Pursuit-Evasion Games using Robots and a Sensor Network

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Pursuit-Evasion with Robots and a Sensor Network

Game Formulation

- **Team of pursuers collaborating and trying to catch evaders, who try to escape from the pursuers**
- **Requirements**
  - Time optimal pursuit and evasion policies
  - Use of sensor network for gathering the evader/pursuer locations
  - Suitable to be applied to a sensor network setup and different evasion policies

Sensor Network

- **A distributed sensor for localization of evaders**
  - Sense the location of the evader
- **Provides complete visibility of the field**
- **Evader localization using a sensor network**
  - Communication delay
  - Packet loss
  - Sensing errors in the sensing nodes

Our Approach

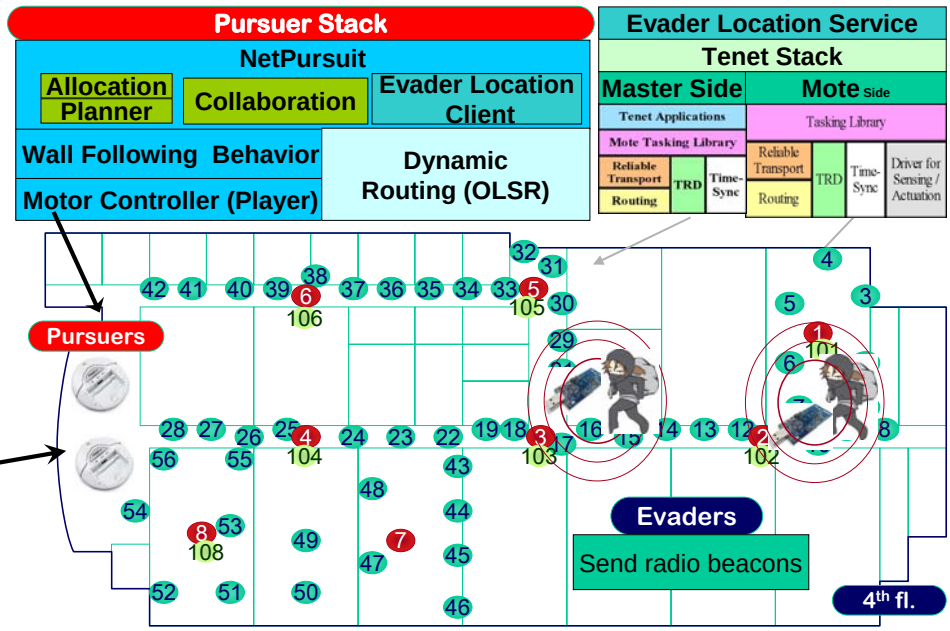
- **Pursuit/Evasion Strategies**
  - Minimize the time to capture all evaders
  - Many pursuers single evader game
  - Full/partial visibility of all pursuers/evader during the game
- **Discrete World Model**
  - Limits number of possible states agents (pursuer or evaders) can arrive at
  - Simplifies path planning, task evaluation and task allocation
- **Environment**
  - Indoors
  - Sensor Network Testbed: implemented on the 4th floor of Ronald Tutor Hall building at USC

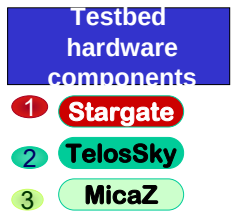
Implementation

Small Mobile Robotic Platform

- **Robot :** iRobot Create from Roomba family
- **Computer:** Ebox-3854 is a 800MHz embedded PC with 256MB shared DDR
- **Communication:** 802.11a/b/g wireless
- **Storage:** 4GB Compact Flash Card
- **Power:** iRobot Create Advanced Power System (APS) (3Ah) and DC-DC Converter (picoPSU-60WI)
- **Software:**
  - Linux
  - Player/Stage
  - MadWifi Wireless Driver

System Architecture





- **Received Signal Strength Indication based evader localization**