Hierarchical Concurrent EFSM

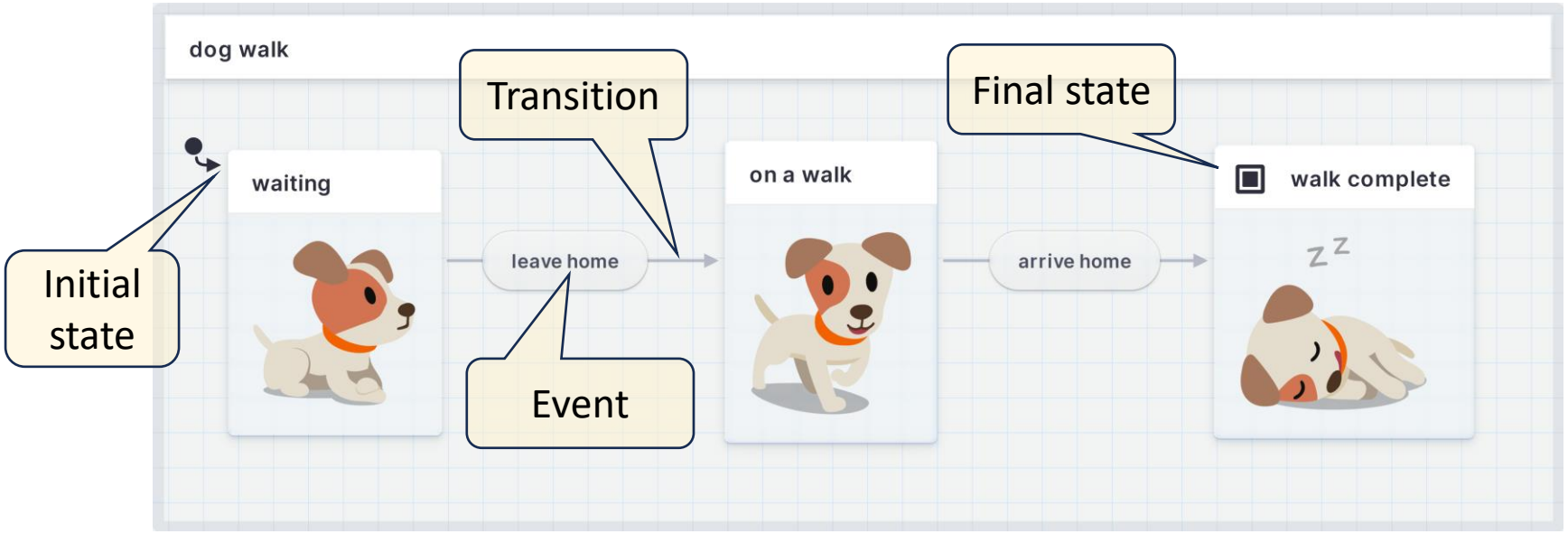
Application-level EFSM such as path-following

Statecharts

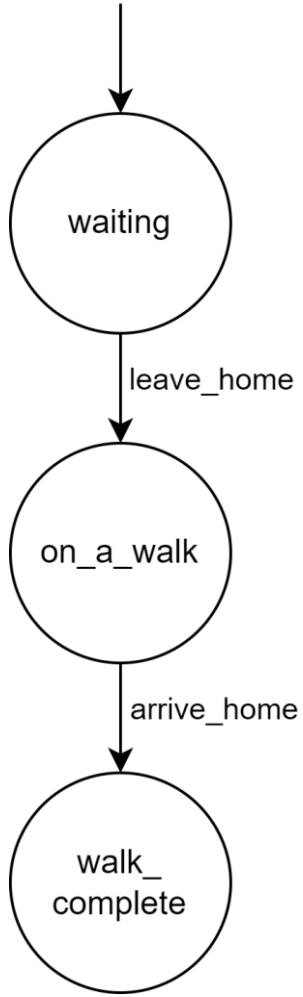
- Definitions
  - *Visual language for modeling the executable behavior of complex reactive event-based systems* [https://sismic.readthedocs.io/en/latest/format.html]
  - Diagrams that represent state machines, including compound states, which are states with *refinements*, the foundation of **hierarchical state machines**

