

Overseer:  
Multiple Unmanned Aerial  
Vehicle Management System

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## Outline

- **Background**
- **Swarm Level Commands**
- **A Cueing System**
- **Selection Methods**
- **Viewpoint Navigation Methods**
- **Command Methods**
- **Conclusions**

## Background - Needs

- **Need command system for**
  - Real-time interaction
  - Short-term combat tactics
  - Decision-making
  - 3D information
  - Addressing data overload and information camouflage

## Background - Overseer

- **Uninhabited Air Vehicle Management Interface**
  - 3D graphical representation
  - 3D cursor in geographic volume
  - Section of groups, paths, and targets
  - Control of swarms of UAV entities
  - Attachable to existing simulation/command software
  - High Level Architecture (HLA) based
  - Test bed uses OpenSkies simulation software

## Swarm Level Commands – Relevant Issues

- **Where and how does the UAV's autonomy interface with higher level commands**
- **Define a library of "swarm level" commands.**
- **Address how these commands translate into individual UAV commands.**

**Ultimate goal: to understand the maximum number of UAVs a single operator, and a group of operators, can control.**

## Swarm Level Commands – Managing Multiple UAVs

- **Command-group definition – ability to divide the UAVs under operator control into subsets that can be given separate commands**
- **Other-group definition – ability to divide into subsets all other known vehicles/installations. Includes characterization of groups as a threat-type**
- **Path generation - command a UAV group to a location**
- **Relative posture command – command a UAV group to a position relative to another entity group**

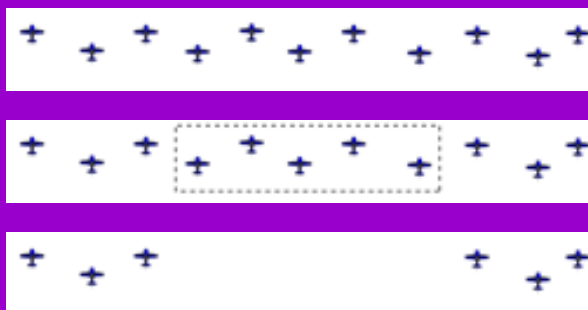
## A Cueing System

- **Graphical differentiation – friendly vs hostile, controlled vs autonomous. Cues such as highlighting and group color**
- **Location cues – perceive 3D location of entities clearly, especially altitude. Includes 3D stereoscopy, artificial shadows, and drop-to-terrain lines**
- **Audio Cues – warning of proximity, velocity, and events such as missile launches, takeoffs, and landings**

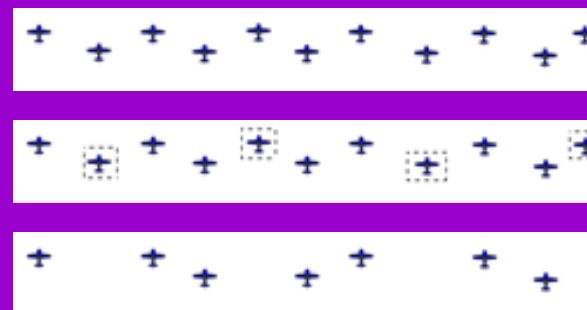
## Selection Methods

- **Selection Tool Palette – different shapes for region selection, 2D and 3D**
- **Grouping – after selection, groups are identified using the Ctrl key and a number.**
- **Standard GUI Conventions – Ctrl+click, Shift+click, Double-click, Triple-click**
- **Fuzzy Selection – subset modifier of normal selection methods, by percentage or other categories (fuel, health, etc.)**

## Selection Methods (cont.)



Traditional Selection Resulting in a  
Tactically Poor Formation



“Fuzzy” Selection of a Third of the Units in  
a Region, and the Resulting, Much More  
Tactically Friendly, Formation

