Modeling Human Perception of Situation Awareness During Constructive Experimentation

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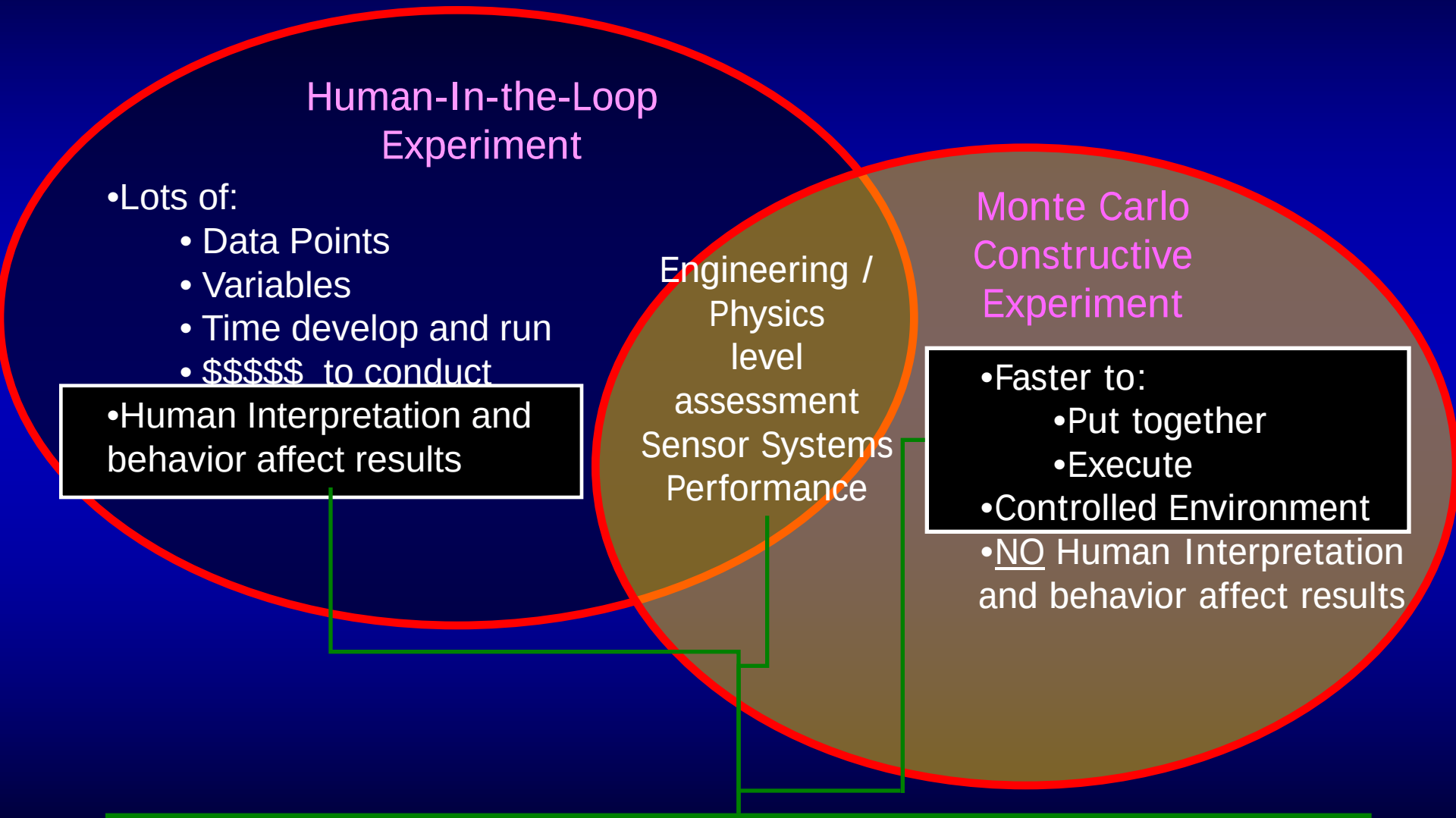
Outline