Statecharts, introduction 1/3

- A flat statechart on Stately.ai

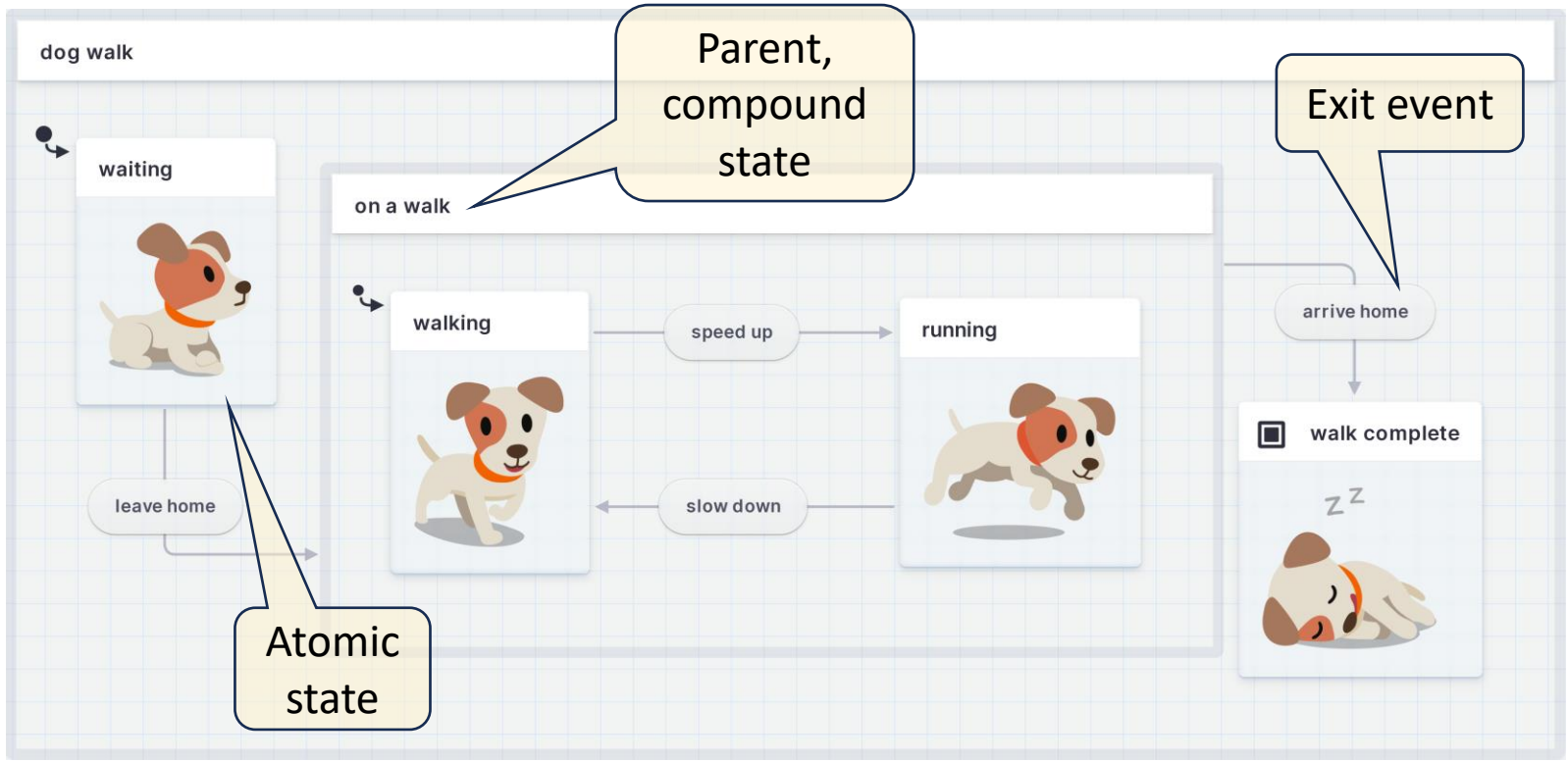


Source: