A numerical/symbolic estimator for activity tracking
A preliminary report

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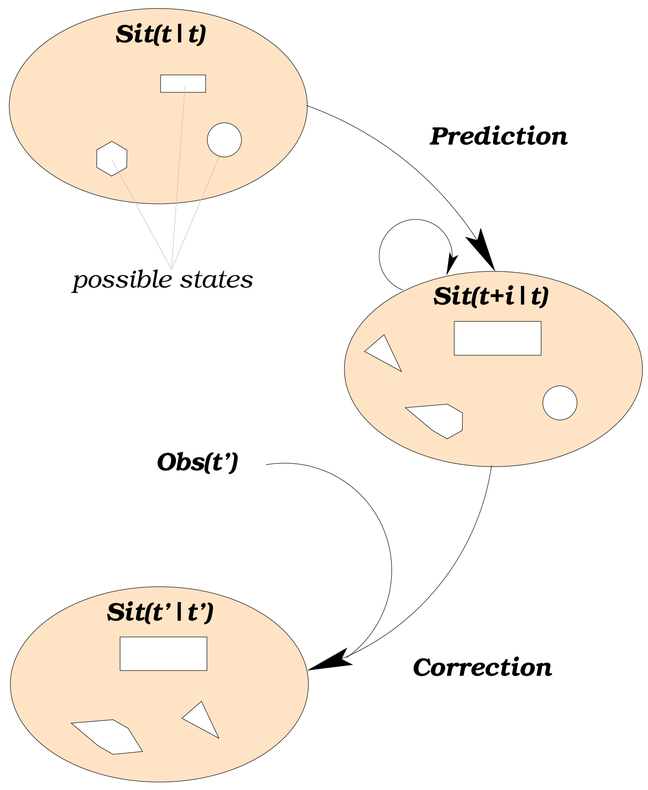
Problem Description

- Aircrew is a major factor of air accidents: about 40 % of casualties.
- Human errors must be understood to be alleviated.
- Our work: design a system able to track the pilot's activity.

Related Work

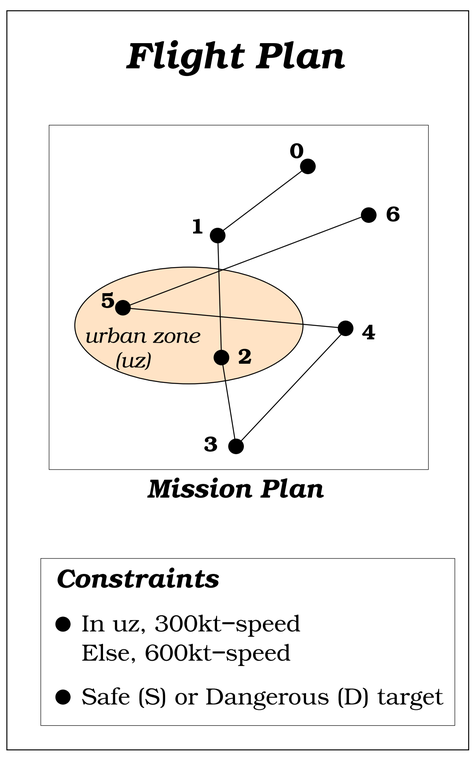
- Chronicles (Dousson & Ghallab, 1993),
- Timed Automata Model (Largouët & Cordier, 2000),
- Bayesian Networks for Traffic Recognition (Buxton & Gong, 1995),
- Scenarii Recognition (Brémond & Thonnat, 2003),
- ROCCO (André, Herzog & Rist, 1997),
- Football actions recognition (Intille & Bobick, 1999),
- Aeronautical Procedures using PNets (Onken, 1997).

