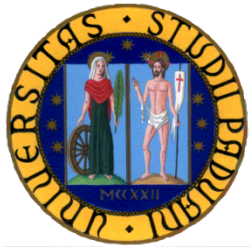

Corso di Laurea Magistrale
in Ingegneria dell'Automazione

DEPARTMENT OF INFORMATION ENGINEERING
UNIVERSITY OF PADOVA

Algoritmi di pattugliamento 2D per reti di videosorveglianza multicamera

Relatore: Prof. Luca Schenato
Correlatore: Dott. Davide Raimondo (Pavia/ETH)

Laureando: Marco Pattarello
matr. 605600-IAM

Padova, 5 Aprire 2011

Descrizione generale progetto

DEPARTMENT OF INFORMATION ENGINEERING
UNIVERSITY OF PADOVA

ETH

VIDEOTEC

FeedNeback
co-design for networked control systems

Relatore: Prof. Luca Schenato
Correlatore: Dr. Davide Raimondo

Laureando: Marco Pattarello

Stato dell'arte

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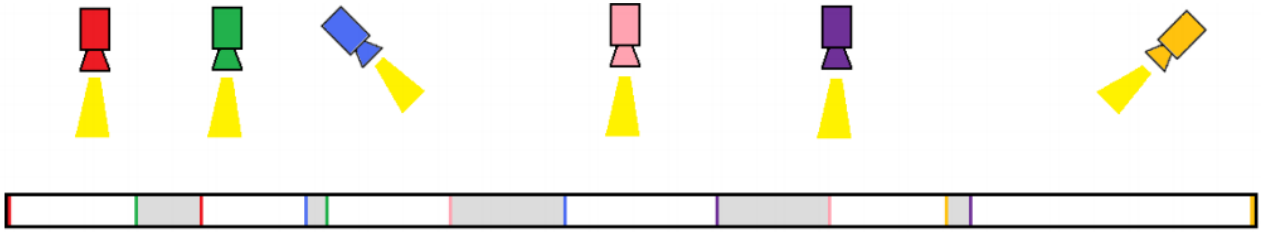
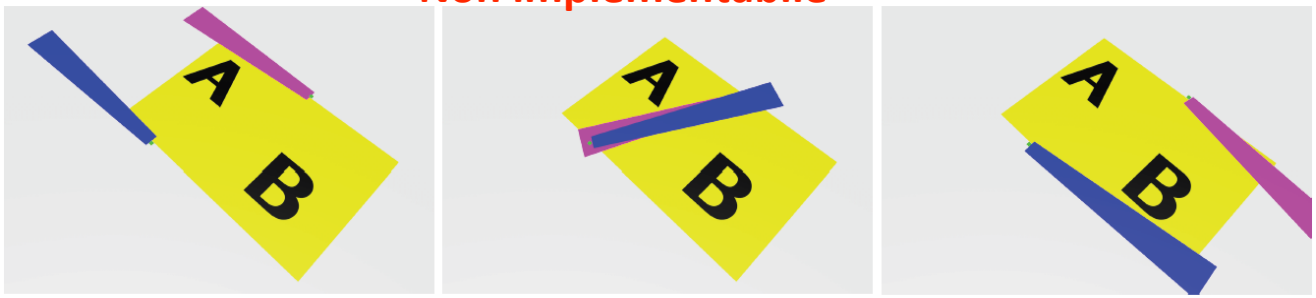
1D



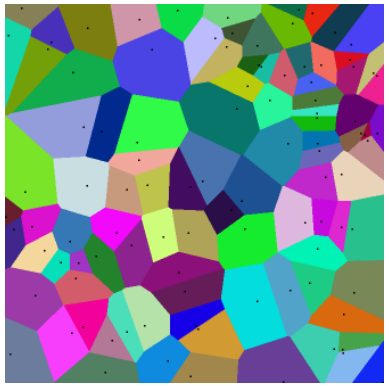
↓

Non implementabile

2D



PATROLLING DETERMINISTICO
Partitioning (Voronoi)



