104.705518975}, {29.3591568895, 104.776071339},
{30.132191434, 104.635930302}, {31.2141988589, 107.494973447}, {30.5574913504, 105.564887792},
{31.9057628583, 102.228564689}, {29.9997163371, 103.009356466}, {39.1439299033, 117.210813092},
{37.5211241916, 105.196754199}, {37.9935610029, 106.208254199}, {36.0215234807, 106.285267996},
{39.0202232836, 106.379337202}, {38.5026210119, 106.206478608}, {33.8712105653, 115.787928245},
{31.7555583552, 116.505252683}, {31.8669422607, 117.282699092}, {30.5378978174, 117.058738772},
{30.9516423543, 118.752096311}, {33.6367723858, 116.988692412}, {30.6600192482, 117.494476772},
{33.9600233054, 116.791447429}, {32.6428118237, 117.018638863}, {32.3173505954, 118.324570351},
{31.3660197875, 118.384108423}, {32.9294989067, 117.357079866}, {30.9409296947, 117.819428729},
{32.9012113306, 115.820932259}, {31.6885281589, 118.515881847}, {29.7344348562, 118.293569632},
{37.4871211553, 118.583926333}, {35.0724090744, 118.340768237}, {37.5287870813, 122.093958366},
{37.4608259263, 116.328161364}, {35.4202251931, 119.507179943}, {34.8078830784, 117.279305383},
{36.1880777589, 117.089414917}, {36.6827847272, 117.024967066}, {35.4021216643, 116.600797625},
{36.8046848542, 118.059134278}, {37.4053139418, 117.968292415}, {36.7161148731, 119.142633823},
{37.5365615629, 121.30955503}, {36.4558285147, 115.986869139}, {36.2336541336, 117.684666912},
{35.2624404961, 115.463359775}, {36.1052149013, 120.384428184}, {36.0997454436, 111.538787596},
{37.527316097, 111.143156602}, {40.1137444997, 113.290508673}, {37.890277054, 112.550863589},
{38.461030573, 112.727938829}, {37.6933615268, 112.7385144}, {35.4998344672, 112.867332758},
{39.3376719662, 112.479927727}, {35.0388594798, 111.006853653}, {36.2016643857, 113.120292086},
{37.8695294932, 113.569237602}, {23.0430238154, 113.763433991}, {22.5451775145, 113.422060021},
{22.9379756855, 112.050945959}, {23.0350948405, 113.134025635}, {23.1200491021, 113.307649675},
{23.1135398524, 114.41065808}, {23.5479994669, 116.379500855}, {24.304570606, 116.126403098},
{23.3839084533, 116.728650288}, {22.7787305002, 115.372924289}, {22.5751167835, 113.078125341},
{23.7572508505, 114.713721476}, {22.5460535462, 114.025973657}, {23.6984685504, 113.040773349},