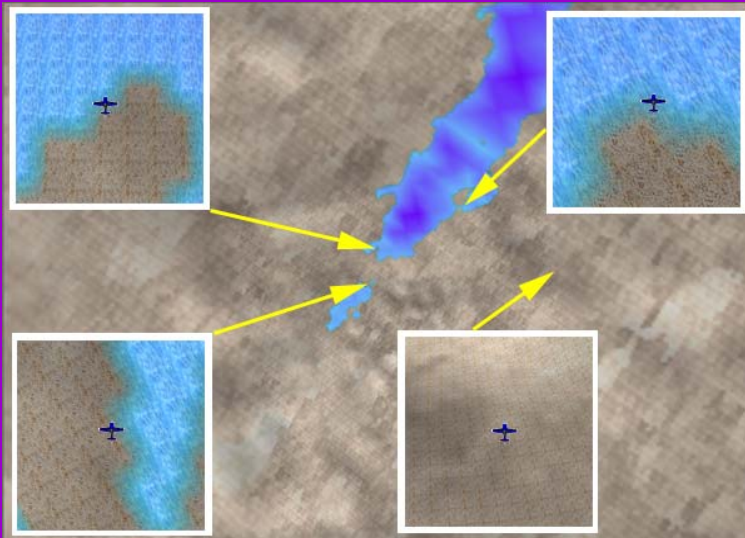
## Viewpoint Navigation Methods

**The Avatar's (or operator's) presence in the simulation, that is, the camera view, can be:**

- **Free Fly – allow the Avatar to move around the world at will, unattached to any object.**
- **First Person – puts the Avatar in the virtual seat of a UAV**
- **Third Person – allow the Avatar to “orbit” a single UAV**
- **Bird's Eye – similar to radar view, Avatar is high above, creating a 2-D like representation for big picture understanding.**

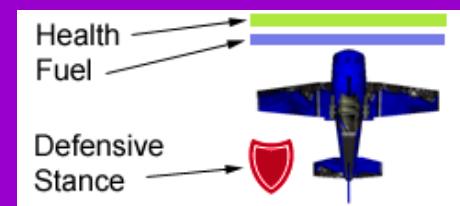
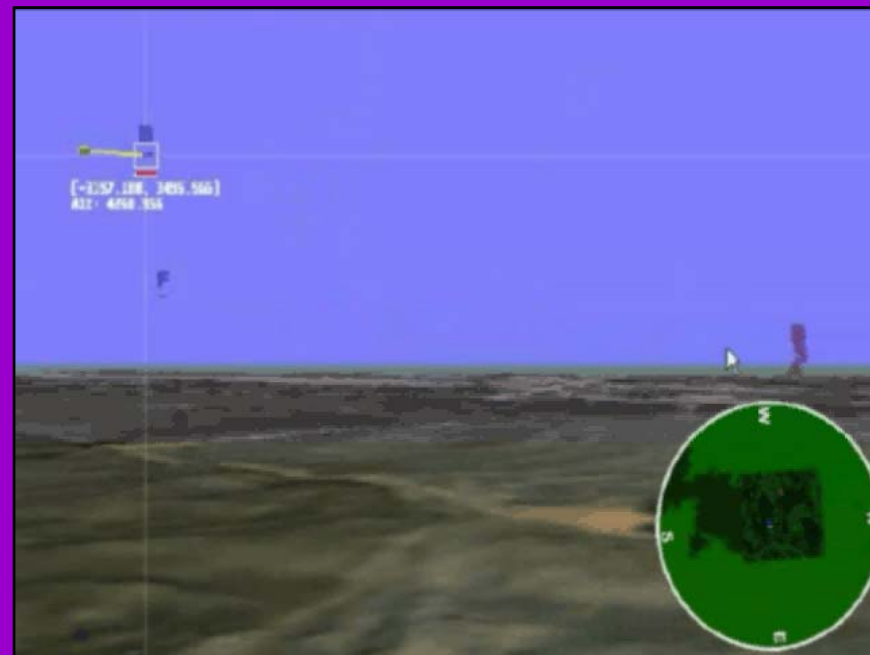
## Viewpoint Navigation Methods (cont.)

- **Center of Mass** – similar to Third Person, Avatar orbits the center of a group of UAVs
- **Tactical Multi-View** – allows view of all UAVs in simulation on a single screen, without need for exact distances between them.




