VEIL: Combining Semantic Knowledge with Image Understanding

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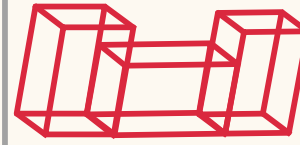
Semantic Knowledge

Veil associates meaningful, *semantic* domain knowledge with image information.

Interaction takes place at a more appropriate level than pixels or collections of cubes.

Raw Image
Pixels

Site Model
Geometric Objects

Headquarters Building
ID: B46
Unit: 8th Armor Bde
Geometric Model:
  » Location …
  » Size …
  » Orientation…
Function: Administration
Commander: "General …"

Semantic Model
Domain Concepts

KR Technology

Veil uses Loom, a knowledge representation (KR) language that provides:

- A term definition language
- A powerful query language

Veil integrates image-derived and collateral information using domain-relevant terms

Organizes geometric objects into groups, hierarchies and functional classes

Specifies event descriptions

Term definitions (represented as Loom "concepts") enable concise, readable descriptions of events:

"In garrison" — vehicles in an analyst-designated storage location

"Convoy" — group of vehicles, most of which are on a road

"In field" — vehicles in an analyst-designated exercise area

Event Detection

Event detection illustrates a powerful application of Veil's enhancement of image processing.
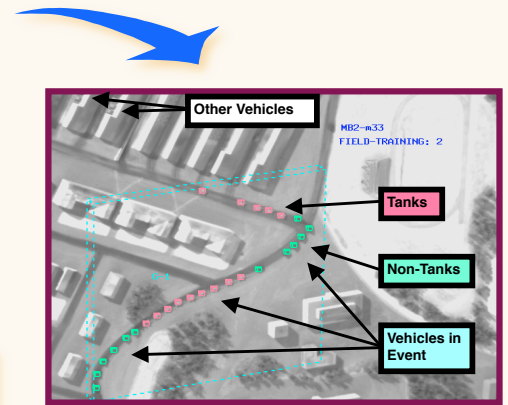
- An *Event* is a sequence of significant actions in the world.
- Events are defined using a high-level event definition language using domain-specific terms.
- Images matching the event criteria are located and the key elements highlighted.

Loom's definitions support a concise and expressive language for specifying event schema.

The query facility is then used to locate appropriate matching images.

1. In Garrison

A Field Training Exercise Event is defined as a group of vehicles which are

- In Garrison, then
- In Convoy, then
- Deployed in Field, then
- In Convoy again.

2. In Convoy

3. Deployed

4. In Convoy

Example from Radius Model Board 2