E.A.5.7 (Cards 2)

1.1 Modellazione

1.1.1 Variabili e domini

Dati i parametri $(\{C_1, ..., C_n\}, N, M, D)$, siano (X, D, C) t.c.

- $X = \{X_i \mid i = 1, ..., n\} \cup \{P_1, V, P_2\}$, dove
  - X_i è la carta C_{X_i} scelta per la posizione i
  - P_1 è la posizione del primo picco
  - V è la posizione della valle
  - P_2 è la posizione del secondo picco
- $D = \{D_l \mid D_l = \{1, ..., n\} \land l = \{X_1, ..., X_n, P_1, V, P_2\}\}$

1.1.2 Vincoli

- $C = \text{alldifferent}(X_1, ..., X_n) \cup C_{\text{stationary}} \cup C_{\text{ord}}$ t.c.
  - $C_{\text{stationary}} = \{\langle\{P_1, V, P_2\}, R\rangle \mid R = \{(p_1, v, p_2) \mid p_1 < v < p_2\}$

$$
\begin{aligned}
C_{\text{ord}} = \Big\{ & \langle\{P_1, V, P_2, X_i, X_{i+1}\}, R\rangle \mid \\
& R = \Big\{ (p_1, v, p_2, x_i, x_{i+1}) \mid \\
& \quad (1 \le i < p_1 - 1 \lor v \le i < p_2 - 1) \Longrightarrow C_{x_i} < C_{x_{i+1}} \land \\
& \quad (p_1 \le i < v - 1 \lor p_2 \le i < n - 1) \Longrightarrow C_{x_i} > C_{x_{i+1}} \\
& \Big\} \\
\Big\} &
\end{aligned}
\tag{1}
$$

1.2 Istanziazione

1.2.1 Variabili e domini

Siano $(\text{Cards}, N, M, D) = (\{1, 1, 2, 2, 3, 3, 4\}, 7, 4, 4)$ i parametri, si hanno (X, D, C) t.c.

- $X = \{X_1, X_2, X_3, X_4, X_5, X_6, X_7, P_1, V, P_2\}$
- $D = \{D_l \mid D_l = \{1, 2, 3, 4, 5, 6, 7\} \land l = \{X_1, X_2, X_3, X_4, X_5, X_6, X_7, P_1, V, P_2\}\}$

1.2.2 Vincoli

- $C = \text{alldifferent}(X_1, X_2, X_3, X_4, X_5, X_6, X_7) \cup C_{\text{stationary}} \cup C_{\text{ord}}$ t.c.

$$
\begin{aligned}
C_{\text{stationary}} = \{\langle\{P_1, V, P_2\}, \{ \\
&(1,2,3), (1,2,4), (1,2,5), (1,2,6), (1,2,7), \\
&(1,3,4), (1,3,5), (1,3,6), (1,3,7), (1,4,5), \\
&(1,4,6), (1,4,7), (1,5,6), (1,5,7), (1,6,7), \\
&(2,3,4), (2,3,5), (2,3,6), (2,3,7), (2,4,5), \\
&(2,4,6), (2,4,7), (2,5,6), (2,5,7), (2,6,7), \\
&(3,4,5), (3,4,6), (3,4,7), (3,5,6), (3,5,7), \\
&(3,6,7), (4,5,6), (4,5,7), (4,6,7), (5,6,7) \\
\}\rangle\}
\end{aligned}
\tag{2}
$$

$$
C_{\text{ord}} = \left\{ \begin{array}{c} \text{circa 30000 valori... non vale la pena metterli tutti} \\ \text{perché il vincolo guarda tutti i valori per tutte le triple} \\ \text{(p1, v, p2), non solo quelle vincolate} \end{array} \right\} \tag{3}
$$

1.3 Codifica in MiniZinc

```
include "globals.mzn";

any: cards_values = [1, 1, 2, 2, 3, 3, 4];
int: n = 7;
int: m = 4;
int: d = 4;

array[1..n] of var 1..n: card_at_position;
var 1..n - 2: peak_1_pos;
var 1..n - 1: valley_pos;
var 1..n: peak_2_pos;

constraint (peak_1_pos < valley_pos /\ valley_pos <
peak_2_pos);

constraint alldifferent(card_at_position);

constraint forall(i in 1..peak_1_pos - 1)
(cards_values[card_at_position[i]] <
cards_values[card_at_position[i + 1]]);
constraint forall(i in peak_1_pos..valley_pos - 1)
(cards_values[card_at_position[i]] >
cards_values[card_at_position[i + 1]]);
constraint forall(i in valley_pos..peak_2_pos - 1)
(cards_values[card_at_position[i]] <
cards_values[card_at_position[i + 1]]);
constraint forall(i in peak_2_pos..n - 1)
(cards_values[card_at_position[i]] >
cards_values[card_at_position[i + 1]]);

constraint (peak_2_pos - peak_1_pos = d);


output ["peak 1 - " ++ show(peak_1_pos) ++ "\nvalley - " ++
show(valley_pos) ++ "\npeak 2 - " ++ show(peak_2_pos) ++
"\n"];
output [show(cards_values[card_at_position[i]]) ++ " " | i in
1..n];
```