QUINTIQ

The Holy Grail of Advanced Planning and Scheduling Systems

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Quintiq

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Company profile

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Founded	Established in 1997
Offices	HQ in Den Bosch, NL and Mannheim, GE
Growth	Every year profitable, 100%+ growth, privately held
Domain Expertise	Quintiq helps organizations to optimize their global supply chains through solving their daily planning puzzles.
Partners	Powerful business development and implementation partner network in Europe
Segments	Market focus on Transport, Metal, CPG, Workforce, Oil&Gas, Chemical

Select customers

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Where does Quintiq add value?

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Cliff Hegan, Production Support Manager at Alcan Rogerstone: *"The ultimate aim of Quintiq is to get our output level up by 20%, a target achieved in early trials during 2002."*

Gradus Hummelink, Deputy-Managing Director at Outokumpu: *"Our material return used to be 60%, by using Quintiq we have been able to improve this with 1%. In terms of added value this means we are gaining almost half a million Euro's every year."*

Nico Louter, Projects Manager at Railion Benelux: *"The system was live in 6 months, which is a unique achievement for a project of this complexity. We have increased punctuality of our trains from 80% to 95% using Quintiq."*

Jacques Blaauw, Managing Director KLM Catering Services: *This is one of the few IT projects, which is implemented on time, within budget and has exceeded expectations concerning the functional requirements. The punctuality of the distribution of the catering products to the aircraft has increased from 98% to 99,5%, which is an important improvement for us."*

Simon Pollard, Vice-President at AMR Research: *"Nice to see and hear something so different and applicable, however, and if the theory further proves itself in practice, then this could over time and with suitable focus-become a breakthrough technology."*

The Challenge

QUINTIQ

Offering an intelligent, adaptable, scalable and easy to deploy solution, to support virtually any planning and scheduling process.

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Opt (1): Definition

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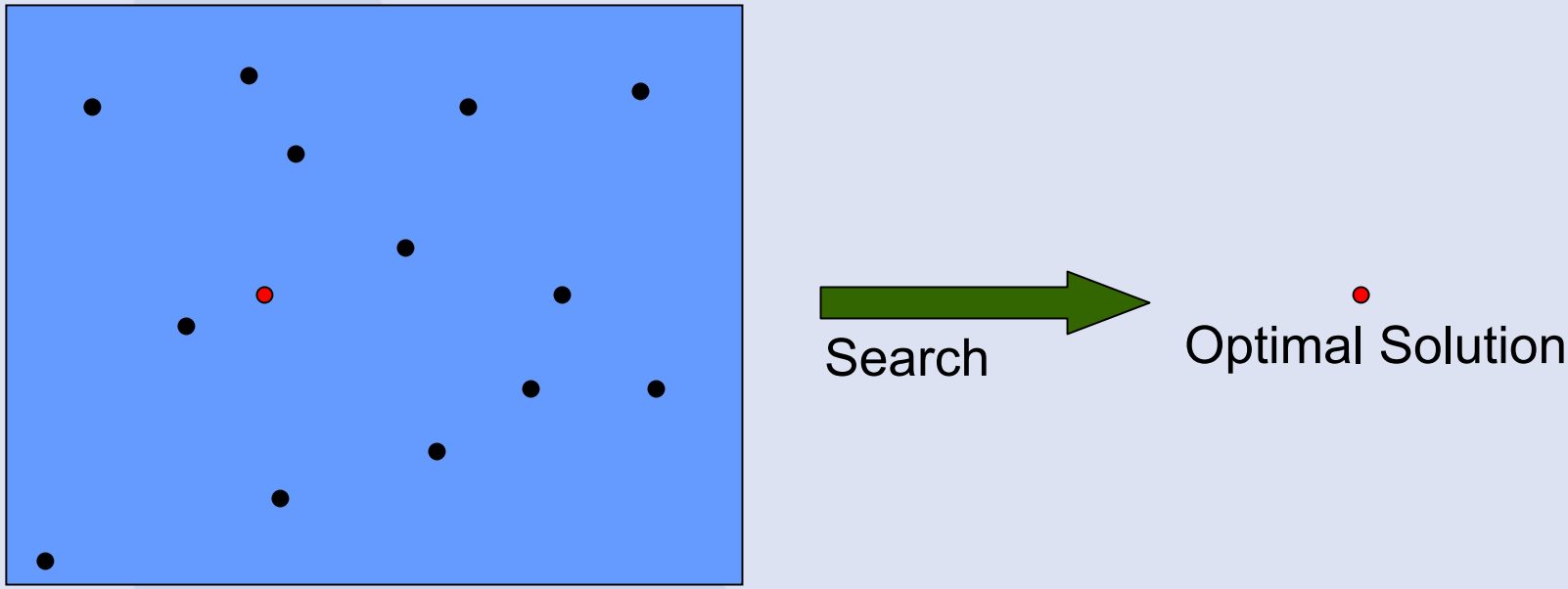

Search space with a very large number of potential solutions together with an evaluation function for each of these potential solutions, resulting in 1 or a few optimal solutions

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Opt (2): Example

- 100 shipments a day in a given area
- 20 available trucks for 5 shipments each
- Routes can have any form:
  - E.g. S1-S2-S3-S4-S5-R1-R3-R4-R2-R5
  - Or S1-R1-S2-R2-S3-S4-R4-R3-S5-R5
- Total number of states:
  - $(100! / 5!^{20}) * (10!^{20} / 2^5) = 10^{217}$
- Evaluation function:
  - E.g. sum of all km driven

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Opt (3): Search

- Search is checking (a subset of) all available (partial) search states
  - Many different search techniques exist, all exploiting some assumption regarding the search space
  - E.g. Genetic Algorithms: The parts of two good solutions may be combined to form a better solution
  - E.g. Hill Climbing: a great solution can be found by making a small change to a good solution
- Search spaces tend to increase in size exponentially compared to the parameters of the problem

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Opt (4): Knowledge 1

- Domain knowledge may be used in two different ways:
  - To guide the search
    - E.g. Genetic algorithms: define mutation and cross-over operations
    - E.g. Hill climbing: define steps
  - To restrict the search space
    - Eliminate infeasible states (exact)
    - Eliminate (expected) bad states (heuristic)
- In most practical APS situations it is more desirable to search in a cleverly reduced search space, than to cleverly search in a large search space. It results in better solutions, found more quickly.