Relatore: Prof. Luca Schenato
Correlatore: Dr. Davide Raimondo

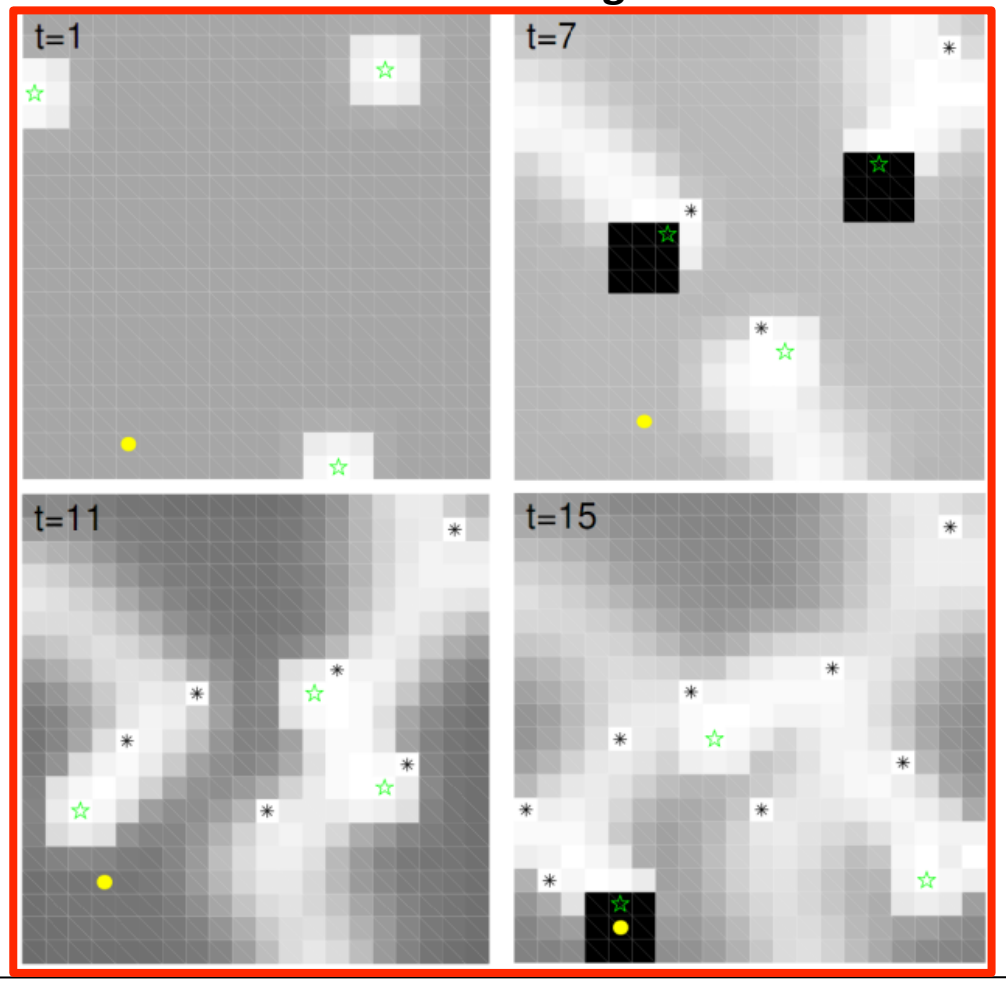
Laureando: Marco Pattarello

Contributo dato al progetto

DEPARTMENT OF INFORMATION ENGINEERING
UNIVERSITY OF PADOVA

1. Modellizzazione Testbed
2. Modello terreno di ricerca e strategie di controllo (policy)
3. Implementazione sul Testbed