- Motivation
- Situation Awareness and Human-in-the-Loop (HITL) Situation Awareness Objects (SAOs)
- Synthetic SAOs (SSAOs)
- SAO Case Study
- Concluding Remarks

Motivation



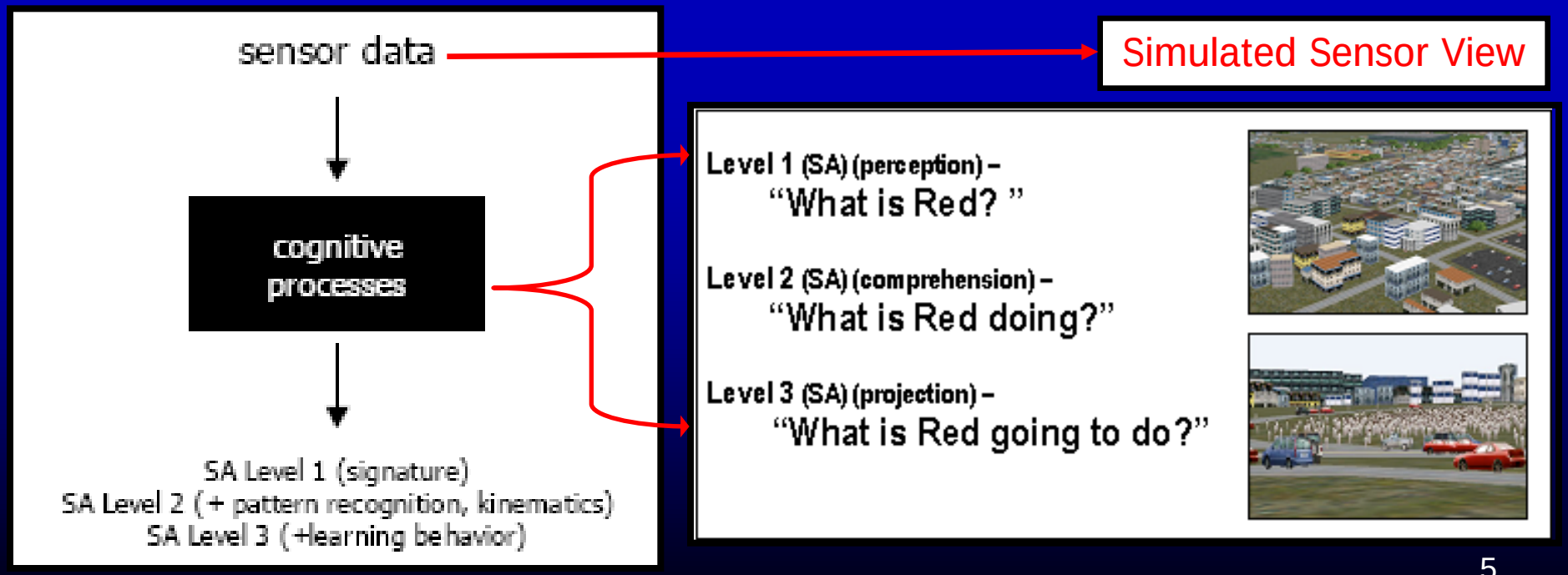
Goal: To Bring Together the Best Elements of Each Experiment Type

Motivation

- Cost and time limits frequency of HITL experiments
- MCC experiments sacrifice human interactions
- Human interactions are very useful in sensor deployment and tasking
- Both approaches provide engineering level insight into sensor performance but …
- …currently only HITL experiments lend insight into usability and performance issues from the user's perspective.

