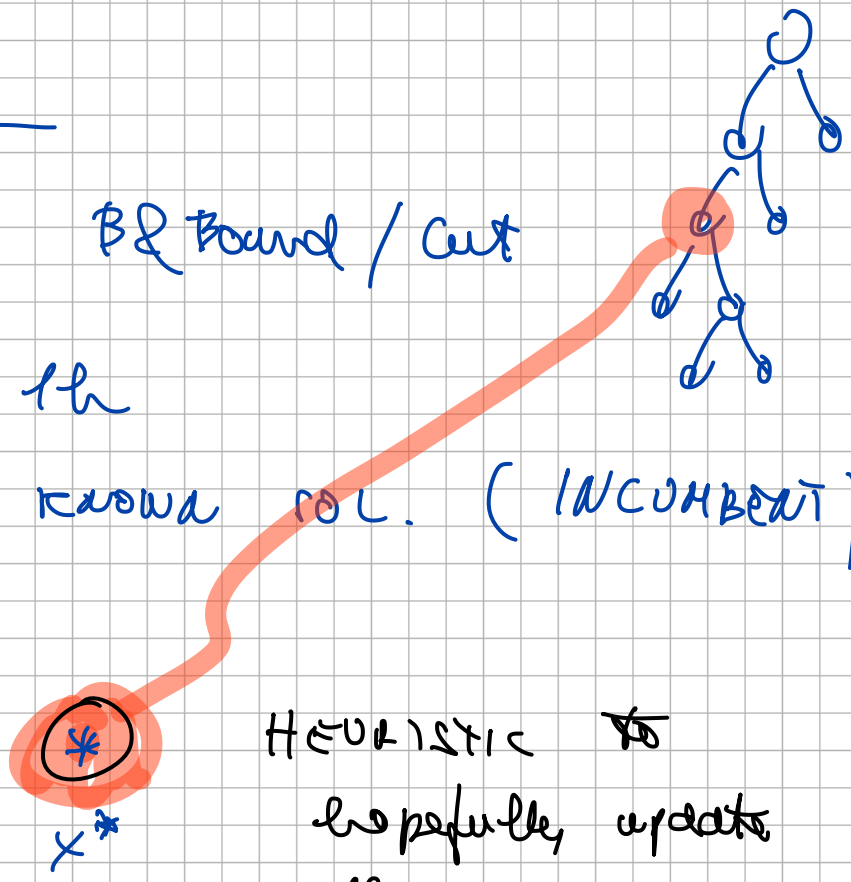
10-JAN-2022

HEURISTICS

ILP B&Bound / Cut

- TIME LIMIT th

BEST KNOWN SOL. (INCUMBENT)



