

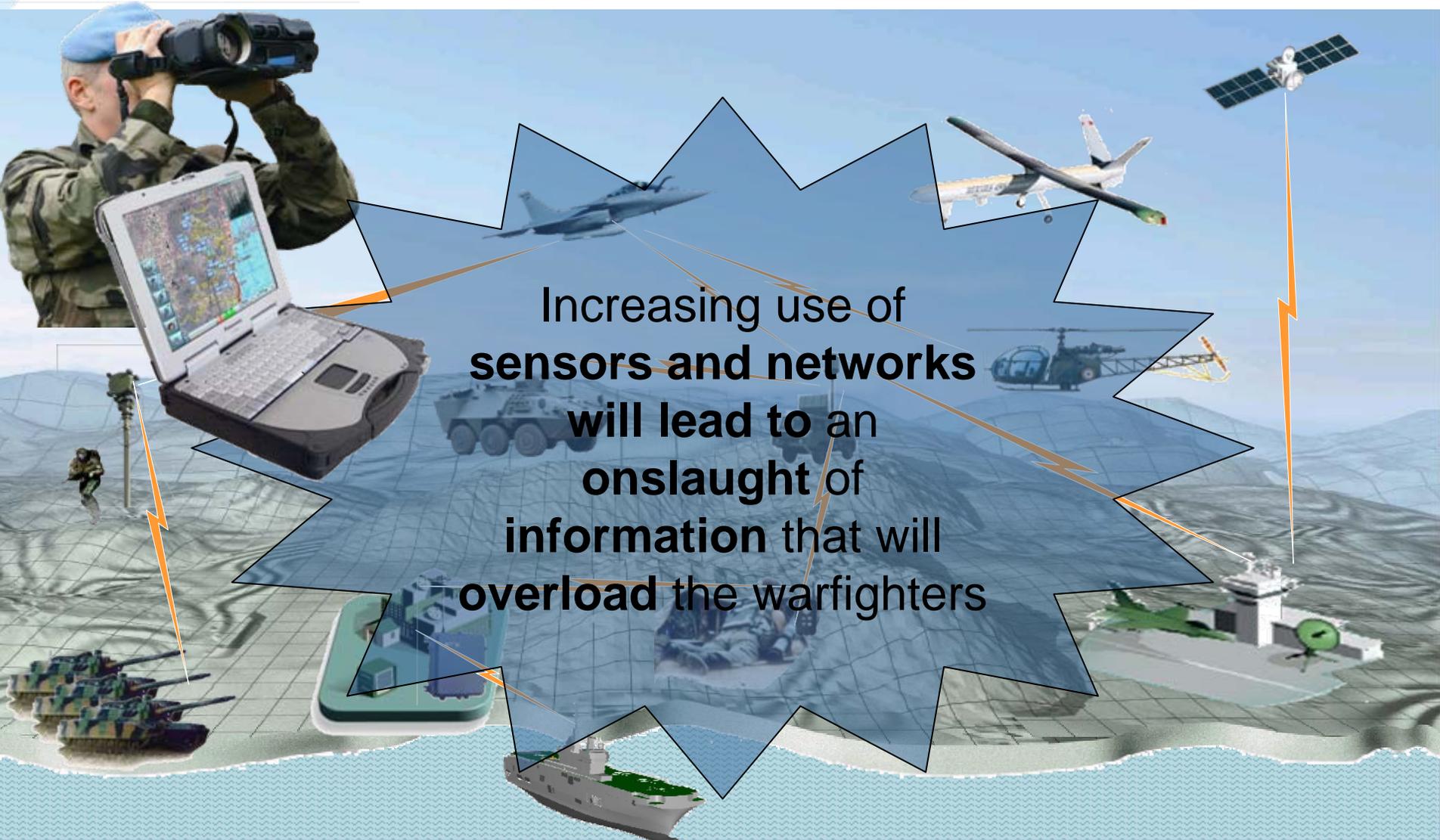
# Perceptual Based Visualization Techniques for Improving Ground Situation Picture Understanding

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# Network Centric Warfare (NCW)

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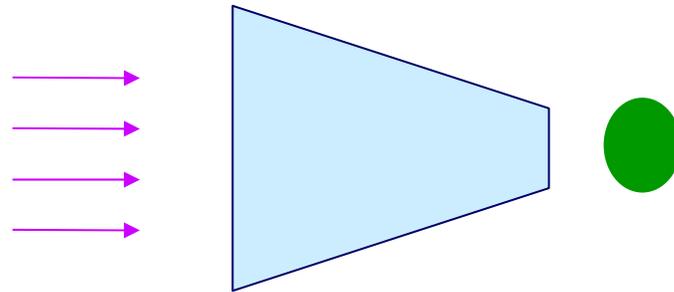