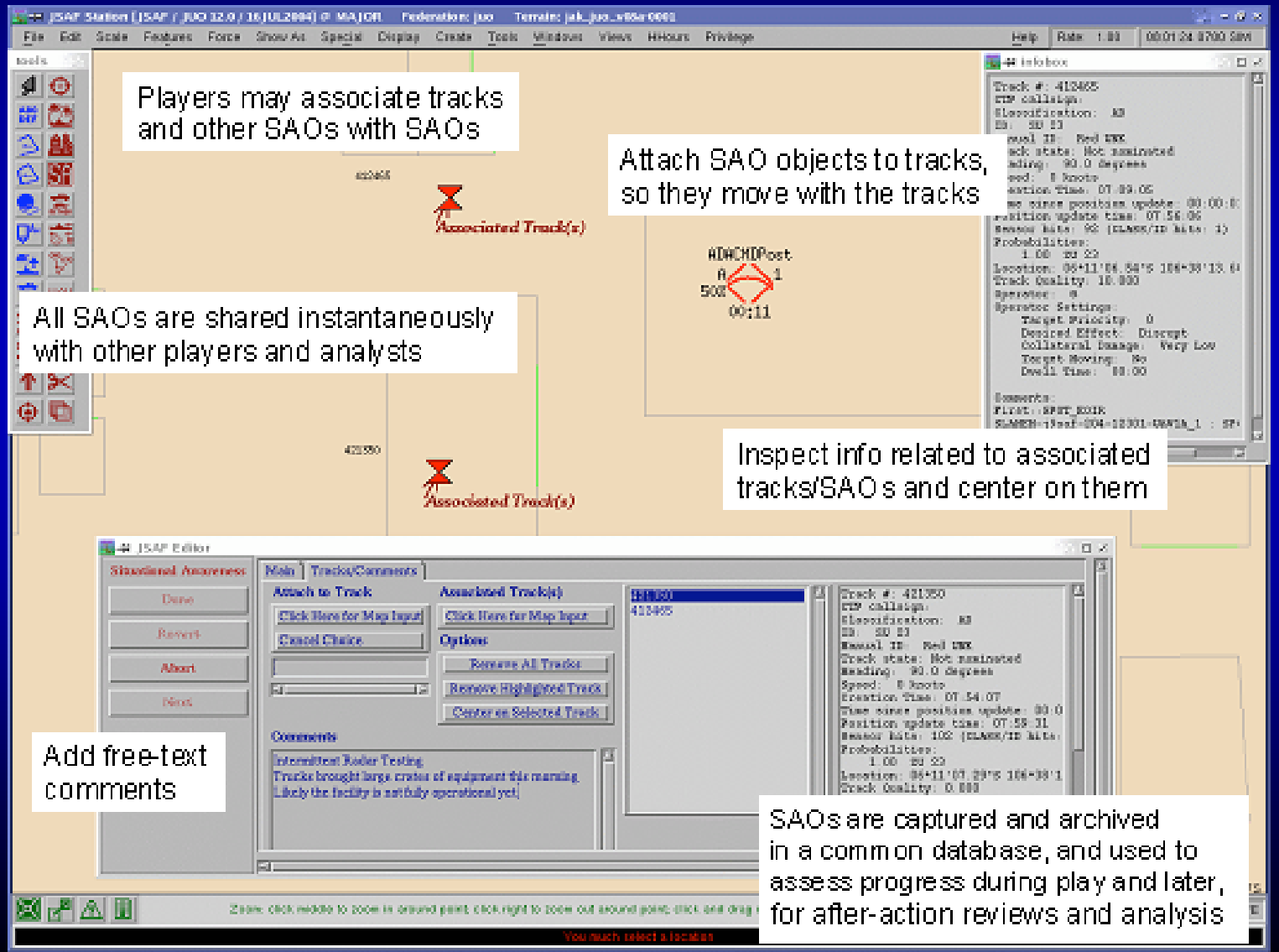
Situation Awareness

- Endsley's 3-Level Model of SA
  - Level 1: Perception involves detection, recognition and identification of basic situation elements
  - Level 2: Comprehension involves understanding current enemy activity
  - Level 3: Prediction involves inferring enemy intent