A numerical/symbolic estimator

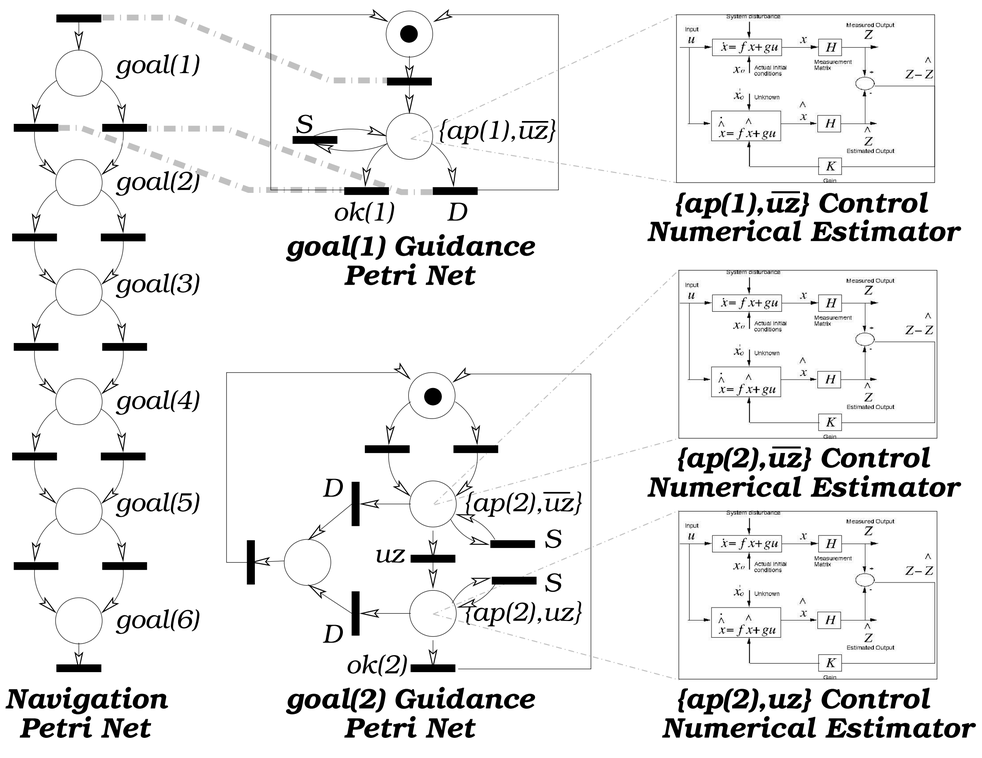


- An iterative process.
- A two-step process: Prediction and Correction.
- $Obs(t)$ is the observation vector at time t.
- $Sit(t'|t)$ is the estimated situation at time t' knowing the observation at time t.

The numerical/symbolic model



Model



Control parameters:
Numerical parameters

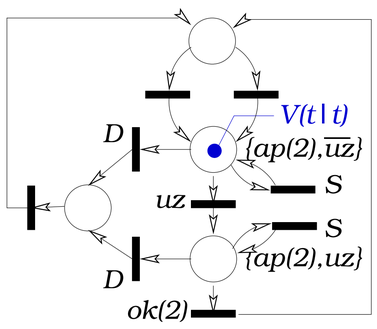
- X
- Y
- Heading
- Speed

Guidance parameters:
Symbolic parameters

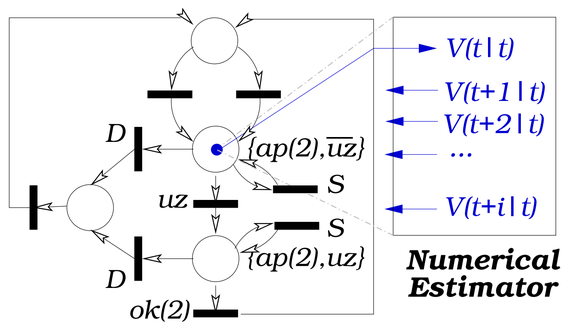
- UrbanZone
- Ok *(reached waypoints)*
- Ap *(reaching waypoint)*

State Vector V(t | t)

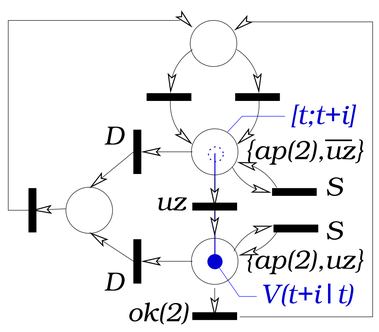
Prediction



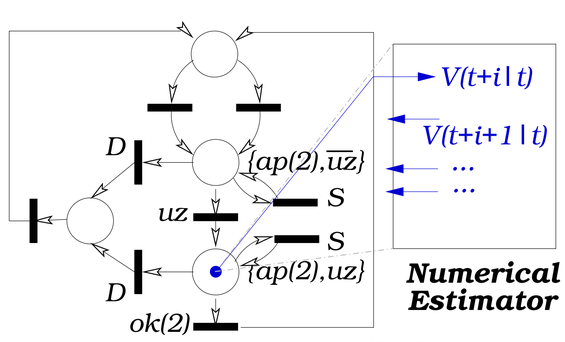
Prediction step
Initial situation Sit(t | t) = {V(t | t)}



Numerical Prediction
V(t+i | t) is the first vector containing uz



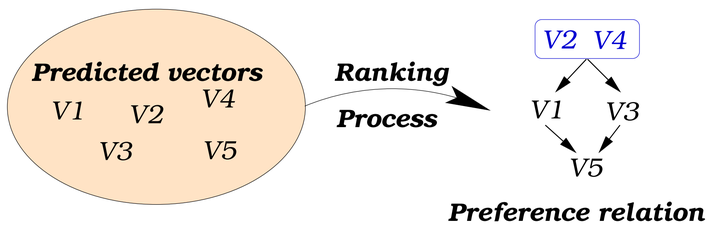
Symbolic Prediction
'uz' transition is fired



Numerical Prediction
within {ap(2),uz} numerical estimator

Correction

- A new observation $Obs(t')$ is available.
- A set of predicted vectors has been computed.
- We want to rank these vectors to keep the "best" matchings between the new observation and the predicted vectors.



Future Work

- Test several ranking methods.*ELECTRE, MELCHIOR, etc.*
- Exploit the Preference Relation.
- Propagate the preference relation within the next Prediction step.