Increasing use of  
**sensors and networks**  
will lead to an  
onslaught of  
information that will  
overload the warfighters

# Attempts to Alleviating Information Overload

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*Fusion engines uses algorithms data reduction techniques as a means of reducing information overload*



Fusion Engine

**Collating, eliminating duplicates and correlating large continuous streams of data across space and time**

# Fused information is still presented in poorly designed MMI

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**tsunami of NCW data**

• Detailed analysis takes a longer time

• Patterns may be missed in the process

• Loss of Situation Awareness

• Missed opportunities

- Difficult for users to develop an understanding of useful relevant to immediate requirements
- Useful data maybe buried in irrelevant data
- Difficult to retrieve information from the data
- Unable to create displays that allow them to see what they need
- Potential useful information sources maybe ignored, because techniques for extracting information are deficient



**Place a tremendous informational and perceptual burden on warfighters!!**

# Alleviating Information Overload

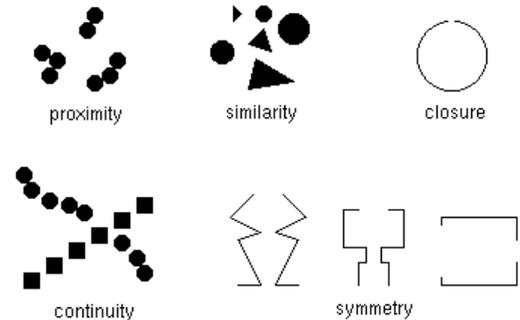
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- Human- way out for warfighters to maintain situation awareness, execute current operations, is through organizing information according to visual perception.

- Pattern matching, trend identification, discovering errors, and recognizing gaps