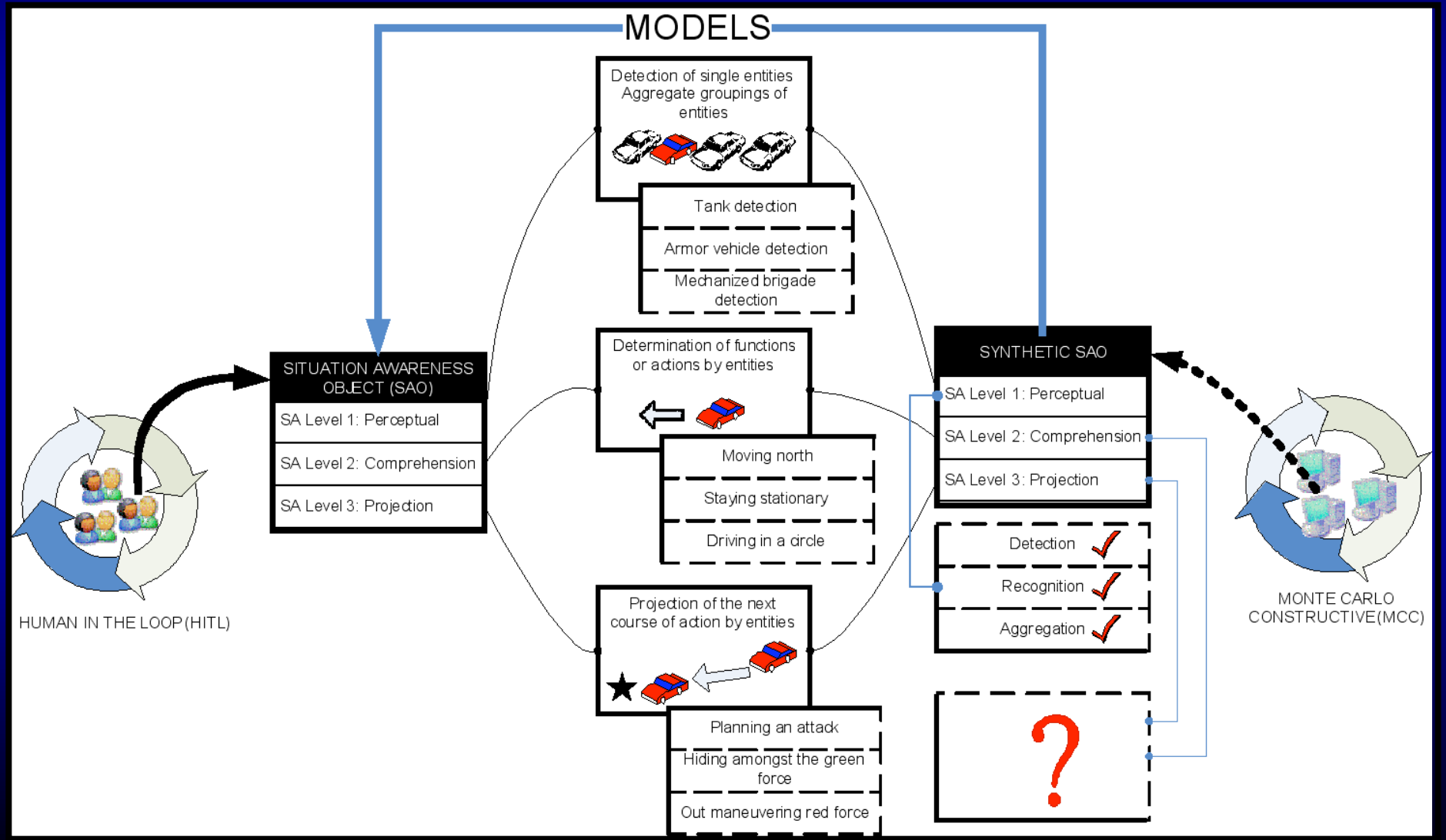
Situation Awareness Objects

The HITL approach to understanding the Player decision making process using SAOs



