

Constraint programming applied to minimizing switching on a binary sorter

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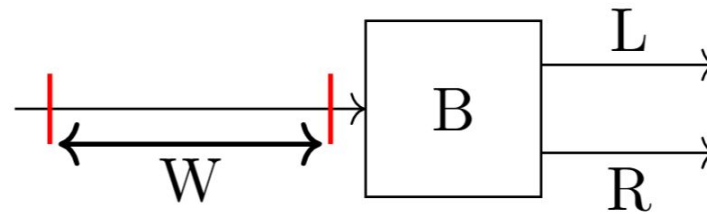


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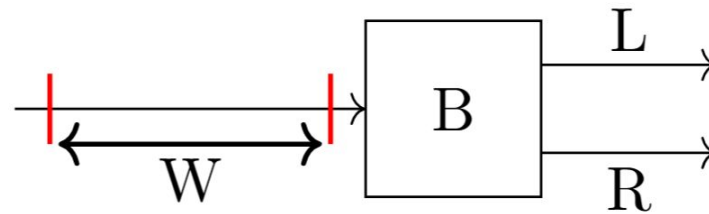
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Introduction

Industrial problem

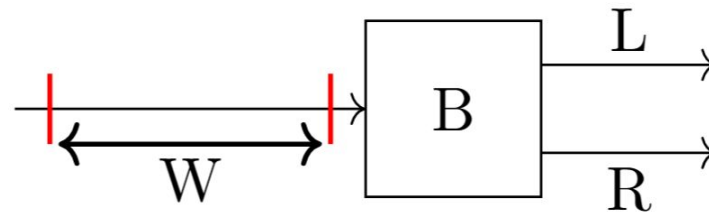


Industrial problem



S	A	B	B	A	C	A	B	A	A
Q	L	R	R	L	L	R	L	R	R

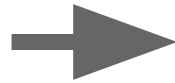
Industrial problem



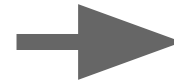
S	A	B	B	A	C	A	B	A	A
Q	L	R	R	L	L	R	L	R	R
C	0	1	0	1	0	1	1	1	0

Consumer Demand

**More
switching in
the binary
sorter**



More
blockage



If long
enough,
production
can stall

Objective

**Optimization objective:
Minimize the switching**

Problem constraints

S	A	B	B	A	C	A	B	A	A	5
Q	L	R	R	L	L	R	L	R	R	

S	A	B	B	A	C	A	B	A	A	3
D	L	R	L	L	L	R	R	R	R	

Constraints & Modelling

General modelling

$$\text{minimize } \sum_j c_j$$

$$\bigwedge_{1 \leq j \leq |S|} c_j = (d_j \neq d_{j-1})$$

$$\bigwedge_{a \in \mathbb{A}} \bigwedge_{m \in \mathbb{M}} F_a^m = \left(\sum_{i \in I_a} d_i = m \right)$$