PATROLLING PROBABILISTICO
Pursuit-evasion game



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Contributo dato al progetto

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UNIVERSITY OF PADOVA

1. Modellizzazione Testbed
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PATROLLING PROBABILISTICO
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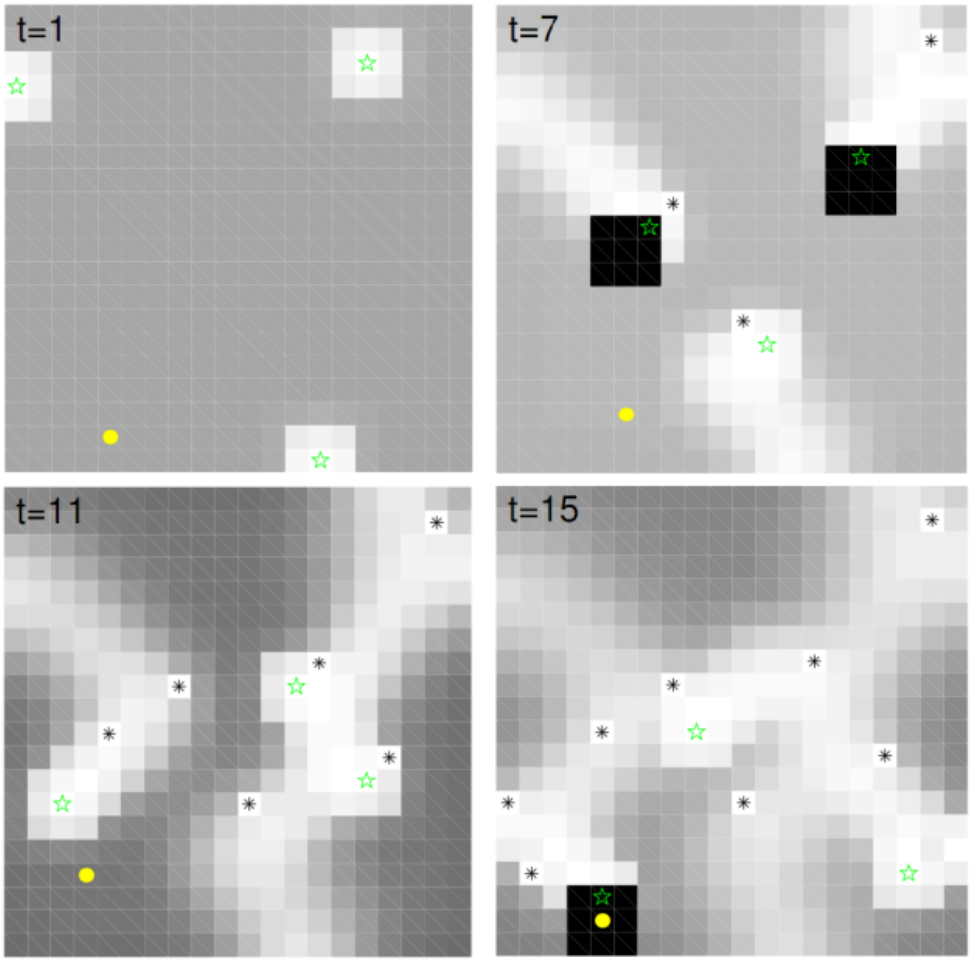

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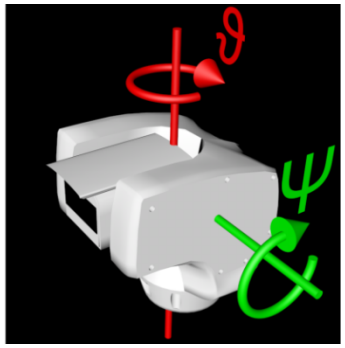
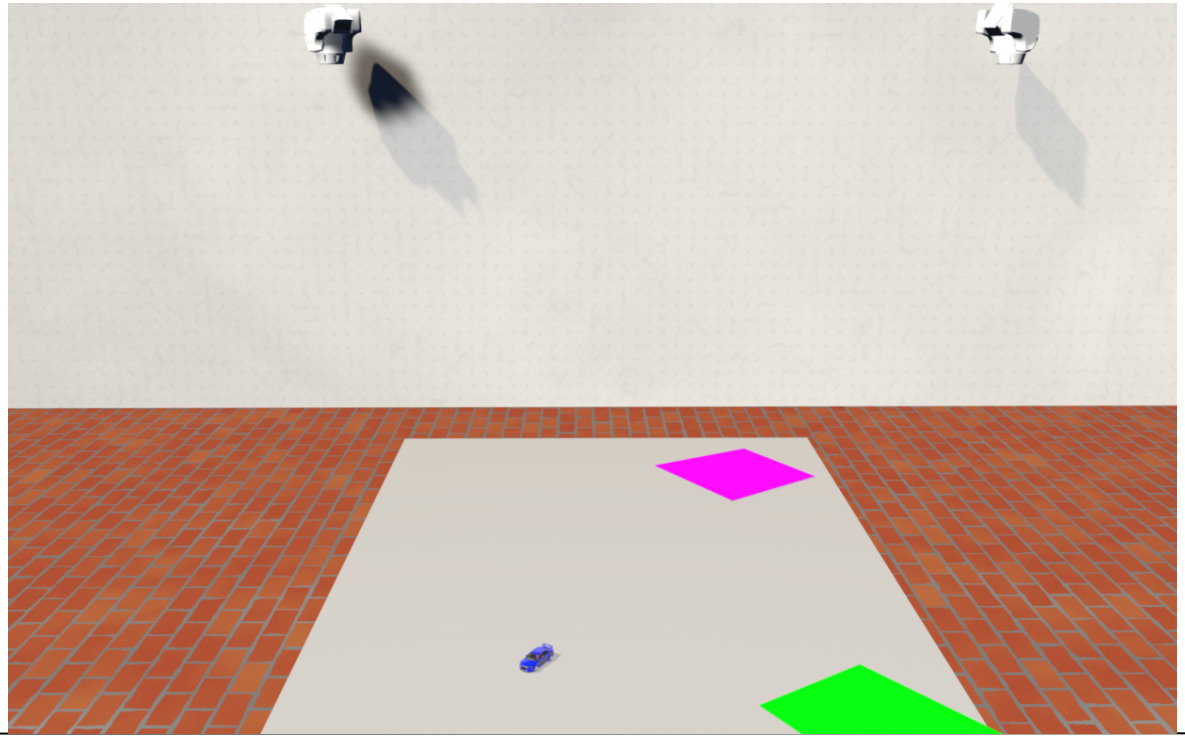
Testbed (Automatic control lab, ETH)