Human Cognition in MCC Experiments

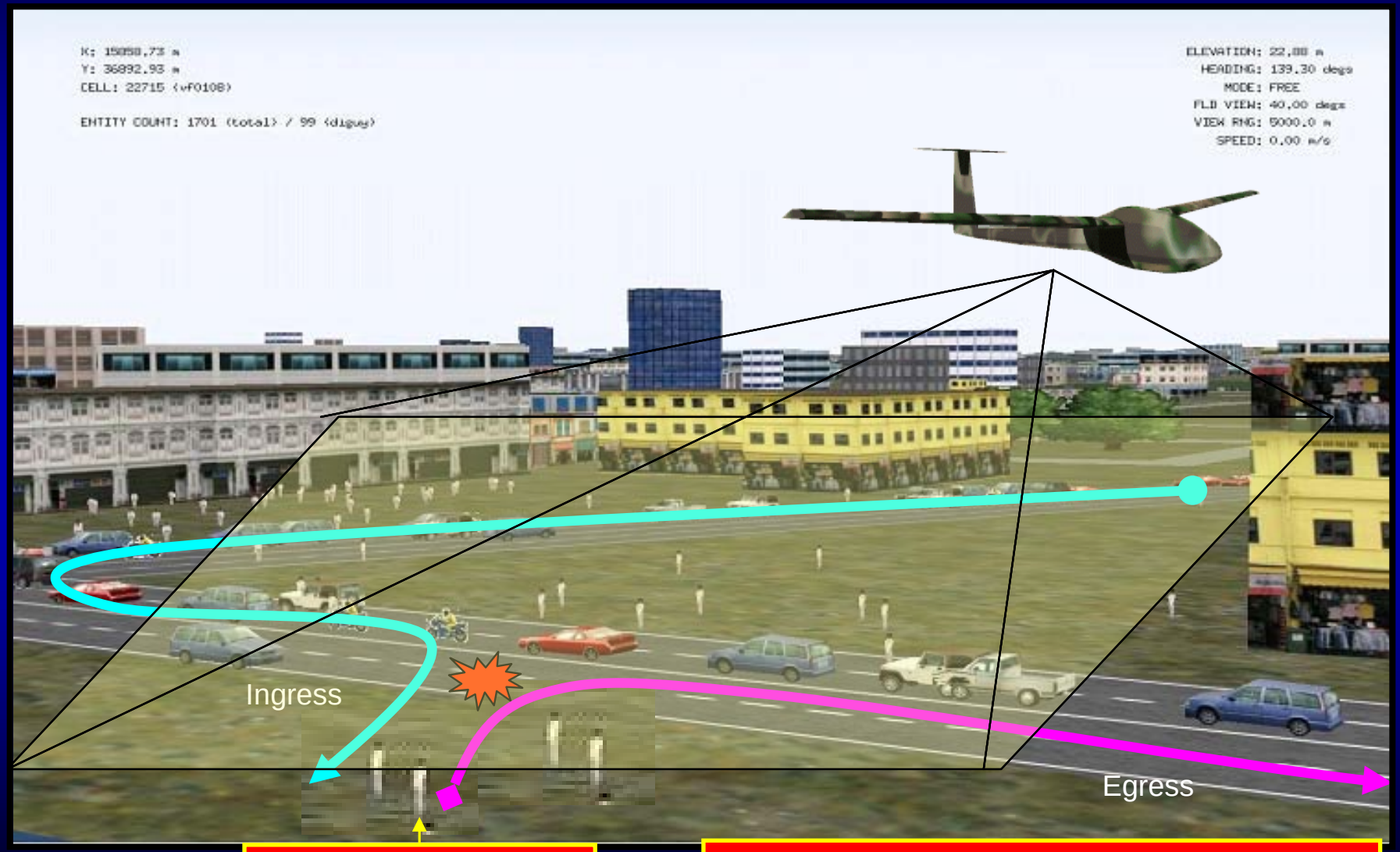
Synthetic Situation Awareness Objects (SSAOs) methodology Defined