## Information Display Methods

- Per Unit Graphics
- Message Console
- Event Queue
- Command Prediction
- Access to Detailed Information

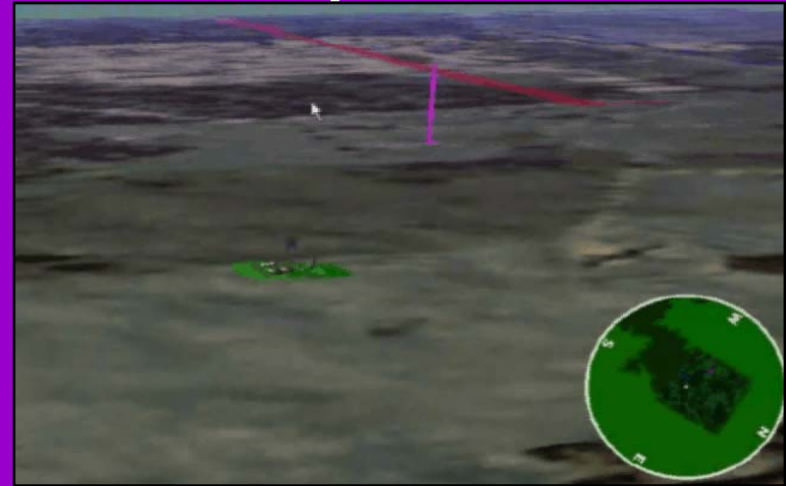


## Command Methods

- **Travel** – “go to there.” 3D destination selection is not trivial
- **Waypoints** – specify multiple destination points, with additional waypoints allowed
- **Formations** – achieved through a “formation palette”  

- **Distributions** – formation of group once the destination is reached, can be very complex
- **UAV-Specific Commands** – done by accessing specific types of UAVs

## Command Methods (cont.)

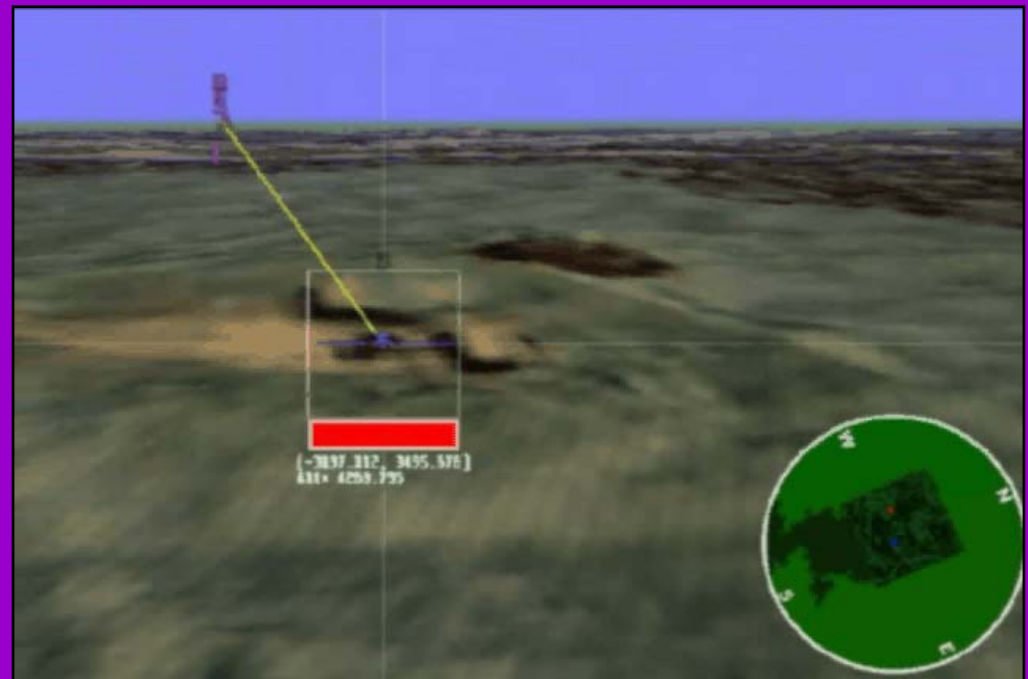
- **Stance/Attitude** – automated responses when events happen to UAVs while the operator is not directly observing them
  - Hostile
  - Guarding
  - Defensive
  - Observing
  - Spy
- **Command Queuing** – multiple commands executed in a specific order



## Command Methods (cont.)

- **Wingman Mode – operator takes almost direct control of a UAV, and the other UAVs as wingmen. Sample commands are:**

- Follow Me
- Attack My Target
- Bomb My Target
- Defend me



## Conclusions

- **Overseer: innovative interface for UAV**
- **Control swarms of UAVs in combat situations**
- **Detailed methods for**
  - Selection
  - Navigation
  - Display
  - Command