Opt (5): knowledge 2

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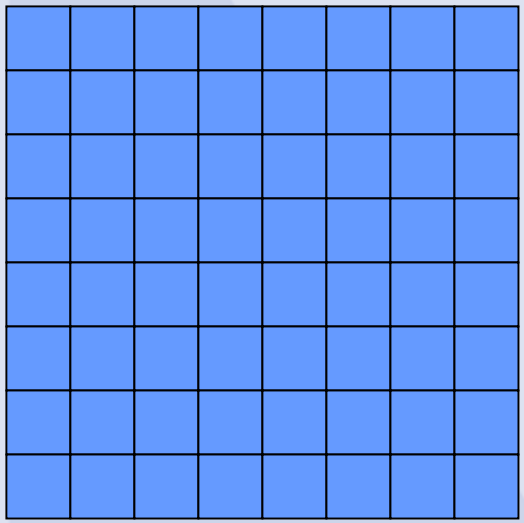
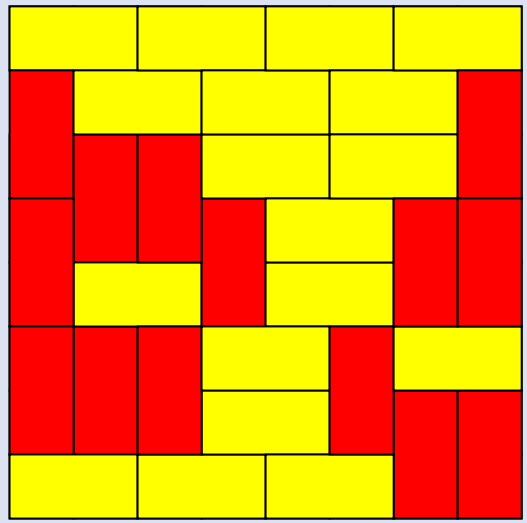
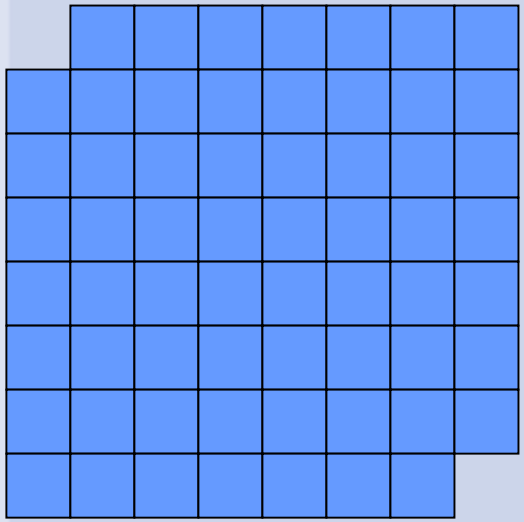


Fit 32 dominos on a chessboard





Fit 31 dominos on a mutilated chessboard

?

Opt (6): knowledge 3

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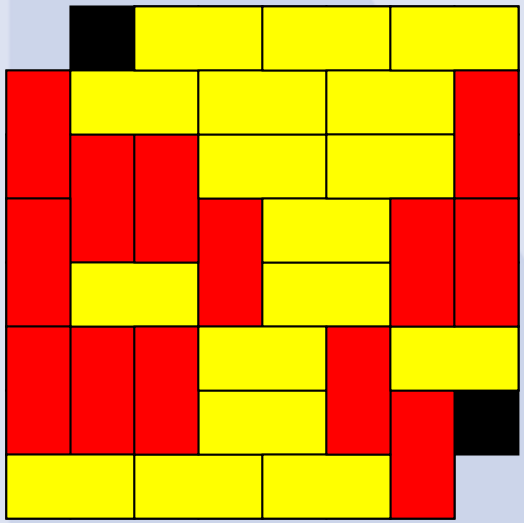

1. Colour the chessboard white and black
2. Each domino will cover 1 black and 1 white square
3. There are 32 black and 30 white squares
4. Thus no more than 30 dominos will fit
5. Any greedy filling that does not isolate squares will fit 30

Opt (7): Quintiq Philosophy

1. Analyze specific problem
2. Formalize available knowledge
3. Restrict search space using the formalized knowledge
4. Select applicable (set of) algorithms
5. Efficiently search remaining search space

Vision

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- 1. Business Model & Business logic
  - Each company is unique
  - Having a 100% fitting model is essential
- 2. Visualization & Interaction
  - Individual visualization is essential to support the users in making informed decisions
  - Interaction must be direct, fast and intuitive
- 3. Optimization
  - Optimization through a selection of algorithm(s) from the Quintiq Optimization Suite

Conclusions

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1. Many companies can make significant improvements in their bottom line by improving the way they solve their daily planning puzzle.

2. To obtain such improvements the three main elements involved are modeling, interaction and optimization.

3. Of these *modeling* is the Holy Grail APS packages should focus on.

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