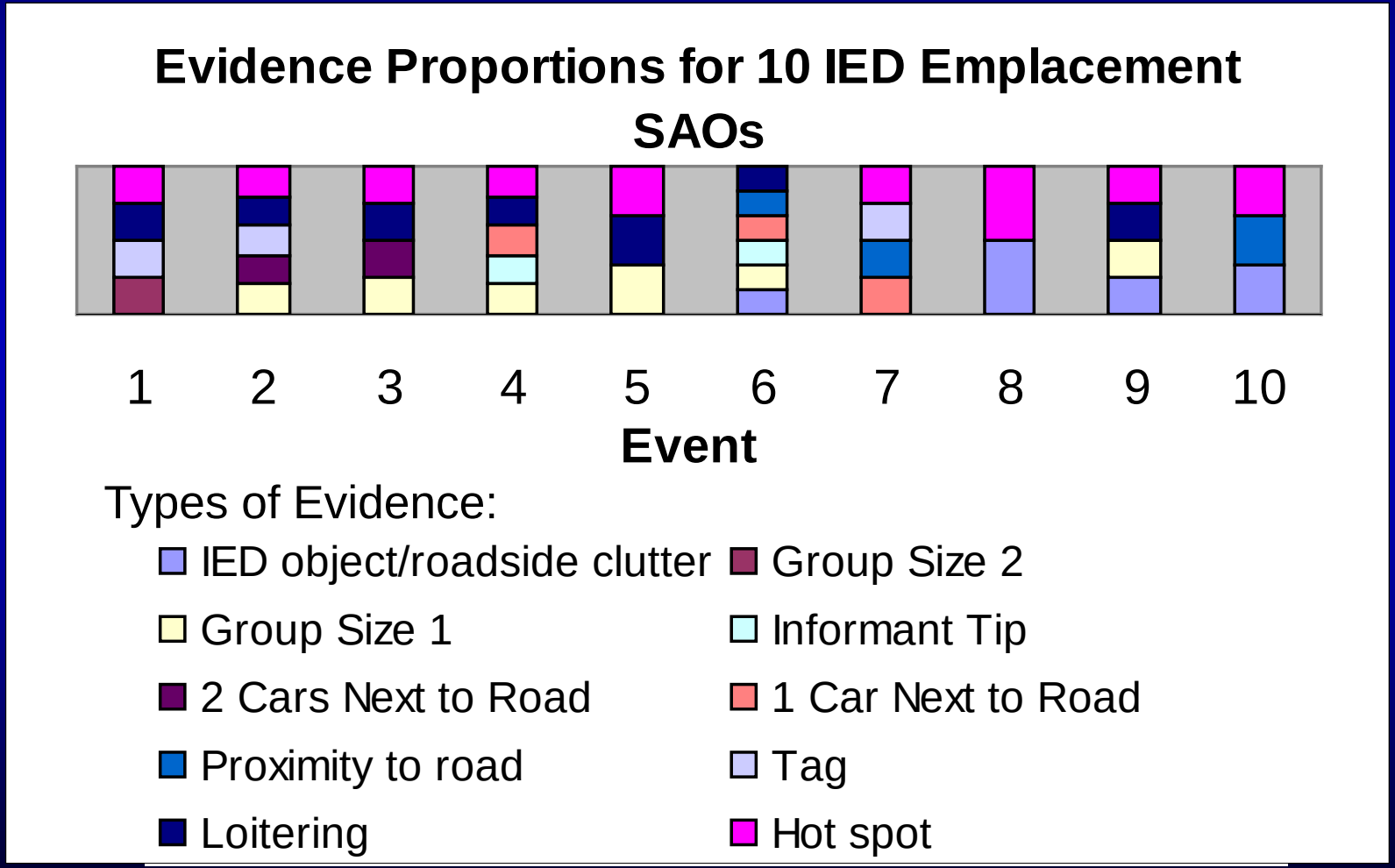
SAO Case Study Example

- Purpose:
  - To identify pieces of evidence used in determining a suspected IED event.
  - To formulate sensor tasking and CONOPS to increase effectiveness
- Scenario:
  - IED Emplacement (refer to following slide)
  - Low fidelity Culture entities are modeled to populate environment
- Sensor System:
  - Fields of view and resolution video modes provide persistent surveillance of battlespace
  - Player responsible for monitoring video continuously
  - Medium and Narrow FOV looks require zooming at the expense of losing WFOV coverage
- SAO Model:
  - **Model for suspected Terror Acts were defined for the following events:**
    - Misc. Other, Meeting, Surveillance, Suspicious, Loitering, Fleeing, Generic Event
  - **Regardless of event, players could type free text to add additional information**

