



Dynamic Scene Understanding: Prediction of Mover Trajectories

World Model Workshop

RCTA PR meeting, 5/25/2017, Luis E. Navarro-Serment



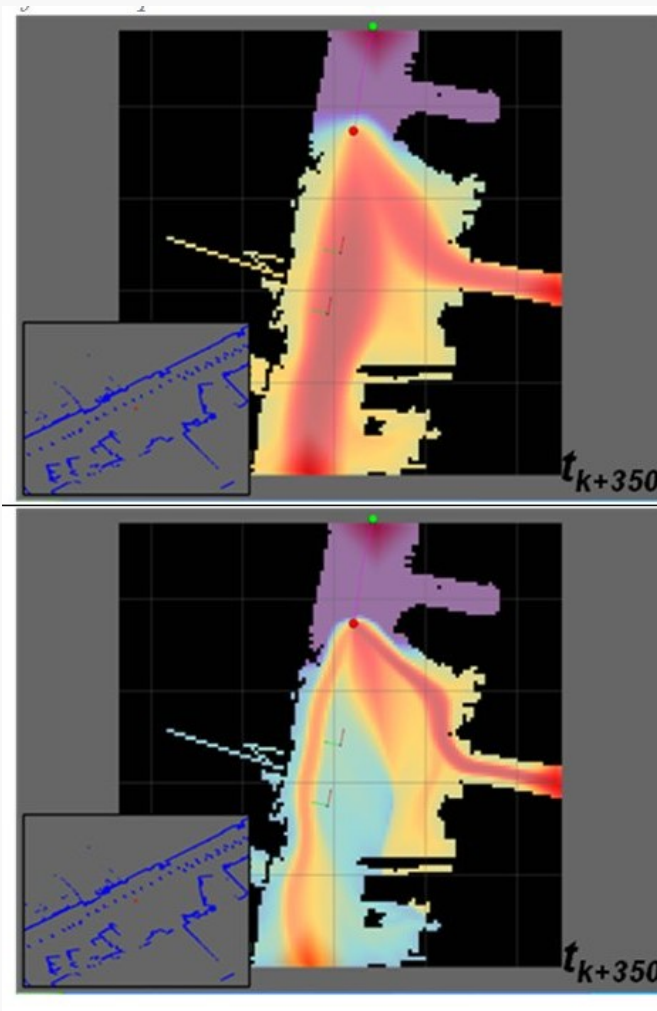
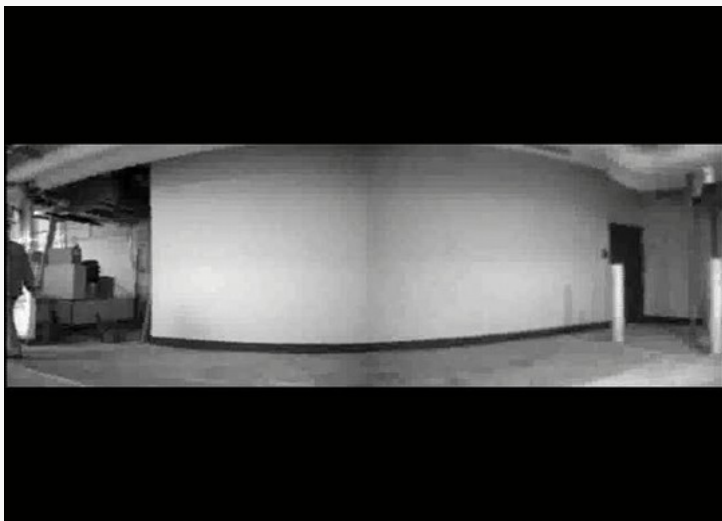
Objective

- To describe the needs of the **Prediction software** (T1C1S2A) as an **example** of a **Perception** component
- To recognize information exchanges between module and the World Model
- To identify potential gaps in current development plan
- To detect areas of opportunity for improvements
 - To alter software design plans accordingly
- To spark additional insights, ideas, etc. that benefit the RCTA as a whole



Fundamental assumptions

- Purposeful motion
- Movers react to environment in a consistent manner
- Locations of targets are known





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Potential destinations

Scene features

Predictive models

Mover tracking

Expected result

- Map of expectations of future visitation

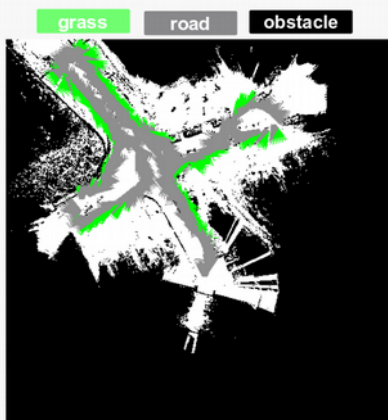


$$T_k = \{ \mathbf{x}_k^{t_1}, \mathbf{x}_k^{t_2}, \dots, \mathbf{x}_k^{t_N} \} \quad \mathbf{x}_k^i = \begin{bmatrix} x_k^i \\ y_k^i \\ \theta_k^i \end{bmatrix}$$

Mover tracking data

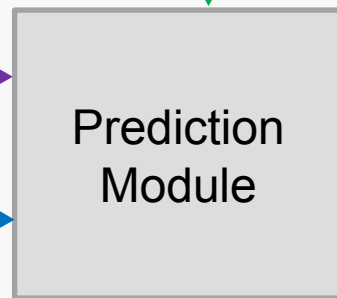
Destinations $\langle x_d, y_d \rangle$

- Map
- Inference



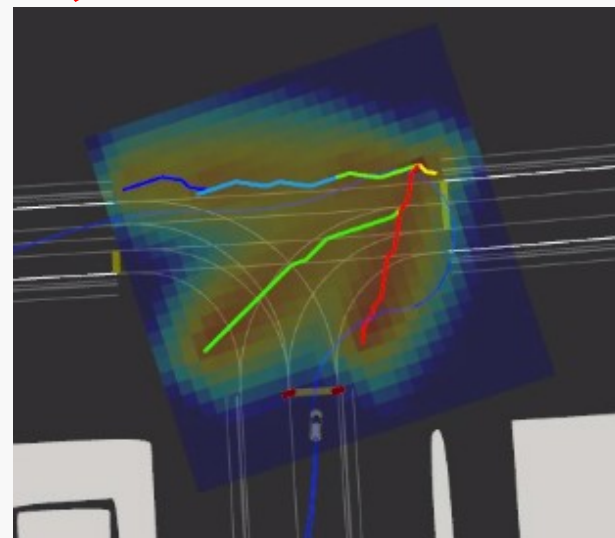
Feature maps

nav_msgs/OccupancyGrid
tf/tfMessage



Predictive model parameters

std_msgs/Float64MultiArray
geometry_msgs/PoseStamped





- **Who generates the data?**
 - **Sensors**
 - **Other modules**
 - **Pre-processing**

- **Rates**
 - **Inputs, Outputs**

- **Future extensions**
 - **Mover class**
 - **SoD**
 - **Social context**

- **Data Collection**
 - **Training**
 - **Evaluation**
 - **Testing**



This was a case study of a Perception module

Other perception modules will have analogous requirements, and will produce outputs which will support additional modules