{21.2574631038, 110.365067263}, {23.6618116765, 116.630075991}, {22.2569146461, 113.562447026},
{23.0786632829, 112.47965337}, {21.6682257188, 110.931245331}, {21.8715173045, 111.977009756},
{24.8029603119, 113.594461107}, {21.472718235, 109.122627919}, {22.8064929356, 108.297233556},
{22.4154552965, 107.357322038}, {23.7411659265, 109.231816505}, {24.3290533525, 109.42240181},
{25.262901246, 110.260920147}, {23.4853946367, 111.30547195}, {24.6995207829, 108.069947709},
{22.6439736084, 110.151676316}, {23.9015123679, 106.631821404}, {23.1033731644, 109.613707557},
{24.4110535471, 111.552594179}, {21.9733504653, 108.638798056}, {21.6173984705, 108.351791153},
{43.8403803472, 87.5649877411}, {43.9222480963, 81.2978535304}, {39.7503455778, 76.1375644775},
{45.5943310667, 84.8811801861}, {44.9136513743, 82.0524362672}, {42.9604700169, 89.1815948657},
{37.1167744927, 79.9302386372}, {42.8585963324, 93.5283550928}, {39.4706271887, 75.9929732675},
{46.7586836297, 82.9748805837}, {44.0070578985, 87.2960381257}, {42.1270009576, 85.6148993383},
{41.1717309015, 80.2698461793}, {47.8397444862, 88.1379154871}, {32.0572355018, 118.778074408},
{32.0146645408, 120.873800951}, {33.9520497337, 118.296893379}, {31.7713967447, 119.981861013},
{34.2715534311, 117.188106623}, {32.4085052546, 119.427777551}, {31.5700374519, 120.305455901},
{32.4760532748, 119.919606016}, {33.6065127393, 119.030186365}, {33.3798618771, 120.148871818},
{31.317987368, 120.619907115}, {34.601548967, 119.173872217}, {32.2044094436, 119.455835405},
{28.4576225539, 117.955463877}, {29.7196395261, 115.999848022}, {28.6895780001, 115.893527546},
{27.1138476502, 114.992038711}, {27.8111298958, 114.400038672}, {27.9545451703, 116.360918867},
{27.8223215586, 114.947117417}, {29.3035627684, 117.186522625}, {27.639544223, 113.859917033},
{25.8452955363, 114.935909079}, {28.2413095972, 117.035450186}, {38.886564548, 115.494810169},
{39.6505309225, 118.183450598}, {39.5186106251, 116.703602223}, {40.8111884911, 114.89378153},
{40.9925210525, 117.933822456}, {38.2976153503, 116.863806476}, {38.0489583146, 114.522081844},
{39.9454615659, 119.604367616}, {37.7469290459, 115.686228653}, {37.0695311969, 114.520486813},
{36.6093079285, 114.482693932}, {34.7833199411, 111.181262093}, {32.1285823075, 114.085490993},
{33.0114195691, 112.542841901}, {33.6237408181, 114.654101942}, {34.4385886402, 115.641885688},
{36.1102667222, 114.351806508}, {33.7453014565, 113.300848978}, {34.8018541758, 114.351642118},
{35.3072575577, 113.912690161}, {34.6573678177, 112.447524769}, {33.5762786885, 114.0460614},