https://stately.ai/docs/state-machines-and-statecharts



Statecharts, introduction 2/3

- A hierarchical statechart on Stately.ai



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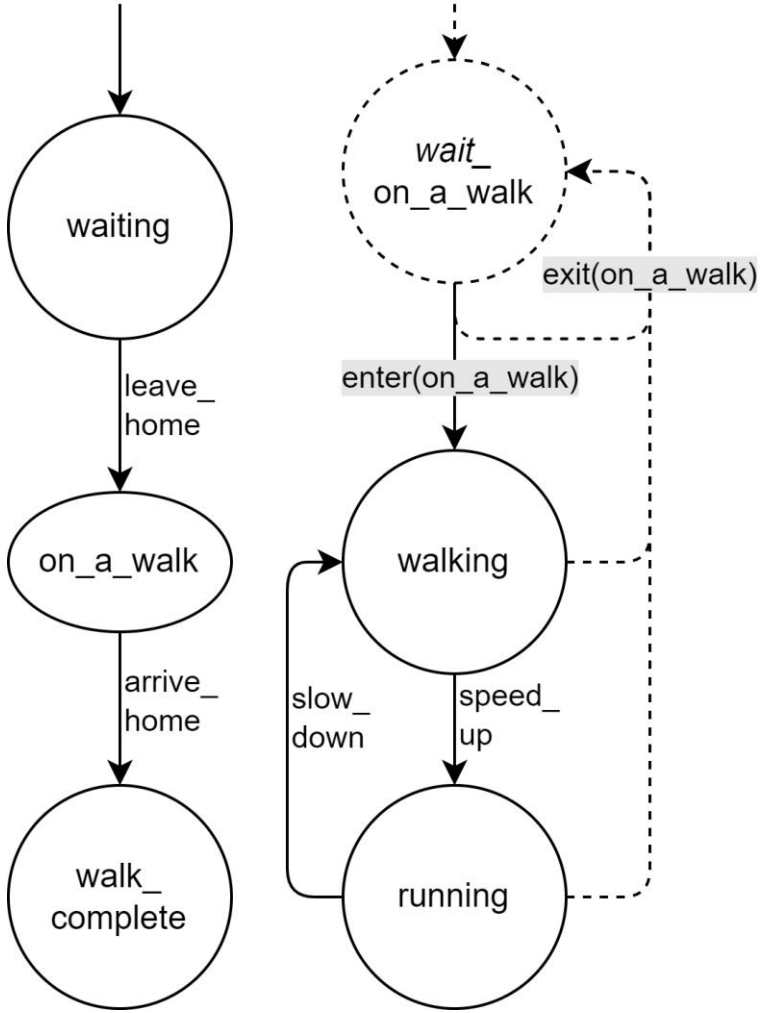
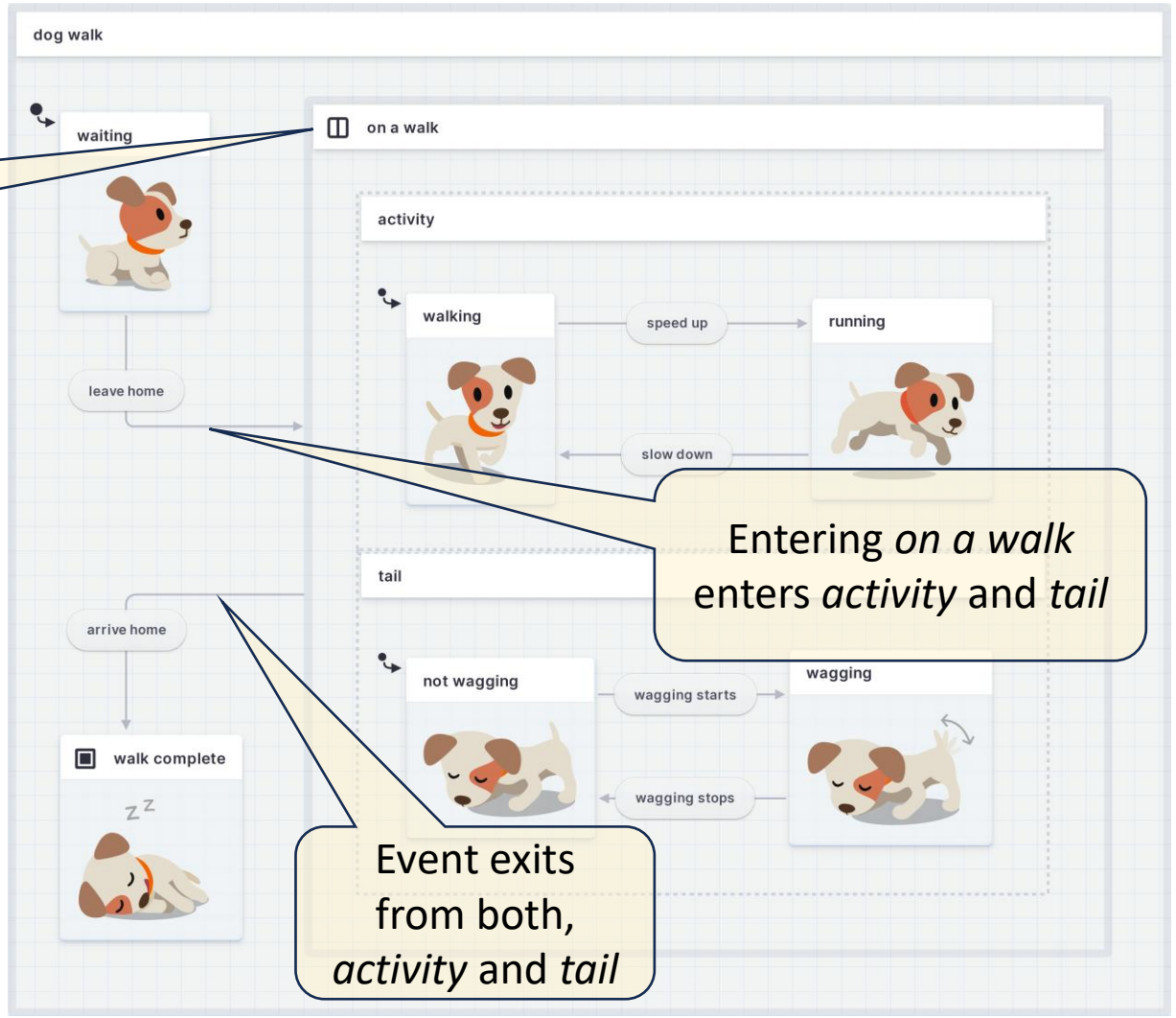