HEURISTIC to hopefully update the incumbent

FRACTIONAL LP-sol. x^* → HEUR. SOL. $\tilde{x}$

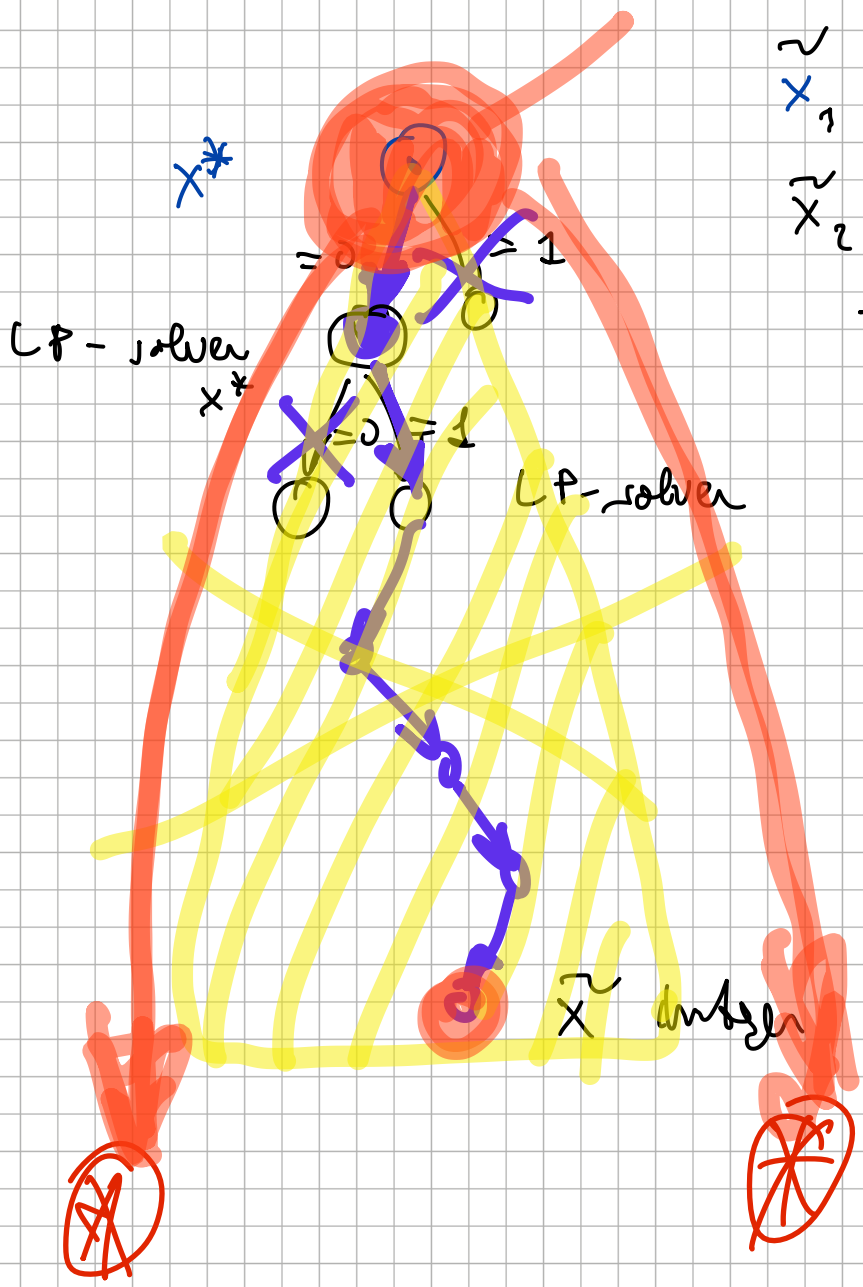
$x^* \rightarrow [H] \rightarrow \tilde{x}$ feasible ILP sol.

H : rounding procedure

$x^*_j \rightarrow \tilde{x}_j = \lfloor x^*_j \rceil$ "round"

if ($\tilde{x}$ is FEASIBLE) then "$\tilde{x}$ can update the incumbent"

$x^* \rightarrow [\text{DIVING}] \rightarrow \tilde{x}$

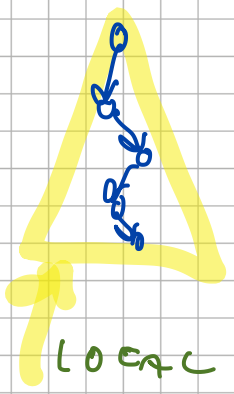


$\tilde{x}_1 := [x^*_1]$ → recompute x^*

$\tilde{x}_2 :=$ --- → "

- - - . → "

- .



LOCAL BRANCHING TREE

$\tilde{x}$ integer → update INCUMB.

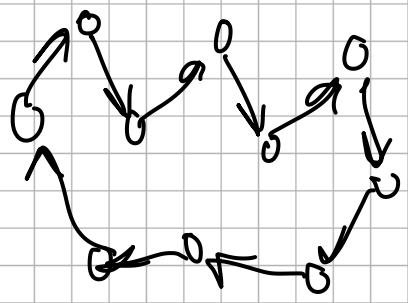
→ RINS / RENS / ...

→ LOCAL BRANCHING

→ ...