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Modellizzazione

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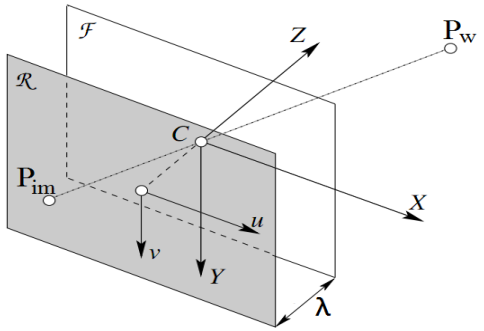
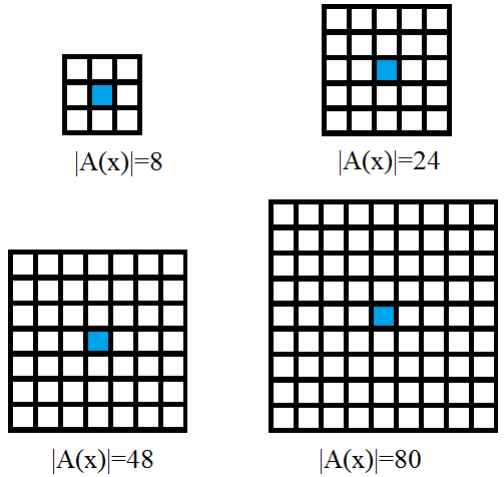
Passo quantizzazione 250ms

Modello Pinhole telecamera

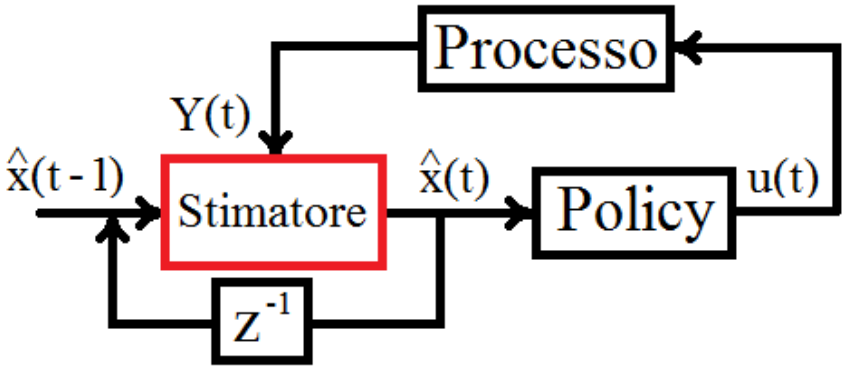


$$\theta_i(t+1) = \theta_i(t) \pm 1.65° \qquad 0° \le \theta_i \le 90°$$
$$\psi_i(t+1) = \psi_i(t) \pm 1.65° \qquad 20° \le \psi_i \le 90°$$

Modello Markoviano Evasore (ρ, |A(x)|)



Misure (Y(t))
Mappa Predizioni (x(t))
Policy (g)