Statecharts, introduction 3/3

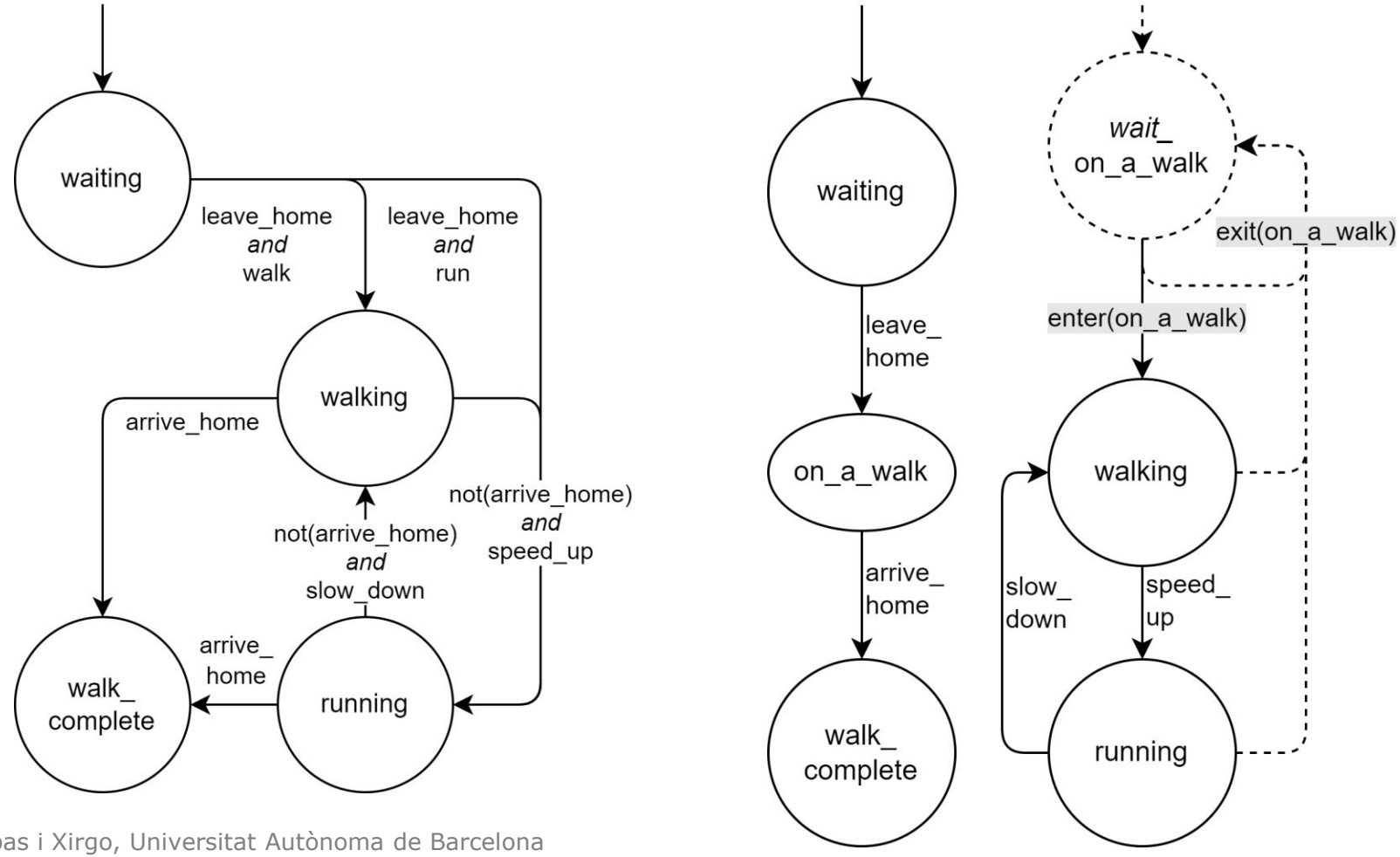
- A hierarchical, concurrent statechart on Stately.ai
- Other features
  - History compound states
    - Shallow
    - Deep
  - Preemptive transitions
    - Top-down, conditional evaluation
  - Synchronization
    - Exit upon reaching final states, i.e. *Transition-on-Completion* mode
    - Exit upon outgoing parent event, i.e. *Transition-Immediately* mode