{35.7532978882, 115.026627441}, {35.234607555, 113.211835885}, {34.157183768, 113.486804058},
{34.0267395887, 113.83531246}, {34.7566100641, 113.64964385}, {32.9831581541, 114.049153547},
{35.7554258742, 114.297769838}, {28.4562995521, 119.929575843}, {28.6682832857, 121.440612936},
{30.7739922396, 120.760427699}, {29.8852589659, 121.579005973}, {30.2592444615, 120.219375416},
{28.002837594, 120.690634734}, {30.8779251557, 120.137243163}, {30.0023645805, 120.592467386},
{30.0360103026, 122.169872098}, {28.9569104475, 118.875841652}, {29.1028991054, 119.652575704},
{18.2577759149, 109.522771281}, {16.840062894, 112.350383075}, {20.022071277, 110.330801848},
{19.1805008013, 109.733755488}, {32.6369943395, 110.801228917}, {29.8806567577, 114.300060592},
{30.9279547842, 113.935734392}, {30.732757818, 111.310981092}, {30.2858883166, 109.491923304},
{30.5810841269, 114.316200103}, {31.2093162501, 112.410562192}, {30.332590523, 112.241865807},
{31.0426112029, 112.217330299}, {32.2291685915, 112.250092848}, {30.3844393228, 114.895594041},
{31.7178576082, 113.379358364}, {30.4461089379, 114.906618047}, {30.2161271277, 115.050683164},
{27.7410733023, 111.996396357}, {29.3780070755, 113.146195519}, {29.0121488552, 111.653718137},
{29.1248893532, 110.481620157}, {27.5574829012, 109.986958796}, {27.8274329277, 113.131695341},
{26.4359716468, 111.614647686}, {27.835095053, 112.935555633}, {28.3179507937, 109.7457458},
{28.5880877799, 112.366546645}, {26.8981644154, 112.583818811}, {27.2368112449, 111.461525404},
{25.7822639757, 113.037704468}, {28.2134782309, 112.979352788}, {22.2041179884, 113.557519102},
{22.1950041592, 113.566432335}, {22.2041179884, 113.557519102}, {35.5985143488, 103.215249178},
{36.064225525, 103.823305441}, {39.8023973267, 98.2816345853}, {34.5843194189, 105.736931623},
{35.5860562418, 104.626637601}, {35.55011019, 106.688911157}, {35.7268007545, 107.644227087},
{38.939320297, 100.459891869}, {37.9331721429, 102.640147343}, {34.9922111784, 102.917442486},
{36.5466817062, 104.171240904}, {39.7414737682, 98.5084145062}, {38.5160717995, 102.208126263},
{33.3944799729, 104.934573406}, {26.2708352794, 117.642193934}, {26.6436264742, 118.181882949},
{24.4892306125, 118.103886046}, {26.6565274192, 119.54208215}, {24.901652384, 118.600362343},
{24.5170647798, 117.676204679}, {26.0471254966, 119.330221107}, {25.4484501367, 119.077730964},
{25.0786854335, 117.017996739}, {29.2290269317, 91.7506438744}, {29.6625570621, 91.111890896},
{29.2690232039, 88.8914855677}, {31.1405756319, 97.18558158}, {29.6669406258, 94.3499854582},

```
{31.4806798301, 92.0670183689}, {30.4045565883, 81.1076686895}, {26.5918660603, 104.85208676},  
{26.2285945777, 105.928269966}, {27.4085621313, 105.333323371}, {26.6299067414, 106.709177096},  
{27.6999613771, 106.931260316}, {27.6749026906, 109.168558028}, {26.5839917665, 107.985352573},  
{26.2645359974, 107.52320511}, {25.0951480559, 104.900557798}, {40.1290228266, 124.338543115},  
{38.9487099383, 121.593477781}, {41.8773038296, 123.929819767}, {41.5718276679, 120.446162703},  
{41.3258376266, 123.77806237}, {41.8086447835, 123.432790922}, {41.141248023, 122.07322781},  
{40.6686510665, 122.233391371}, {40.7430298813, 120.860757645}, {41.2733392656, 123.172451205},  
{42.2997570121, 123.854849615}, {41.1308788759, 121.147748738}, {42.0192501071, 121.660822129},  
{41.1187436822, 123.007763329}, {29.5446061089, 106.530635013}, {34.345372996, 108.707509278},  
{33.8739073951, 109.934208154}, {32.70437045, 109.038044563}, {34.3640808097, 107.170645452},  
{36.6033203523, 109.500509757}, {38.2794392401, 109.745925744}, {33.0815689782, 107.045477629},  
{34.5023579758, 109.483932697}, {34.2777998978, 108.953098279}, {34.9083676964, 108.968067013},  
{34.4804845846, 100.223722769}, {36.5176101677, 102.085206987}, {36.9606541011, 100.879802174},  
{36.2843638038, 100.624066094}, {37.3737990706, 97.3426254153}, {33.0062399097, 97.0133161374},  
{36.640738612, 101.76792099}, {35.5228515517, 102.007600308}, {22.3072458588, 114.173291988},  
{22.4274312754, 114.146701965}, {22.2721034276, 114.183870524}, {45.7750053686, 131.019048047},  
{47.7346850751, 128.910765978}, {46.8137796047, 130.284734586}, {46.6551020625, 131.17140174},  
{45.7732246332, 126.657716855}, {51.991788968, 124.19610419}, {46.59670902, 125.02183973},  
{44.5885211528, 129.608035396}, {46.646063927, 126.989094572}, {45.3215398866, 130.941767273},  
{47.3386659037, 130.292472051}, {50.2506900907, 127.500830295}, {47.3476998134, 123.987288942}}
```

```
local best, fbest = mol.tspsolve(city, "GEO")
```