PROBLEM-SPECIFIC HEURISTICS

E.g. TSP

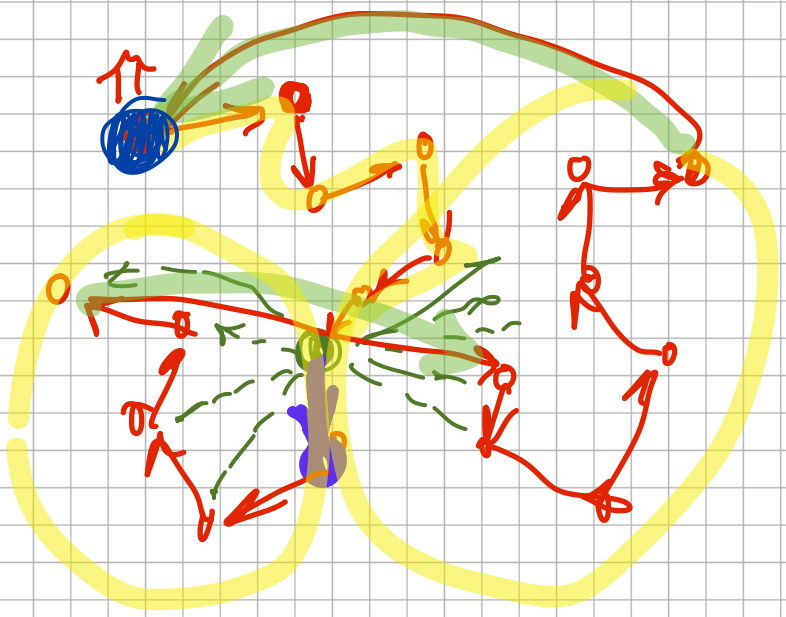


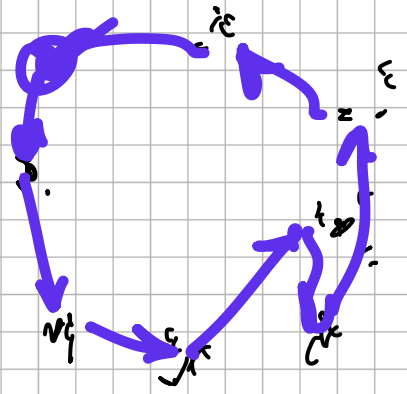
- exact TSP:

  BRANCH CUT method (CONCORDE)

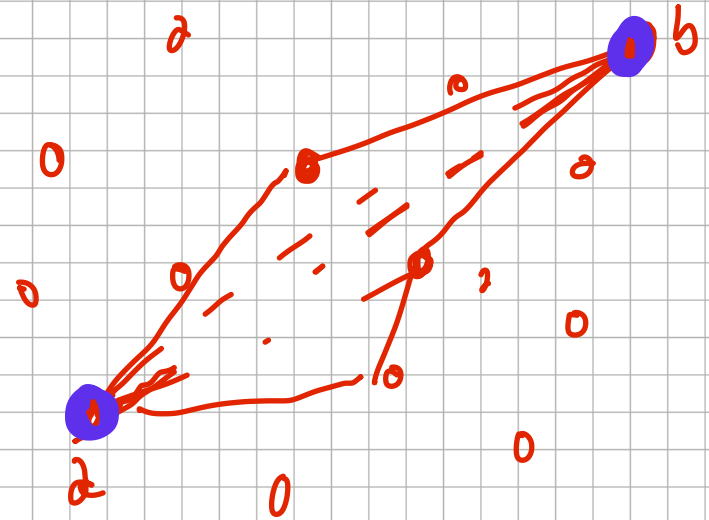
- specific heuristic

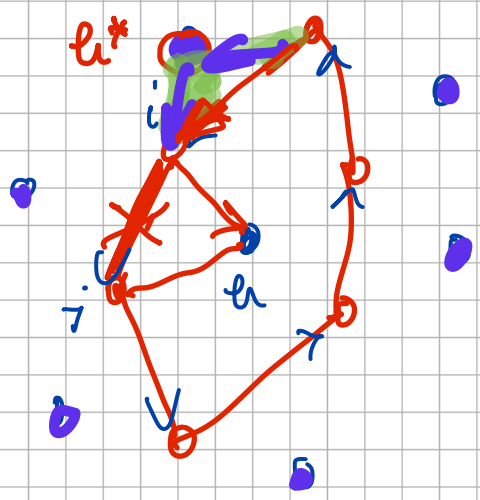
  - GREEDY METHOD





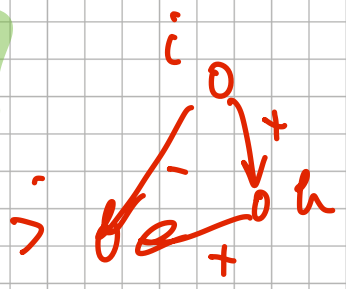
NEAREST NEIG. HEU.