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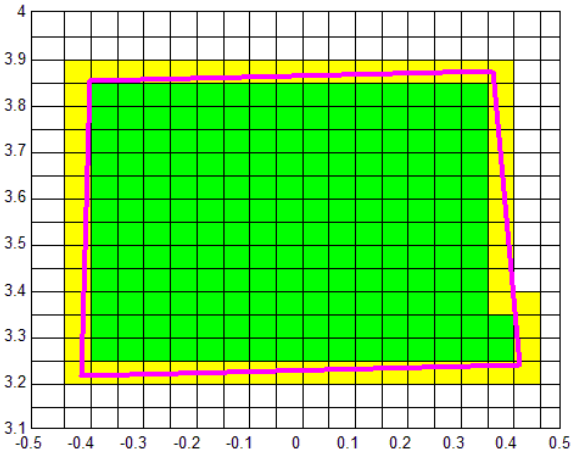
Update

- $P(x_e = x|\boldsymbol{Y}_t = Y_t) = \alpha p_e(x, \boldsymbol{Y}_{t-1}) Y_t$
- $p_e(x, \boldsymbol{Y}_t) = (1 - |A(x)|\rho) P(x_e = x|\boldsymbol{Y}_t = Y_t) + \rho \sum_{\bar{x} \in A(x)} P(x_e = \bar{x}|\boldsymbol{Y}_t = Y_t)$

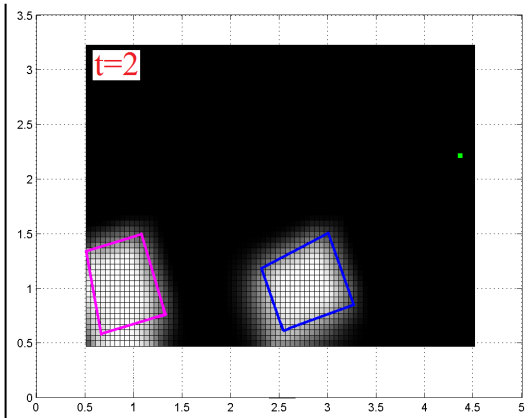


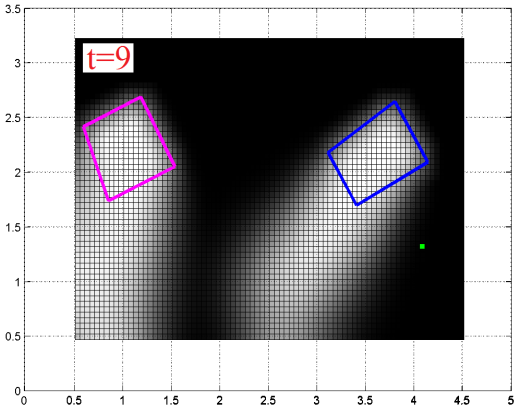
Misure

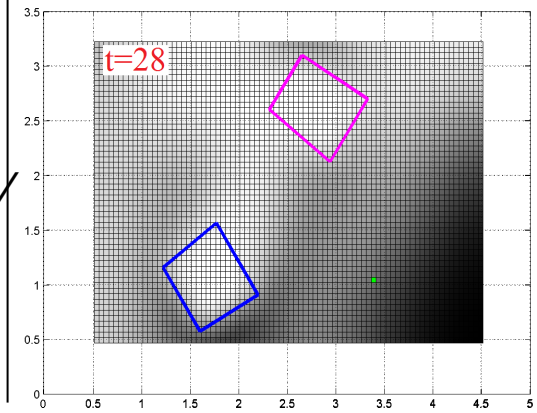
Giallo= $\frac{\text{Area Casella} - \text{Area interna}}{\text{Area Casella}}$