Human

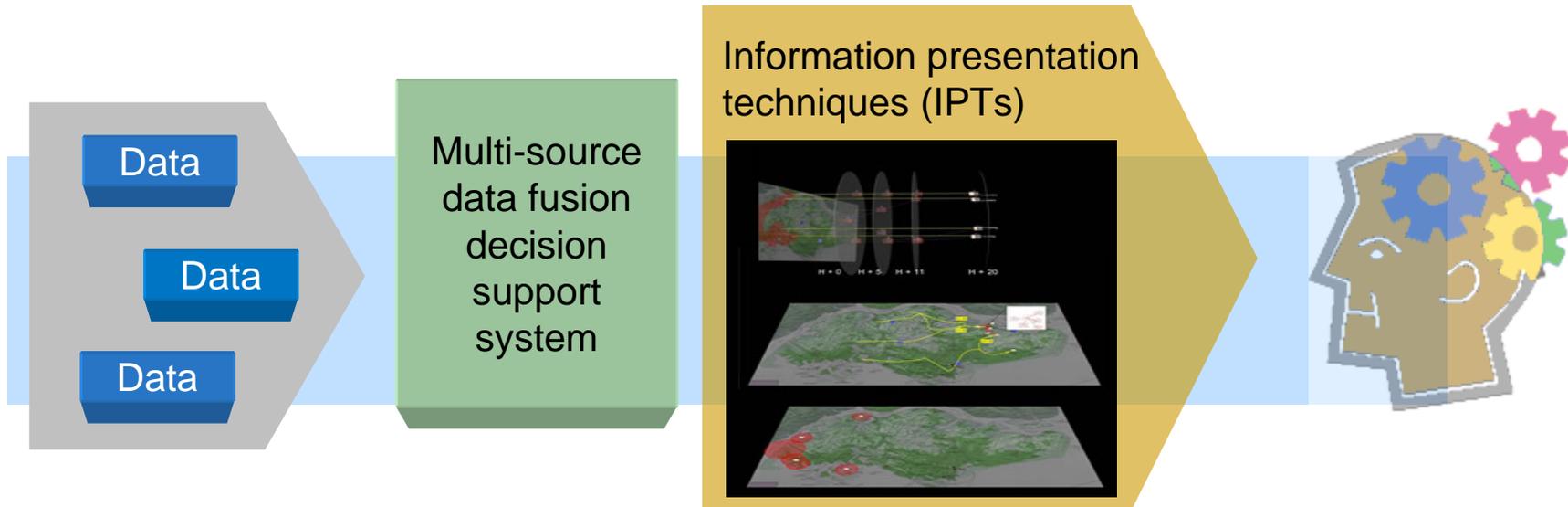


Visual perception science

# Aim

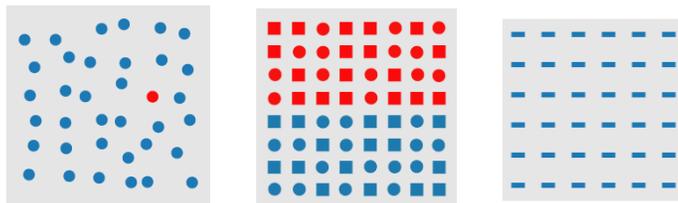
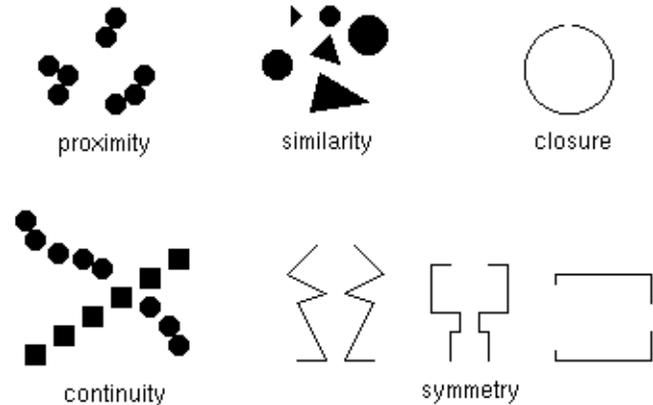
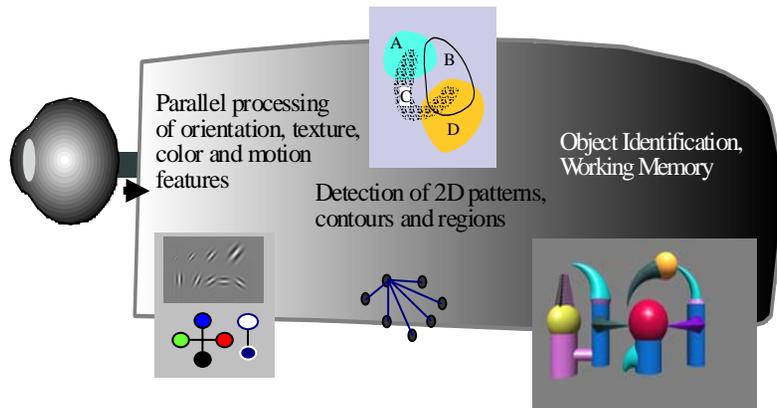
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- **Research and develop novel visualizations, to improve commanders' ground situation assessment & awareness.**
- **Data provided by an existing multi-source data fusion engine.**