IED Emplacement Scenario



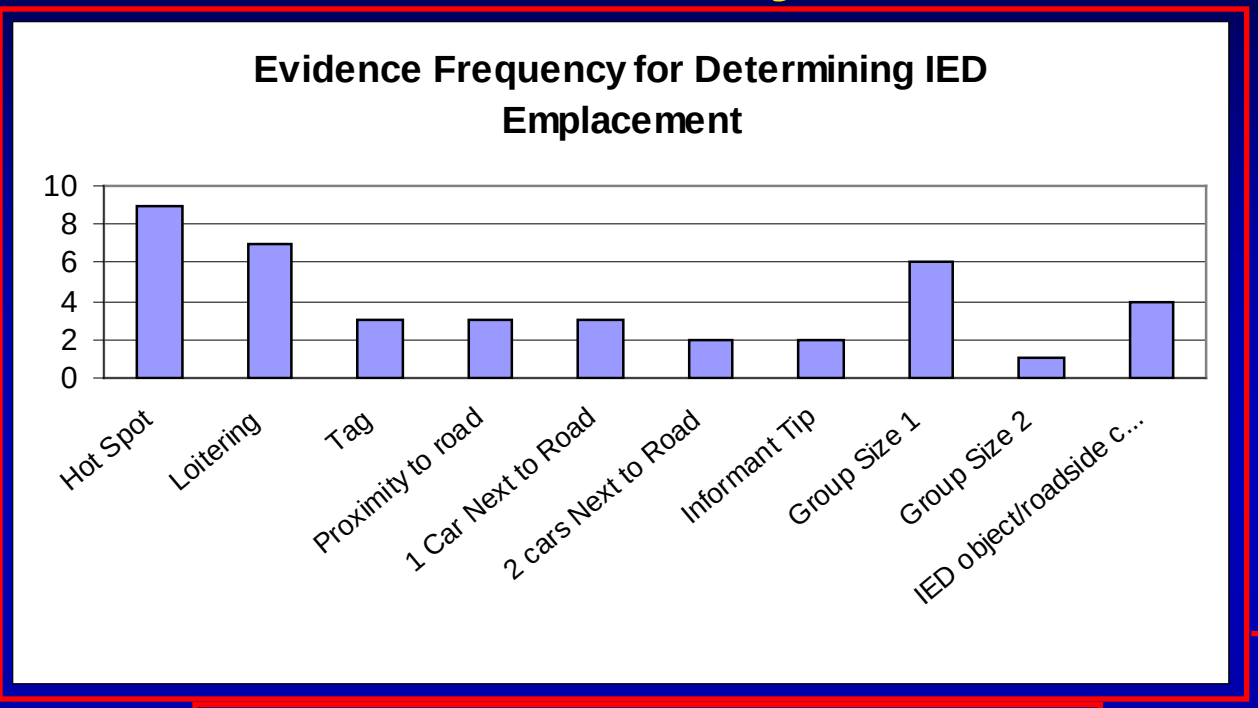
Case Study Remarks

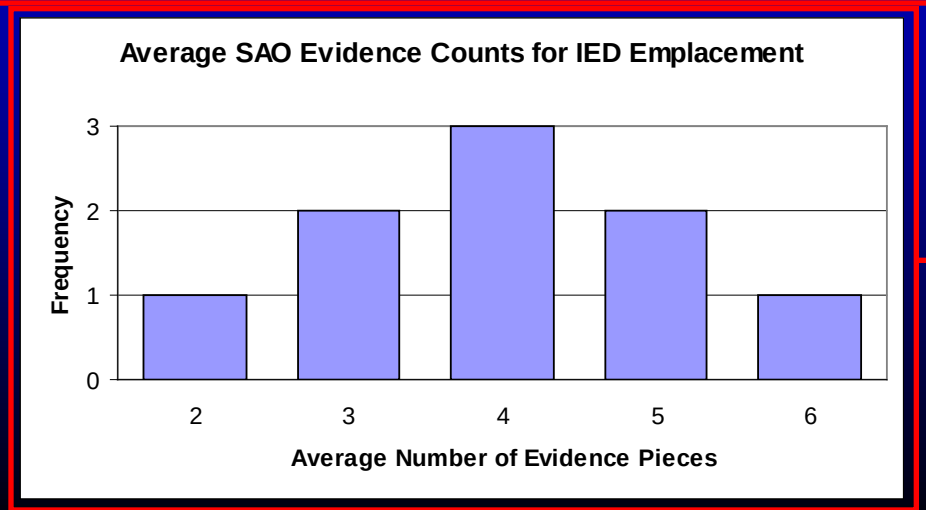


Case Study Remarks

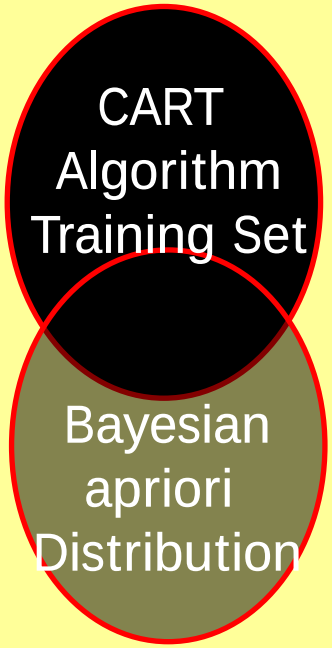
Categories	Type	Specific	Definition
Actions	Loitering	Loitering	Individual standing or kneeling in roughly same location for several minutes
	Proximity to Road	Proximity to Road	Any action, location, or information located at roadside
Counts		Group Size = 2	Observed individual is acting alone
		Group Size = 1	2 observed individuals close to one another
	Vehicle count parked at roadside	Vehicle Count = 1	Observed one vehicle parked along roadside
		Vehicle Count = 2	2 observed vehicles parked along roadside
Objects	Tag	Tag	A person or vehicle with any type of tag
	Object on Road	IED/Clutter Object	An observed object laying on the road (either a roadside clutter or IED)
Information	Location	Hot Spot	Action or object observed in known area of interest
	Tip	Informant Tip	White cell injection that suspicious activity is taking place

Case Study SSAO Generation





SSAO Data Feeds MCC Simulation Fusion and Tracking Algorithms



Concluding Remarks

- Resource limitations
- SSAO is new paradigm for combining human cognition and MCC experiments
- Applications:
  - SAOs and SSAOs as drivers for technology development
  - Value of sensor technologies under specific circumstances
  - Understand potential usage of sensor systems
  - Algorithmic approaches to higher level SA
  - Human cognitive limitations, e.g., timeliness of information.