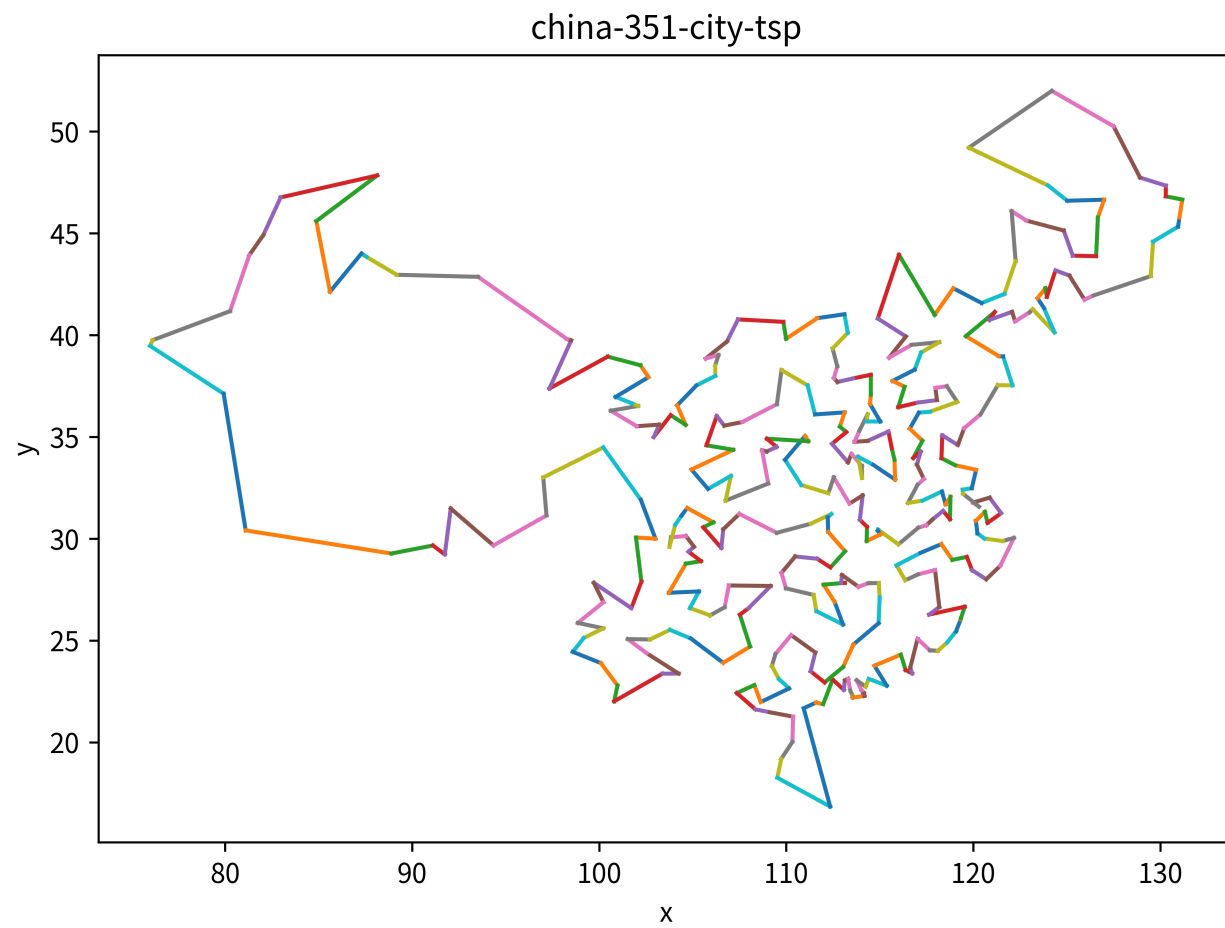
```
mol.print(cjson.encode({  
    fbest = fbest,  
    best = best  
}))
```

```
local ps = {}
local len = #best

for i = 1, len - 1 do
    table.insert(ps, plt.line({{city[best[i]][2], city[best[i + 1]][2]}, {city[best[i]][1], city[best[i + 1]][1]}}}))
end
table.insert(ps, plt.line({{city[best[#best]][2], city[best[1]][2]}, {city[best[#best]][1], city[best[1]][1]}}}))

local fw = plt.framework(111, 'china-351-city-tsp', {'x', 'y'})
plt.show({fw, ps})
```

其解如下图所示：



长沙市先验真理数据科技有限公司 2023-2026

 湘公网安备43019002002046  湘ICP备2023033902号-1

所有权利归长沙市先验真理数据科技有限公司所有,侵权必究.