



Dynamic optimization of vehicle routes for milk distribution





OptiMilk consists of a main module - **TOUR PLANNING ASSISTANT** - for the daily tour planning, and of the following modules:

- **SIMTOUR**: simulates the distribution process
- **TOUR ONLINE**: dynamically plans tours in real-time



OptiMilk is the software application for the management and optimization of milk distribution.

It is the result of the co-operation between AntOptima, a company specialised in innovative and high-performance optimization algorithms, and a group of international companies, leaders in their market sectors.

The technology

OptiMilk employs the innovative algorithms inspired by Ant Colonies, developed by *Istituto Dalle Molle di studi sull'intelligenza artificiale*.

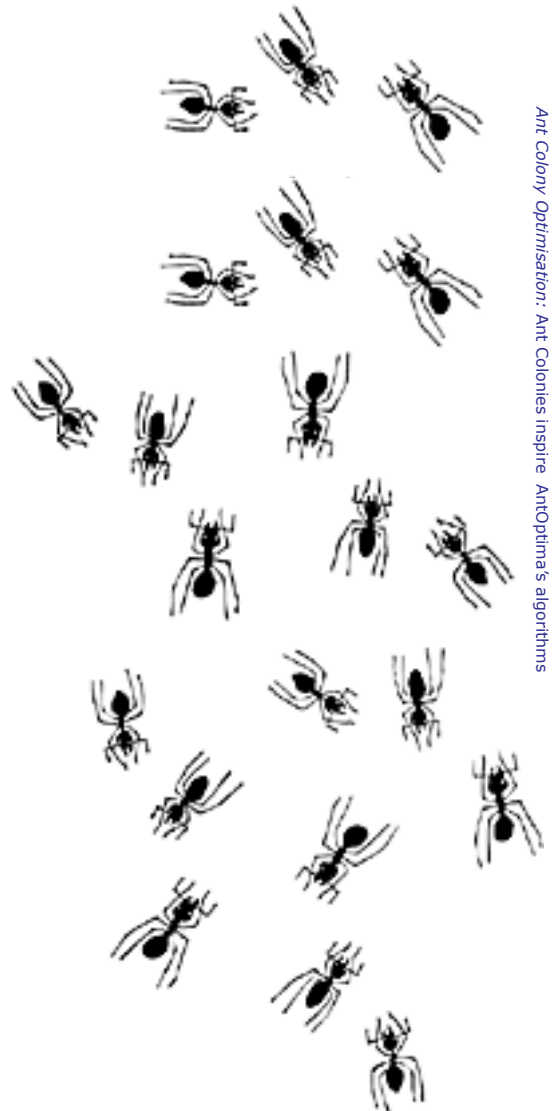
These algorithm learn from experience and can adapt to unforeseen situations. They can solve in just a few minutes problems that are otherwise intractable with traditional methods.

The advantages

OptiMilk handles the logistics of milk distribution thanks to an integrated approach from different sides of the problem. OptiMilk allows to:

- optimise the use of the fleet of vehicles (typology and number of vehicles, travel times, truck filling) with a complete and excellent solution, often better than the one realized from the planning team;
- improve the milk supply process from the breeders of the zone;
- reduce the costs of distribution;
- improve the efficiency (less miles, less time, more deliveries);
- increase customer's satisfaction, thanks to real time management of urgent deliveries.

OptiMilk runs under Microsoft Windows and it can be integrated with the majority of commercial EDP systems.



Ant Colony Optimisation: Ant Colonies inspire AntOptima's algorithms

OptiMilk can be interfaced with GPS, GPRS/GSM devices to geo-localise the vehicles. It implements the German standard TDL DIN 26051-1 to exchange data with the onboard delivery measurement devices.

Tour Planning Assistant (main module)

Given a set of orders, access constraints and delivery time windows, the main module computes the best delivery routes for your vehicles. This module manages non-homogeneous fleets, where vehicles may have different dimensions, equipment and capacities. Solutions are optimised taking into account the loading time of the milk at the supply source, the travel times, the set-up at the customers and the delivery times.

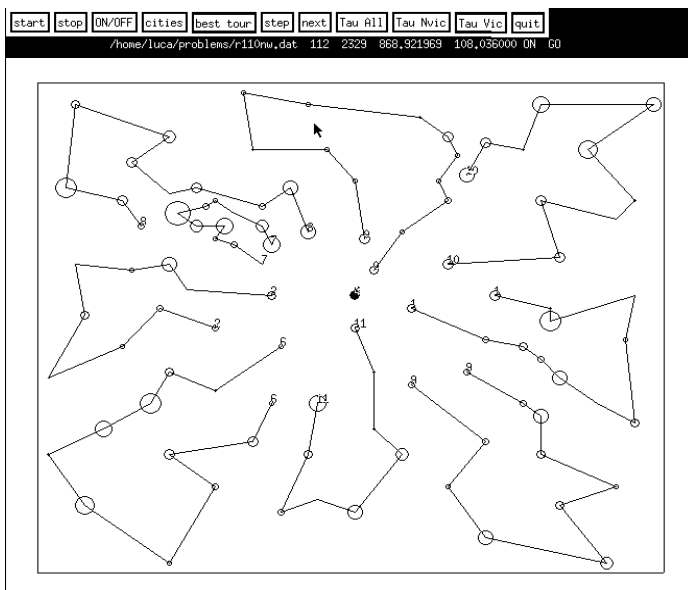
The Tour Planning Assistant offers a user friendly and usable interface to visualise the state of orders (pending, in progress, delivered) and the state of the fleet. Thanks to an integrated geographic information processing module, delivery routes are graphically displayed on a geographic map.