# Approach

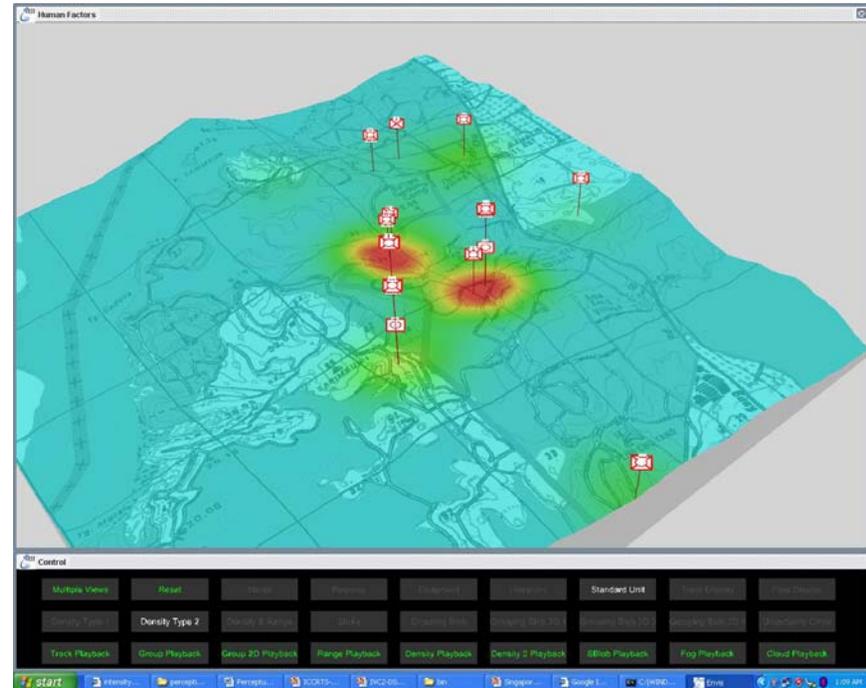
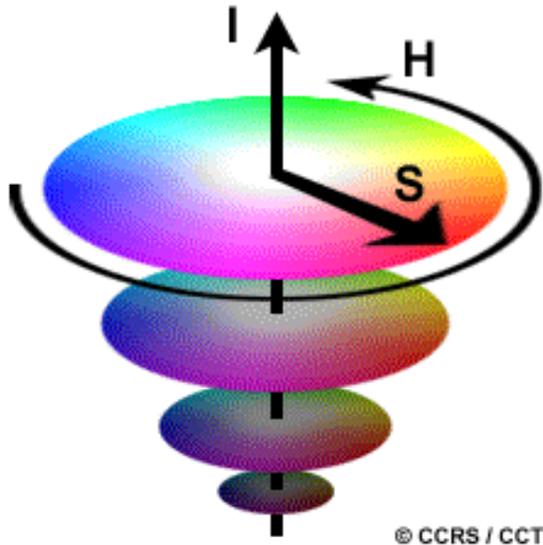
- The design effort will identify and draw inspiration from suitable ***theories of human perception*** such as pre-attentive features and Gestalt laws for perceiving patterns and adapting scientific techniques for designing visualizations in the project.



Gestalt Laws for perceiving groupings/patterns

# Pre-attentive features – Hue, Intensity, Form

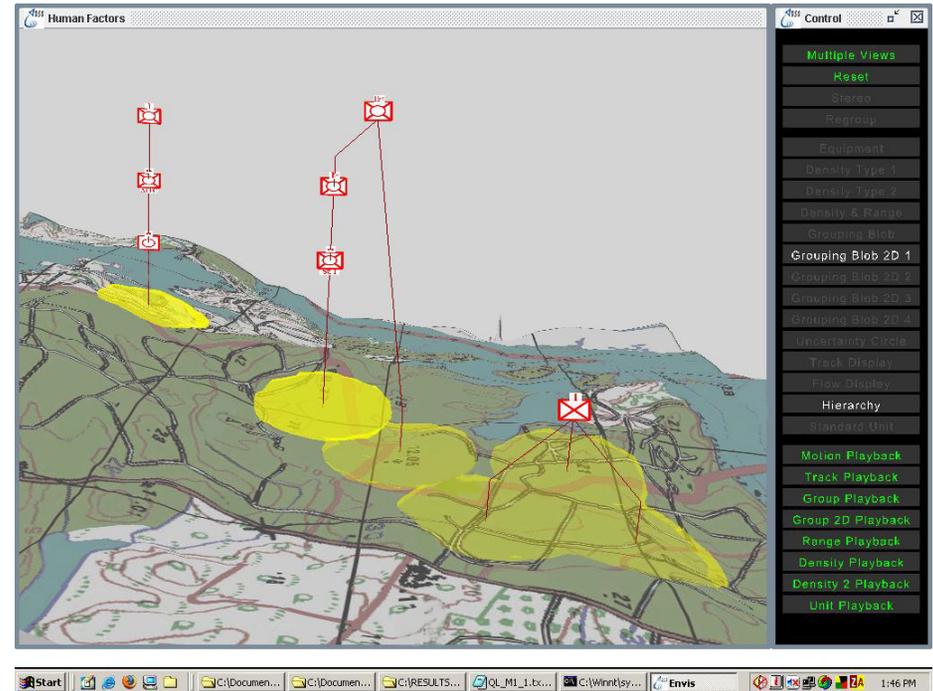
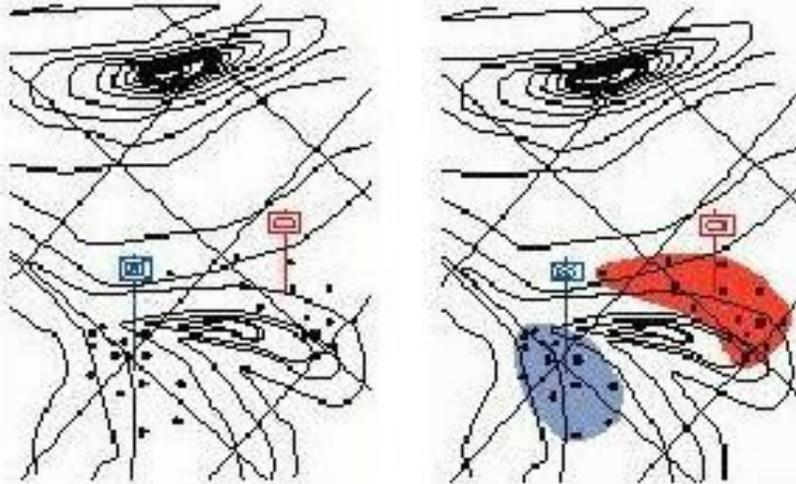
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## Force Concentration