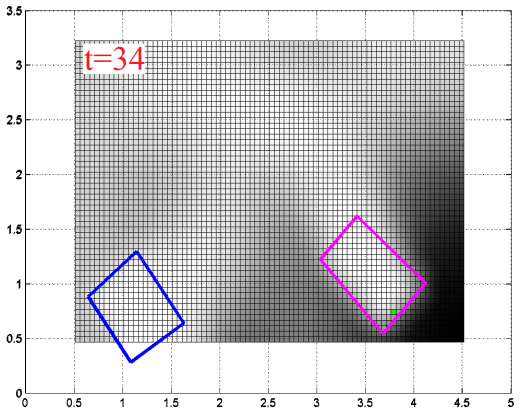
Verde=0

Bianco=1

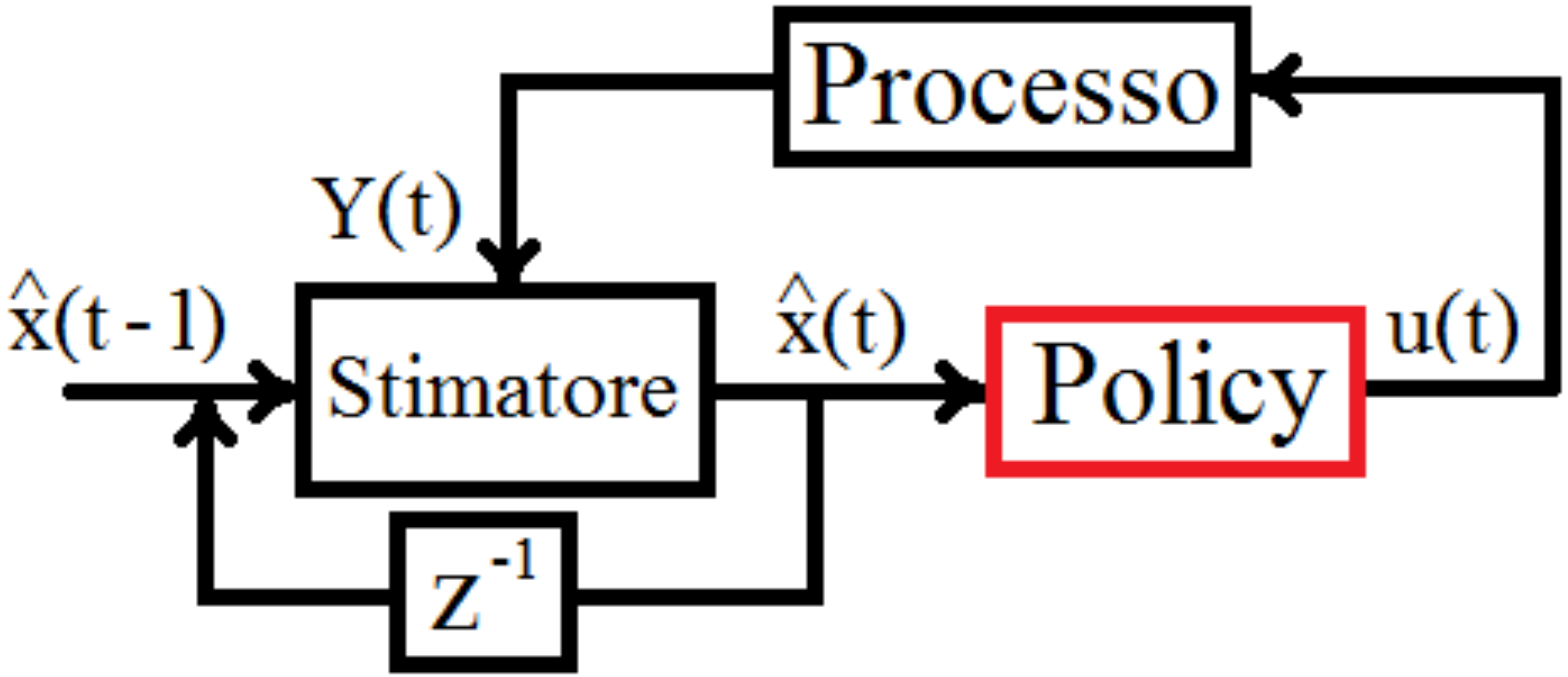








Controllo



Strategie di controllo

Policy utilizzate $\bar{g}$

- **LOCALMAX**
- **TOTALMAX**
- **RANDOM**
- **LOCK**

$\boldsymbol{T}^*$ È una variabile aleatoria discreta che tiene conto del primo istante di tempo in cui è trovato l'evasore, essa assume valori in $\overline{\boldsymbol{\tau}}=\{1, 2, \ldots . +\infty\}$

$$E_{\bar{g}}[\boldsymbol{T}^*] = \sum_{t=1}^{\infty} t f_{\bar{g}}(t) \left(\prod_{\tau=1}^{t-1} (1 - f_{\bar{g}}(\tau)) \right)$$

