



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

NAO PLANNING CHALLENGE

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Artificial Intelligence
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MOVEMENTS

Positions

- a. Predefined = ['StandInit', 'Stand', 'Sit', 'Crouch', ..]
- b. Timeline = ['Guitar', 'Happy Birthday', 'Rotation Right Arm', ..]

Execution

Based on the type of the the position, we had to define two ways of executing an action:

- a. **applyPosture**: Specific function, for Timeline Positions. In this case, we have exported the timeline from Coreographe and adapted into a python function
- b. NAO QI library for nao interaction

Incompatibilities detection

- Semi-automatic algorithm

PLANNING

Algorithm

- Graphplan
- Python
- AIMA library

Modeling

- a. **States** - position that nao can perform
- b. **Actions** - movement from a position P1 to another position P2
 - a. Preconditions: Nao is in P1 and P1 is compatible with P2
 - b. Postconditions: Nao is in P2

Constraints

- **Mandatory intermediate positions**
 - Iterate over mandatory positions and generate intermediate independent plans and then unify all the plans into a single choreography
- **Minimum number of positions**
 - If an intermediate plan does not meet the minimum number of positions constraint, the planner generates another plan from the second-last position found so far and then generates the plan from that position to the intermediate goal after removing the compatibility from the second-last position to the goal
- **Time**
 - Modify the code of the positions in order to make them faster
- **Artistic correction, avoiding repetitions**
 - Random shuffle of the initial state
 - Deleting duplicates from the plan and generate a new plan removing compatibilities if possible

The image features a complex network diagram on a light gray background. It consists of numerous nodes of varying sizes and colors (dark blue, light blue, and gray) connected by thin, dark gray lines. Some nodes are highlighted with larger, concentric circles. The word "THANKS" is centered in a bold, black, sans-serif font. The overall aesthetic is modern and tech-oriented.

THANKS