**Hue, intensity and form are useful for showing target detection, boundary detection, region tracking**

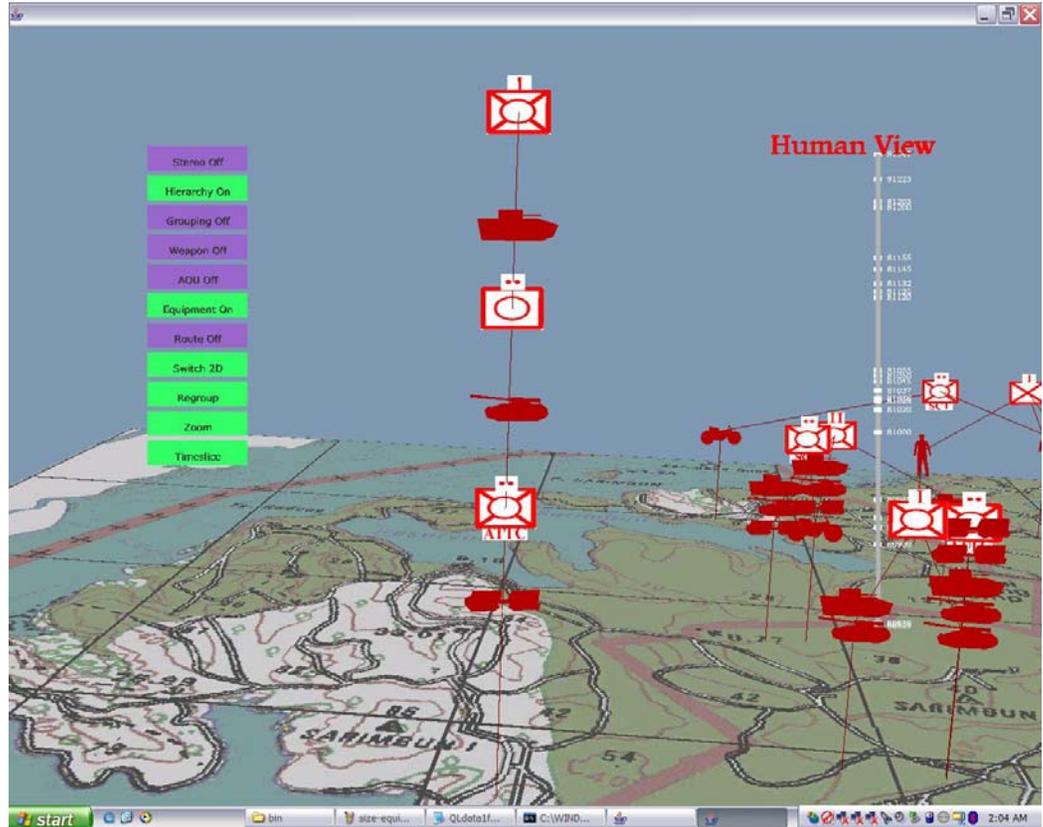
# Gestalt Laws for Perceiving Patterns - Law of common region