$$\bigwedge_{a \in \mathbb{A}} \bigwedge_{m \in \mathbb{M}} F_a^m = V_a^m(Q)$$

Objective

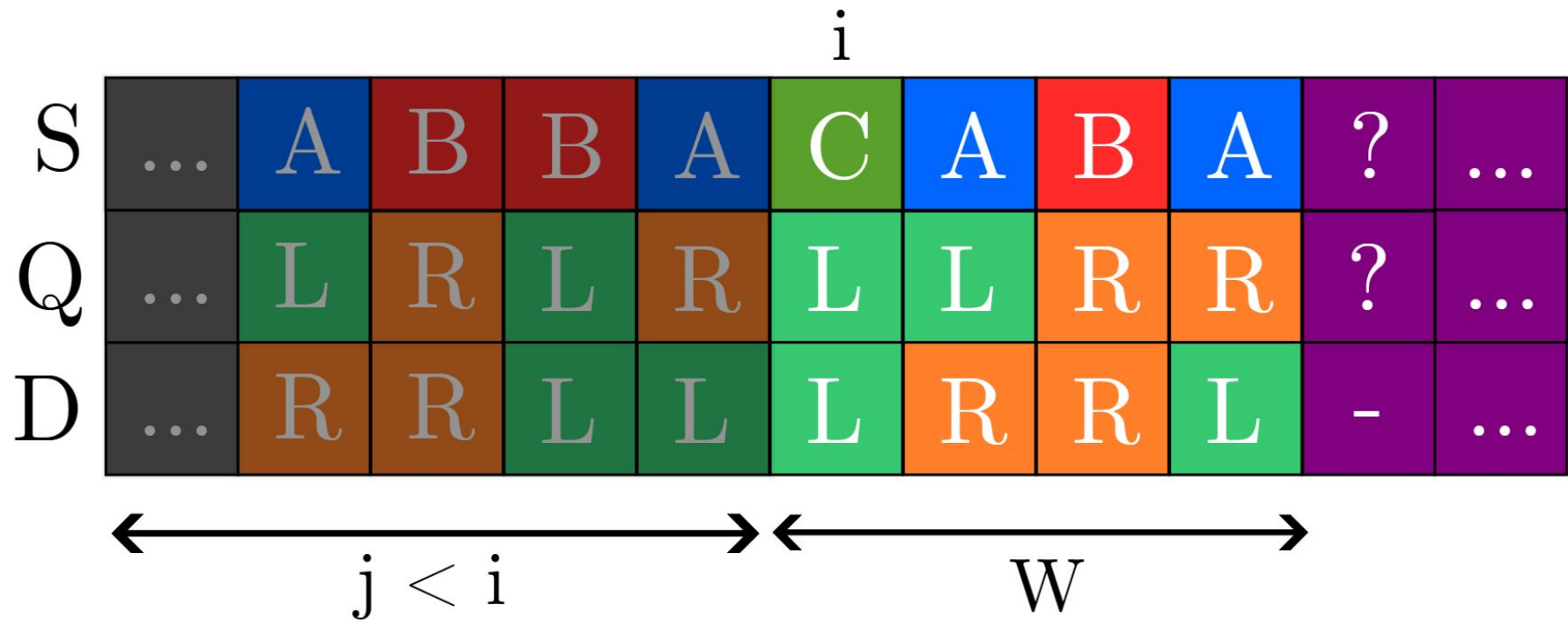
This produces optimal solutions....

Objective

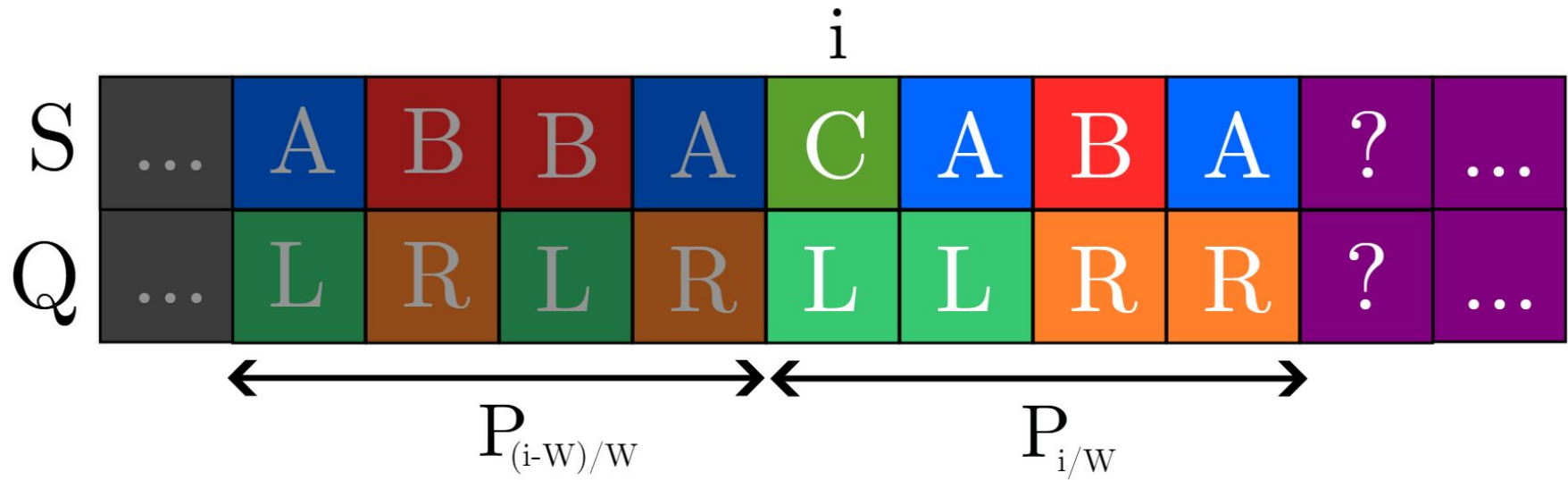
This produces optimal solutions....
If all the information is known upfront