Nome Cliente	cap	Località	L.T.	Qtà	Capa.	Urt.V.	Dal	Al	C...	Plan.
5661	6952	CANDBBIO	0	1000	2000	23	17.11.97	22.11.97	0	34P-Lun
70482	6982	AGNO	0	1000	1500	34	17.11.97	22.11.97	0	34M-Mar
71124	6954	BIGORIO	0	1700	2000	27	17.11.97	22.11.97	0	24M-Lun
26169	6976	CASTAGNOLA	0	8000	10000	27	17.11.97	22.11.97	0	27M-Lun
23679	6915	NORANCO	0	1600	2100	22	17.11.97	22.11.97	0	27M-Lun
5468	6962	VIGANELLO	0	3500	4000	22	17.11.97	22.11.97	0	22M-Lun
71577	6948	RESSIGA-POR...	0	600	1000	27	17.11.97	22.11.97	0	34P-Lun
18888	6805	MEZZOVICO	0	4000	6000	23	17.11.97	22.11.97	0	24M-Mar
93912	6964	DAVESCO	0	3500	4000	23	17.11.97	22.11.97	0	24M-Mar
6900	6900	MASSARNO	0	1500	2000	23	17.11.97	22.11.97	0	24M-Lun



The Tour Assistant Module is a fully fledged Decision Support System, which works side to side with the human tour planner in the preparation of delivery routes: while automatically computing them, it allows the user to evaluate and adapt the solutions to face unplanned and peculiar situations. The Tour Planner Assistant does not trade power for flexibility: it gives you both.

Strategic tool

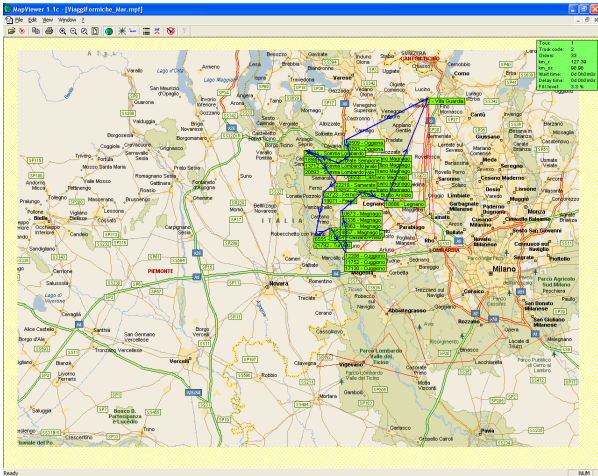


Tour Planning Assistant allows to:

- Optimize the distribution fixed tours, by maintaining the same frequency and the same days of visit for each customer and respecting the delivery time windows.
- Manage load unity expressed in pallet, kg, cbm and liters.
- Plan the pick-up and delivery orders per zones and simulate a planning, by grouping some zones together or changing the original distribution zones to evaluate the results and compare the differences.
- Simulate alternative distribution sceneries by varying specific parameters to evaluate the quality of the choices performed and, if necessary, carry out some changes.

OptiMilk can be interfaced with your company's database thanks to the ODBC standard, which supports most database systems, including Oracle, Microsoft SQL Server, Microsoft Access, and many others.

SimTour



The human planner can use the tour simulation module to assess the feasibility and the quality of the automatically generated tours in front of new traffic and meteorological conditions, which are affected by uncertainty and are random in nature. In the simulation environment the user modifies the parameters to construct a set of delivery routes, which are both efficient and robust.

Thanks to SIMTOUR the planner can evaluate alternative strategies and analyse different plans and distribution sceneries. This module, used with the TOUR ONLINE module, plays a key role in the evaluation of management strategies for urgent deliveries.

Tour Online

The online planning module is a tool of the utmost importance during the delivery process. Thanks to it, the planner can follow the execution of deliveries on the map, where the current vehicles' positions are represented. The fleet is connected to the base station via GSM/GPRS and is localised thanks to GPS devices.

On the basis of this information, the TOUR ONLINE module finds the best way to deliver incoming urgent orders, which keep coming during busy working days. These orders are very frequent in the case of milk distribution, since customers cannot be left without the product. The flexibility and extreme speed of AntOptima's algorithms are the reason behind the performance of the TOUR ONLINE module, which returns quick answers and has the ability to adapt to the unforeseen.



TOUR ONLINE uses data transmitted from palm computers (see an example above) that are connected to the black-box of the tanker trucks, linked via GPS/GPRS to the base station

AntOptima's profile

AntOptima was founded in 2001 in Lugano, Switzerland, as a spin-off of Istituto Dalle Molle di studi sull'Intelligenza Artificiale, a leading research institute in AI. AntOptima acts as liaison between basic research and industrial production, providing companies with cutting-edge technology and ideas to cope with problems in optimization, logistics, scheduling, and data mining. AntOptima solves complex industrial problems that require deep knowledge both of the production system and of the solution techniques. AntOptima's job involves identifying the correct level of abstraction of the problem and to apply the best available technological solution, integrating novel algorithms and hardware solutions within well-established information systems.

AntOptima's software is flexible and it evolves with your company's growth. We build intelligent systems that learn from past experience how to continuously improve the quality of the solutions.



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