## Organizational grouping/footprint

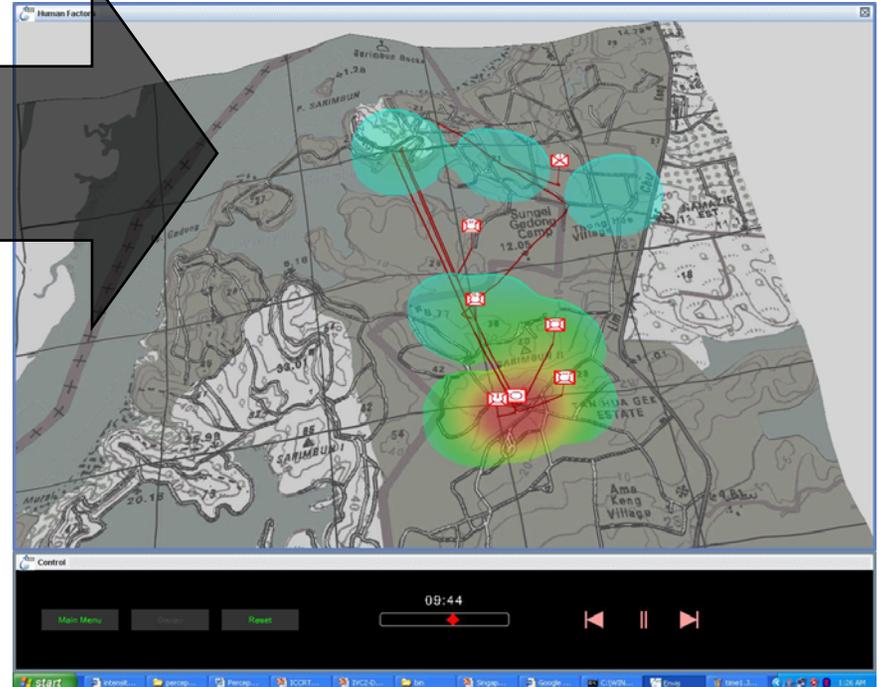
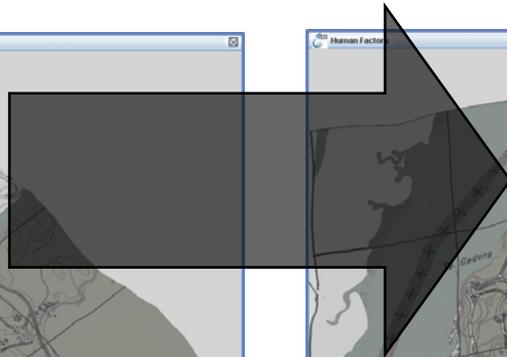
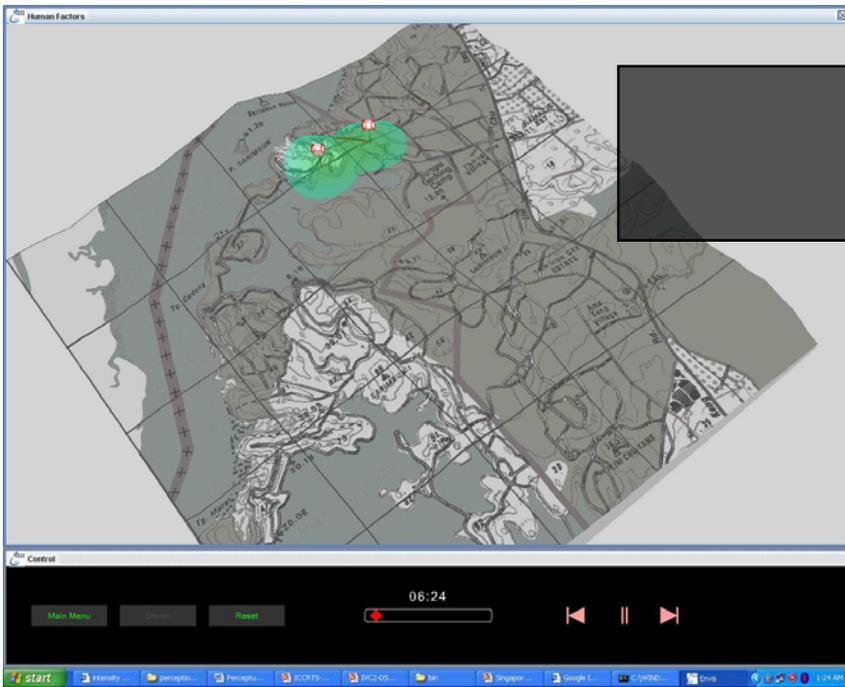
**Closed contours are useful for showing footprints and set relationships/groupings among chaotic array of discrete entities**

# Totem Pole Stacking



**Totem pole metaphor for reducing clutter**

# Reasoning about Time and Space



**Time Space Browser**



# LIVE DEMO

# Future Work

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- **Translate the perceptual visualizations for Experimentation**

- **Information encoding**

- **Interference**





**Thank you**