Persistenza

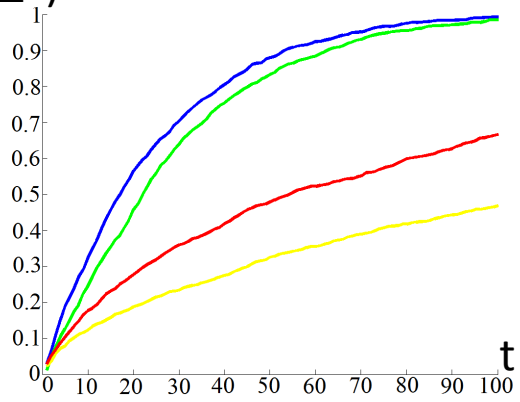
$$f_{\bar{g}} = P_{\bar{g}}(\boldsymbol{T}^* = t | \boldsymbol{T}^* \geq t) \geq \epsilon \qquad \forall\, t$$

Persistenza in media di periodo T

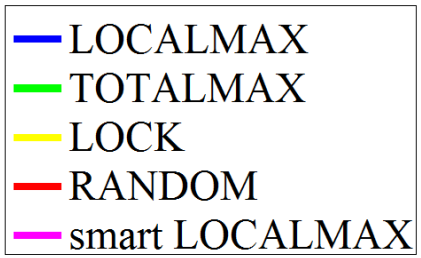
$$\bar{f}_{\bar{g}} = P_{\bar{g}}(\boldsymbol{T}^* \in \{t, t+1, \ldots, t+T-1\} | \boldsymbol{T}^* \geq t) \geq \epsilon \quad \forall\, t$$

Simulazioni

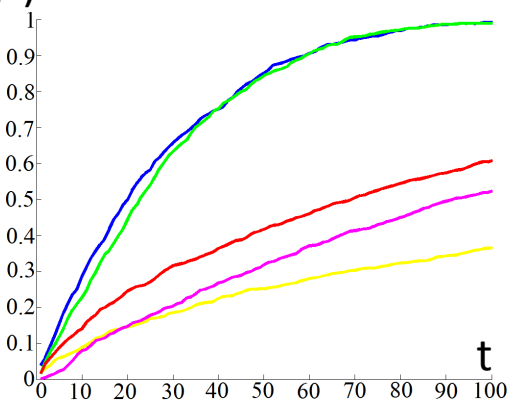
$P(T\uparrow* \leq t)$



Ve=0.8[m]

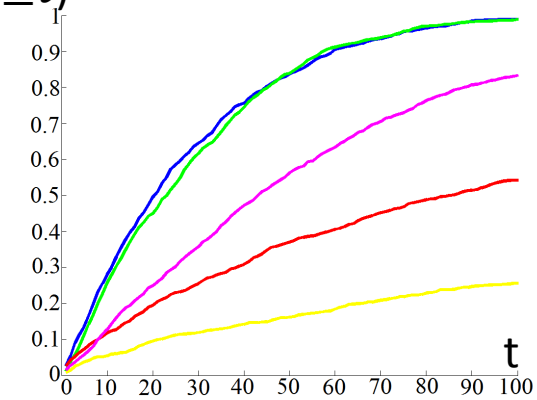


$P(T\uparrow* \leq t)$



Ve=0.6[m]

$P(T\uparrow* \leq t)$



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Conclusioni e Sviluppi Futuri

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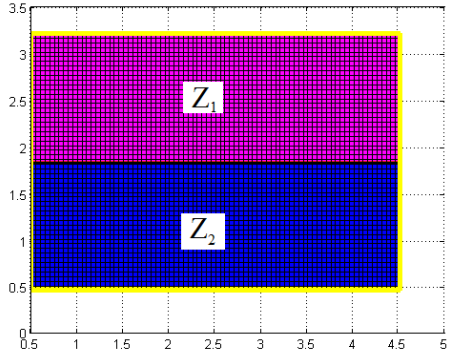
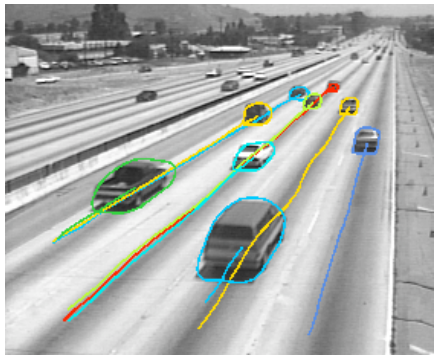
UNIVERSITY OF PADOVA

- Calcolo strategie stocastiche con evasore intelligente (Equilibrio di NASH)



- Soluzione decentralizzata tramite diagrammi di Voronoi

- Unione con algoritmo di Tracking



- Patrolling 3D

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GRAZIE PER L’ ATTENZIONE…