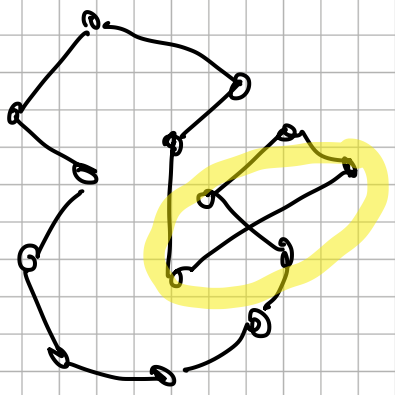




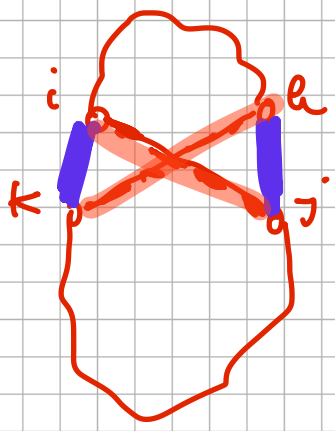
EXTRA-MILEAGE $(i, j, h) := c_{ih} + c_{hj} - c_{ij}$

$\Rightarrow$ MINIMUM





$\rightarrow$ NO DIRECTION ARCS

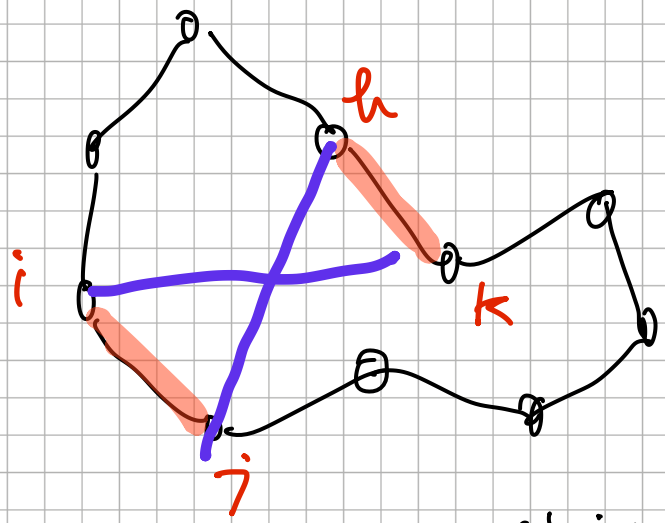


$[i,j]$, $[h,k]$

$\rightarrow$ $[i,k]$, $[j,h]$

$$\Delta \text{cost}(\text{MOVE}) = (c_{ik} + c_{jh}) - (c_{ij} + c_{hk})$$

if $\Delta < 0 \Rightarrow$ improve !

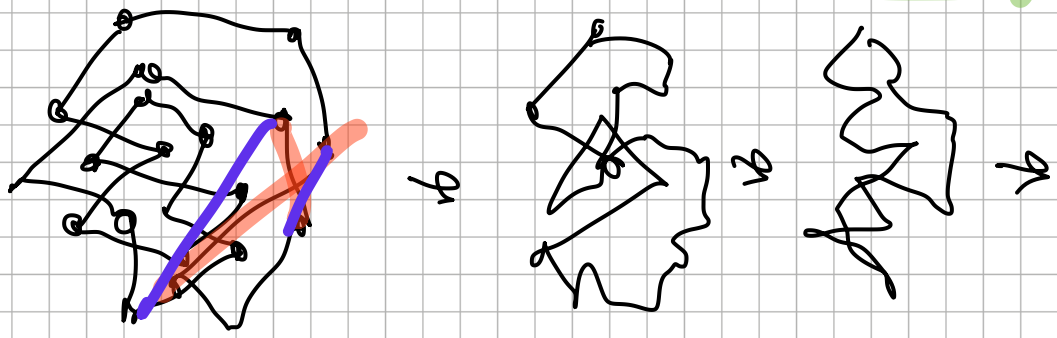


$\frac{n(n-1)}{2}$ possible MOVES

TRY ALL POSSIBLE PAIRS (i,j), (h,k)

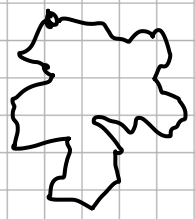
$\Rightarrow O(n^2)$

ITERATIVE REFINING PROCEDURE



Initial TSP sol. (random)

→ ... →



LOCAL OPT. SOL.

MORE ADVANCED METHODS:

→ TABU-SEARCH META-HEUR.

→ GENETIC "

→ ML-heuristics ...