Source: https://stately.ai/docs/state-machines-and-statecharts

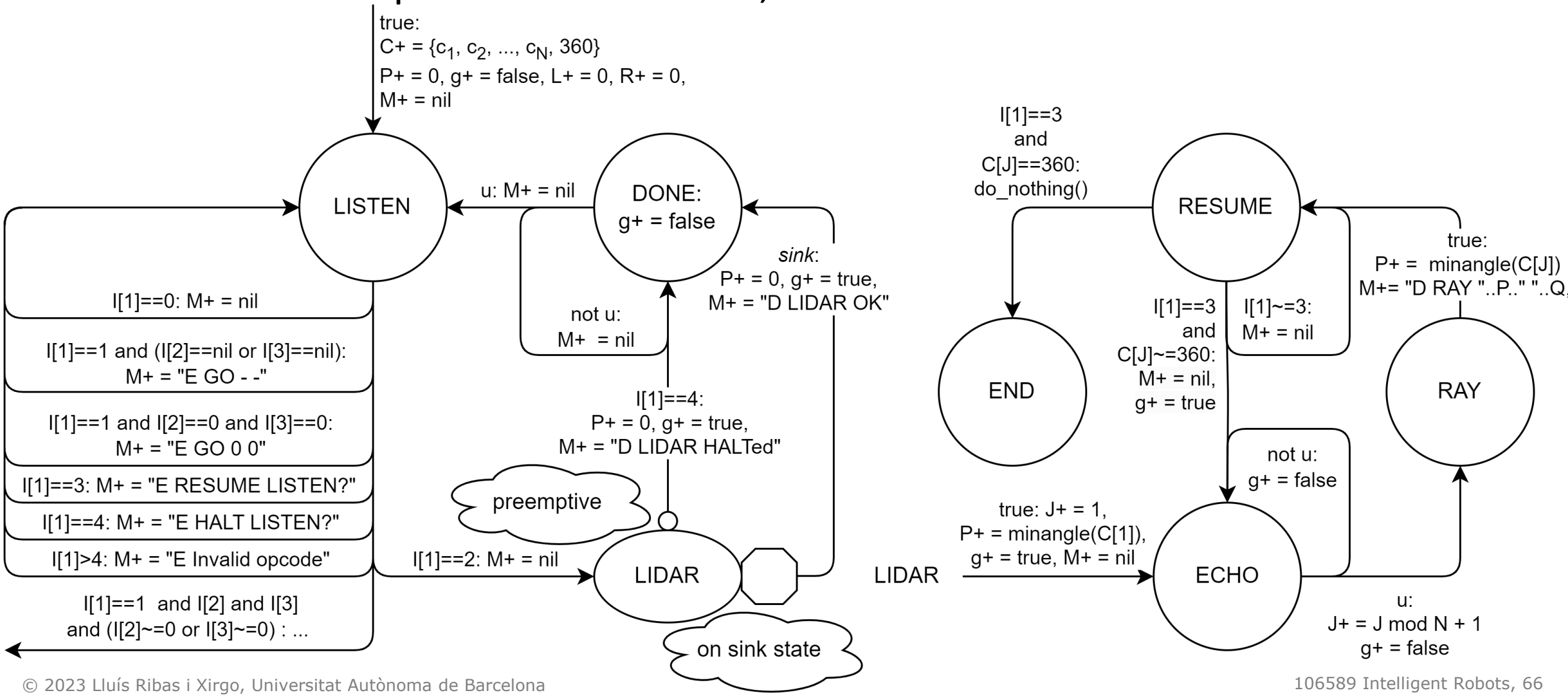
Hierarchical, concurrent EFSM

- Hierarchy minimizes number of arcs w.r.t flat version



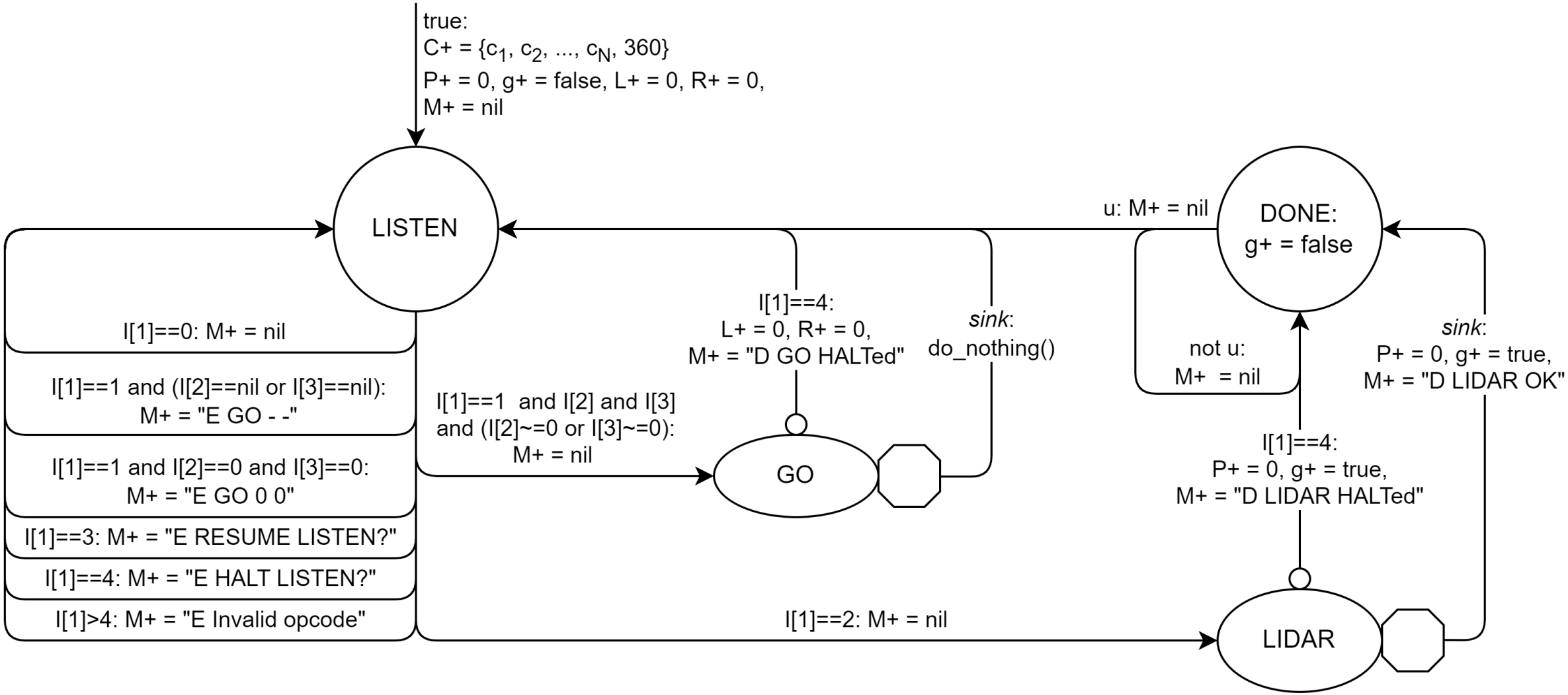
Hierarchical, concurrent EFSM

