

Cotares Parking Tour Help

What is a Parking Tour?

A journey will often end in a search for a parking place. Data on parking probabilities is starting to be made available, so Cotares has designed a unique algorithm to find an optimal path around the parking possibilities within easy walking distance of a destination. We call this final leg of a journey a Parking Tour. In the future autonomous vehicles will also need to perform a Parking Tour after they have completed their delivery.

Cotares ParkingTours are calculated on our own Server using our translation of the full Open Street Map world map, including pedestrian links, and are presented over Open Street Map tiles. The demonstration software can also work with Here and TomTom maps. More information, including some downloadable documents, is available on our website at [Cotares Parking](#).

This demonstration is ready to use real parking probability data but does not use any here, it simply avoids parking on higher functional class roads and sets a global parking probability on all others. By weighting against difficult driving manoeuvres, we already see very sensible Parking Tours emerging.

A tour is any sequence of roads that a driver could use. We know from experience that the optimum search strategy for parking can sometimes involve returning to the same sequence of roads to see if a space has become free, perhaps even looping around a few roads close to the destination. For that reason, the data structures and algorithms for generating and comparing tours become very different from those used for routing, as are the optimisation criteria.

Setting Journey Start and End Positions

The journey Start and End markers can be set by either dragging the Start and End markers or right-clicking. The Start marker is green and labelled S, and the End marker is red and labelled E.

The new Route and Parking Tour are calculated immediately. A quick way to move the Start and End position to another country is to use one of the preset Tours in the "Parking Tours" drop-down menu.

Expected Values

A standard route-finding algorithm is designed to minimise the estimated values of cost parameters such as distance, time and fuel, taking into account uncertainties such as traffic conditions. The uncertainties arise from inaccuracies in the map distances or traffic predictions, but they are small and well understood.

A tour is rather different. We want to minimise parameters such as the walking distance, but for a given tour, we do not know on which link the driver will find a free parking space. However, we do know the probability (s) that they will find a space if they travel along each link, the probability that they will reach that link in the tour (r), and the walking distance (d) from each link. This is a well-known situation where we can compute the "Expected Value" of a cost parameter. The expected walking distance is the sum of the ($s*r*d$) over all the links of the tour. This is effectively the average distance that we would have to walk if we repeated the tour many times.

More information can be found in this [Wikipedia article on Expected Values](#)

Parking Tour Labels and Colours

The route of the Parking Tour is drawn in two colours. Brown means "don't park here", either because it is too far from the destination, or there is no parking allowed on that road. Black means "look for parking here".

The links in the tour that are within the maximum walking time to the destination are numbered from 1 upwards, which helps to see the order in which the tour visits them. To get a good idea of the Parking Tour Route, you can click the "Animate" button to animate the route's progress, starting from the first parkable link.

Controls

The Cotares Parking Tour algorithm has many parameters. If you click on the "Controls" button at the bottom left a Control Panel appears with sliders to control a simplified subset. After changing one of the sliders you can use the "Recalculate" button at the bottom left to see the result.

Drive Time Limit (s)	This sets a limit, in seconds, on how long the algorithm will track the Parking Tour after the route has arrived within walking distance of the destination. If you set it to a long time you will probably see the Tour re-visiting links which have a chance of becoming free.
Max Walking Time (s)	This is the maximum time that you would be prepared to walk, if known. If you set it to a longer time the Parking Tour will be able to cover a wider area, while a smaller value will result in faster computations.
Minimise Walking	This will change the cost of the time spent walking in the overall Parking Tour Cost Function. A high cost will cause the Parking Tour to spend more time near the destination resulting in a smaller expected walking distance at the expense of a higher expected search time spent looking for a space, or higher expected parking charges.
Minimise Driving	This will change the cost of the time spent driving in the overall Parking Tour Cost Function. A high value will weight against driving, maybe at the expense of more walking.
100m Parking Prob	While we do not have any real parking probability data we have found that we can get very good results by not allowing parking on main roads and by setting a Parking Probability per 100 meters on all other roads. A typical value, which is the default, is 0.1, which means you have a 10% chance of finding a parking space on each 100m section of tarmac. Setting this to a higher value means you are much more likely to find parking near the destination, whereas a low value means the area of the Parking Tour will be much wider.
Recovery To Half Prob (s)	After you have driven down a road with no available spaces some spaces may become free while you are visiting other nearby streets. Every road will have a rate at which cars leave the spaces, and if this rate is high enough it will be worth re-visiting a road at a later stage in a Parking Tour. This parameter sets the time, in seconds, for the parking probability to recover to half its normal value after we have seen that all the spaces are full. If this value is low we will probably not loop around a street again, but if it is high it may be worth looking at a road several times during a parking tour. You may have to set the Drive Time

	Limit to a larger value to see this effect.
Ease of Driving	The Parking Tour Algorithm weights against difficult driving manoeuvres, including U-turns. For example, in the UK, where we drive on the left, it is easier to turn left at a junction rather than right. In countries which drive on the right the situation is reversed. The junction weighting would also make it unlikely that a Parking Tour would keep crossing a main road. Try setting "Ease of Driving" to a large or very small value with a high "Drive Time Limit" and click on the "Animate" button to see the effect.

Parking Tour Summary Box

The Summary Box reports the total values for several important quantities from the latest Parking Tour Calculation. It can be dragged to another part of the map if it obscures significant detail.

Parking Probability	This is the probability that one will have Parked by the end of the Tour. To increase the probability, the tour can be made longer by increasing the drive time limit.
Expected Search Time	This is the expected value of the time, in seconds, that will be spent on the Tour before a free space is found.
Expected Walk Dist (m)	This is the expected value of the walking distance, in metres, from the parking space to the final destination.

Giving Feedback

Sometimes it will not be obvious why a particular Parking Tour has been generated, so we would welcome feedback on particular routes and particular control settings. We will then investigate and report back to you on our interpretation.

To add Feedback for a Parking Tour first generate the Tour and then click the "Feedback" button. Fill in your email address and a give your feedback or query on the Tour. The comments will be saved along with the exact Parking Tour parameters on our Server, which will allow us to re-create the Parking Tour and give a detailed explanation.