Sliding window problem

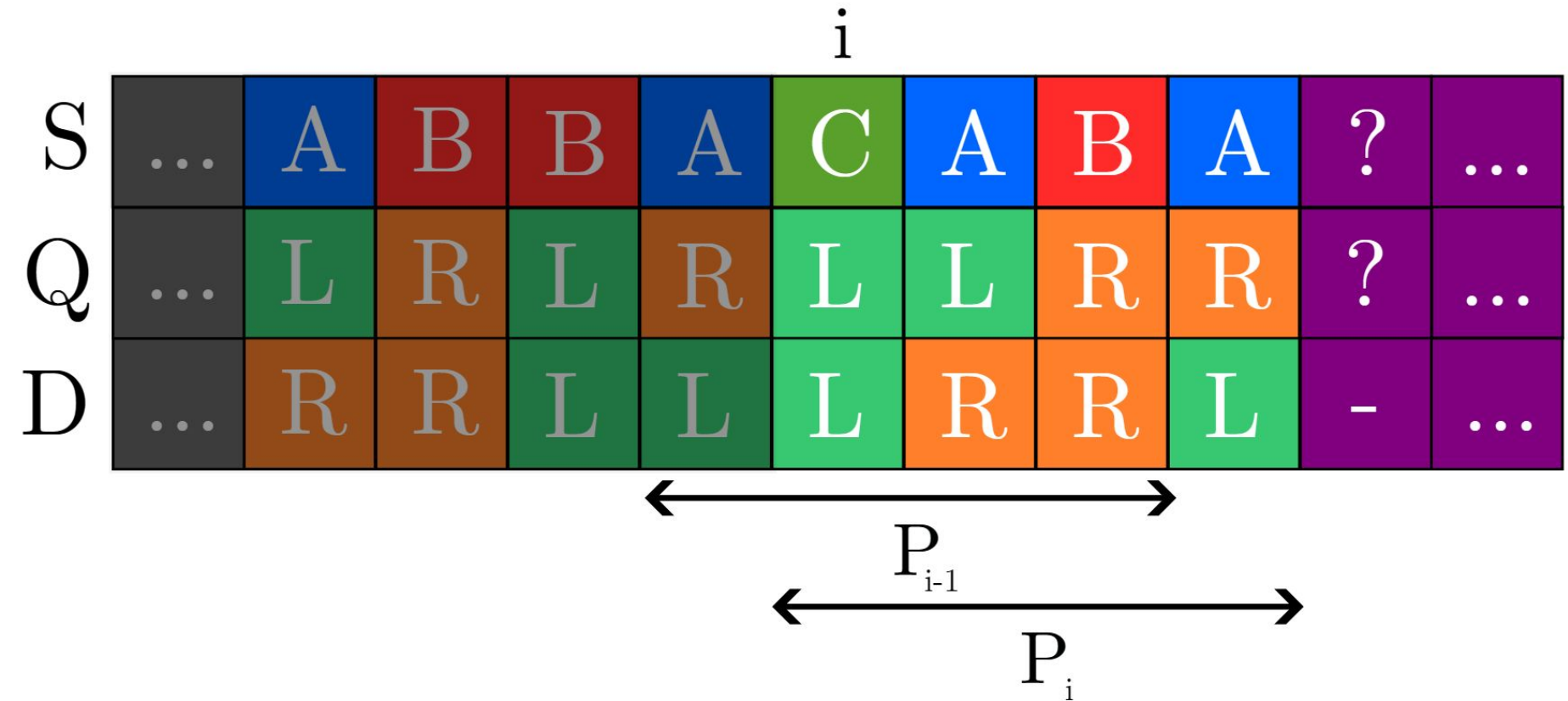
Sliding window problem



Optimization by blocks