- Robot basic operations controller, L0Main + LIDAR refinement



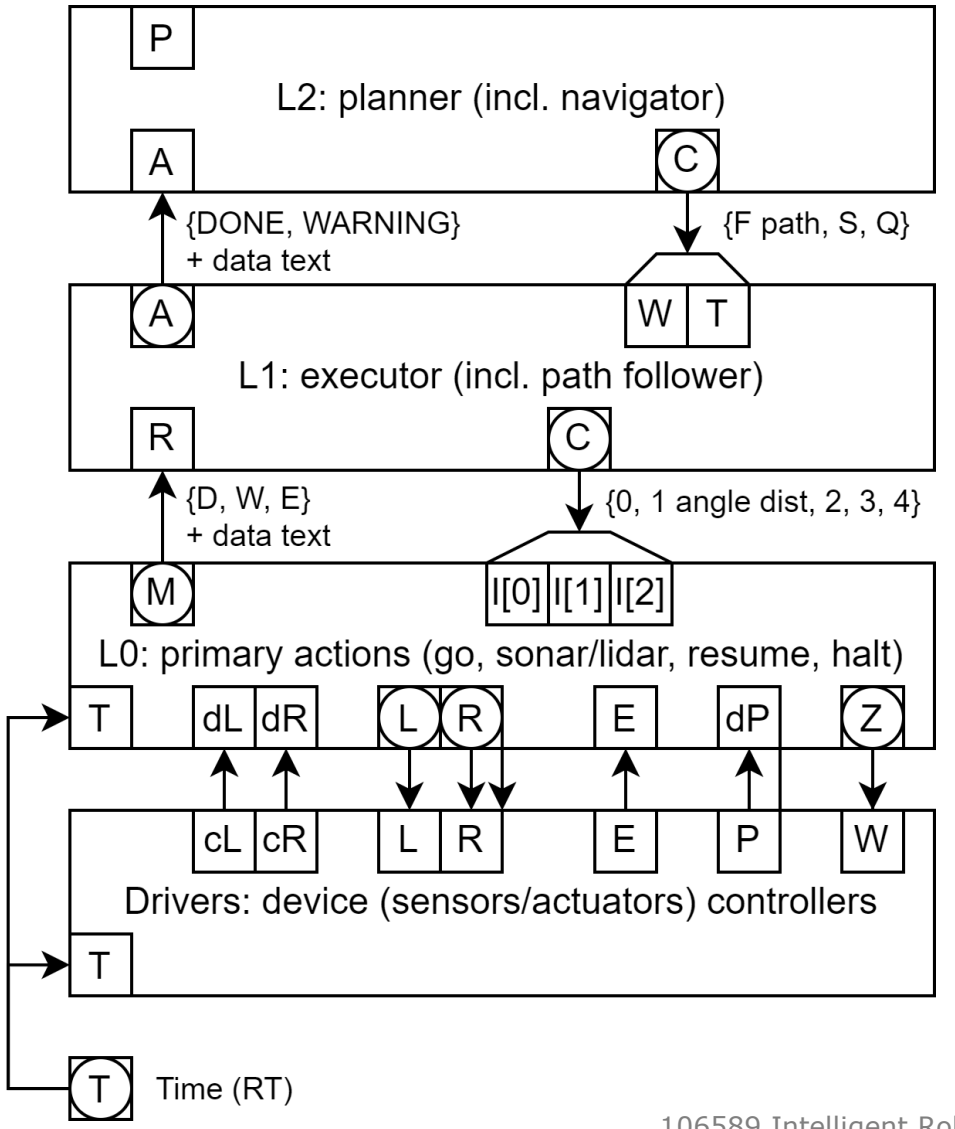
Hierarchical, concurrent EFSM

- Robot basic operations controller, L0Main + GO refinement



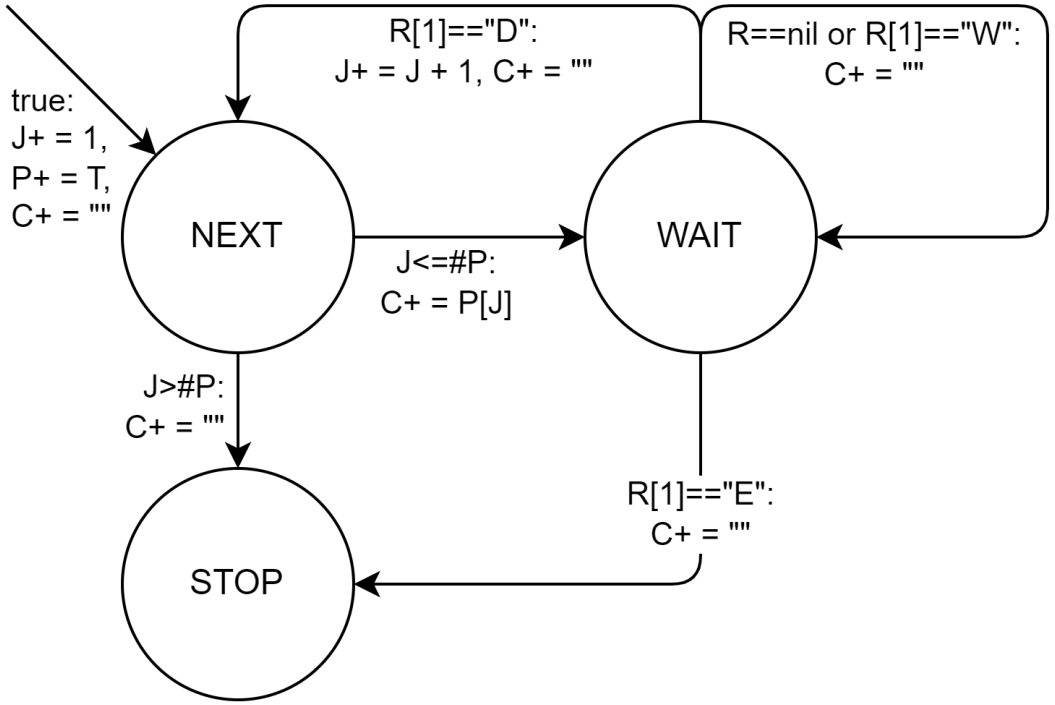
Hierarchical, concurrent EFSM

- Layered architecture
  - Communications' based hierarchy
  - All assignments consistent
  - Need for explicit synchronization protocols



Exercise 6: Path follower implementation

- Path follower



R[1]=="a" must be replaced by `(R and string.sub(R, 1, 1)=="a")` in Lua