Exploit the Weather for Battle: One USAF Perspective on the Importance of Weather in UAS Mission Planning

Capt John Radovan
AFLCMC/HBAW

Integrity - Service - Excellence
Overview

Providing the Warfighter’s Edge

• Mission Planning Framework for UAS Support
• Novel Uses of Climatology
• Machine Learning – Decreasing the Decision Cycle
• Q&A
### UAS Mission Planning Framework

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#### The Challenge
- **Manned** aircraft mission planning framework is too rigid and **not suitable for UAS Ops**
- In general, **UAS weather tolerances** are much lower than manned counterparts
- Mission Planning must take into account **UAS safety AND mission objective**
  - Weather is the #1 efficiency driver

#### Responding to a Shifting Reality
- Mission Planning becomes **dynamic** vs static AND **continues** during the mission
- Level of **weather input** into the planning process is **exponentially higher** than manned
  - Drives an **increase in human-in-the-loop support**
- **Weather** flight performance model **preflight testing** is vital

#### Implications
- **Mission Planning = Risk Reduction**
  - Weather risk is **managed over time** during the planning process
  - Weather mitigation strategies developed
- Flexible framework allows users to **anticipate** and **exploit the weather** for operations
- **Plan around the weather** and not through it
Climatology as Risk Reduction

Exploiting Weather Patterns

- Vital to short-to-medium-range planning
- When juxtaposed with regional climatology, it can identify adverse weather “bottlenecks”
- When integrated into the UAS Mission Planning framework, it provides decision makers timely, decision-grade impact data

Regional Climatology

- Incorporating seasonal and regional climatology into UAS mission planning creates efficiencies in long-term planning
- Aids in pre-decisional UAS deployment considerations
- Identifies weather risks early – allowing weather to be incorporated into the initial concept of operations
Applying Machine Learning to Weather

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The Innovation Blind Spot

- Delivers **technical capability** with human excellence
- **Scalable solution** as new data sources flood the market
- Currently partnering with MIT Lincoln Labs to fuse existing heterogeneous data in data sparse areas into near real-time weather radar

**Opportunity out of Necessity**

- **Expands capability** without expanding infrastructure
- **Bridges the gap** where communication between planners and forecasters most often breaks down and process stall
- Can provide aircrew **mission-saving environmental situational awareness**

“We’ve got to get into the next stage, which is machine learning/AI…to turn all that data into decision grade quality information and then you act.”
- General Goldfein

Multiple convolution layers used to combine features from each input

Convolutional Neural Networks are a powerful class of machine learning models for processing image data
Questions

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