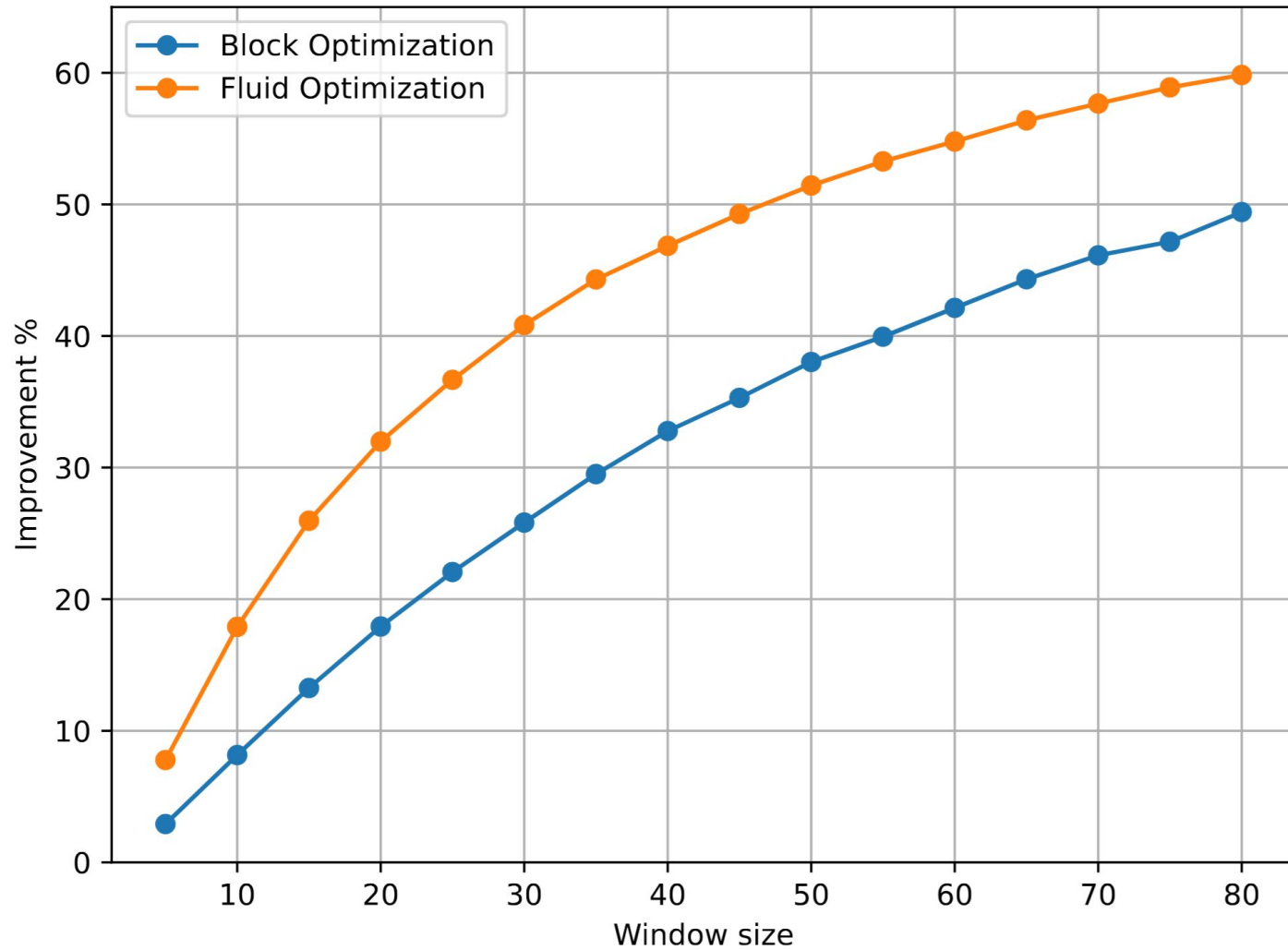


Fluid optimization



Results

Results



Thank you very much!

Any questions?

Josep Maria Salvia Hornos

