IAA Drone Symposium



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U-Flyte Project Maynooth University

30th May 2019





U-Flyte Project

Maynooth University

National University of Ireland Maynooth





U-Flyte Research Platform

Wide Area Mapping

- Swarm Flight Planner
- Cloud work-flow
- Real-time processing

Search & Tracking

- Machine Learning
- Feature Search/Detection
- Object Tracking

Logistics

- Scheduler
- Optimised flight plan
- Priority, Risk, Performance

| | U-Space Modelling | | UTM/U-Space D | Director | Protocols | ο |
|-------------|--|-------------------------------------|---|--|---|-----------|
| • • • | 3D Model (Sparse Voxel Octree) Risk Modeller/Attribution U-Space Topology Builder U-Space Model Update | Air-Tra Updat Flight-P Sys | ffic Multi-agen tes Optimisatio Weather lanning tem Routing | nt Traffic Conflict on Manager A*/Dijkstra's | Blockchain ID-Registration Cybersecurity Privacy Real-time Data | perations |
| | | Alert | s Emergency E Manage | Event r Simulation | | |

U-Flyte Aerial & Drone Test Platforms



U-Flyte Sensors

Gimbal Video/Cameras



CM202



2-axes, 3-axes gyro-stabilisatio 4k, 1080p, 32MP, 120fps

MicaSense Altum



LIDAR

FLIR Vue

Thermal 7μm– 13 μm







Velodyne

Velodyne VLP-16

GeoSLAM ZEB-Horizon

U-Flyte Ground Station



Waterford Airport Testbed

- EIWF interest in supporting Drone R&D
- Good location, un-cluttered airspace
- CTR (10nm,7000'), Tower, ATC
- Easy access to Celtic Sea/Atlantic











U-Flyte Research : Artificial Intelligence (Machine Learning)

Deep Learning (Convolutional Neural Networks)





Semantic Segmentation (Feature-Learning)

- Kernel based
- K-Nearest Neighbour (supervised/un-supervised)
- Random Forest
- SVM
- Histogram of Orientated Gradients (HOG)





U-Flyte Research: U-Space Graph & UTM



Fundamental Elements

- Constrained/Un-constrained Airspace
- Airway Topology (Cell, Link/Node)
- Traffic De-confliction
- Optimisation (Path, Travel-time, Arrivaltime, Departure-time
- Emergency Event Handling



U-Flyte Research: Artificial Intelligence: Reinforcement Learning - UTM Control



Drone Industry Map (2019)



SECTOR 🗸

Accelerators & Investors



Development of UAS Platforms* by Continent



Source: Association for Unmanned Vehicle Systems International (AUVSI) and the Danish Technological Institute, 2018/2019

Unmanned Traffic Management (UTM) Systems - USA



U-Space Services - Europe

A set of new services & specific procedures designed to support safe, efficient and secure access to airspace for large numbers of drones.



Anatomy of Drone Airspace: Majority of Activity - Very Low Level (VLL)



Typical Drone Activities

Persistent

- City/Urban
- Critical Infrastructure
- Precision Agriculture
- Package-Delivery

Non-Persistent

- One-off mapping
- News-gathering
- Emergency Response
- Air-Taxi





Wind Farms : Analogue for Drone VLL Airspace?



Sliabh Bawn Wind Farm

• 5km SE Strokestown, Co Roscommon

• 3km*7km









Drone Test Corridors: Key Components



BVLOS Corridor

Certified, safe, regulated and secure drone testing environment for experimental flight performance, data gathering & logistical tasks



Digital Risk Model (SORA)

3D Risk Model incorporating Topography, risk zones, Human Activity



Drone Ports

Self contained drone ports designed. Fully automated IP rated weatherproof stations with integrated robotics; land/T-Off, Charging, Pick-up/Drop-off, Storage



Low Airspace

Monitoring



Connectivity

Cooperative and non-cooperative airspace surveillance with integrated ADS-B, RADAR, RF & Optical sensor surveillance Robust Communication for C2, Data Link, ATM/ANSP



Potential Drone Cargo Airbridge (e.g. France to Ireland)



- 250kg to 1Metric Tonne Cargo
- Secure Drone Corridors &

Drone Ports

- Automated drop-off/pick-up, charging
- Automated UTM
- Round the clock Operation



Europe's U-Space Demonstrators & UTM Test Corridors in USA



Integrated Pilot Programme (IPP)



Source: https://www.faa.gov/uas/programs_partnerships/integration_pilot_program/lead_participants/

U-SAFE Test Corridor(Ney York State)



Summary

- Re-definition of Very Low Level Airspace operational environment
- Increasing reliability on technology (Sensors, Connectivity, Computation) to ensure Drones fly safely & responsibly
- Gradual move towards BVLOS 'over the hill' operation
- Entrance of new players to provide U-Space
 Service/UTM Systems
- Increase of machine-on-machine, taking humans-out-ofthe-loop, decrease the need for drone operators
- Emerging role of in Artificial Intelligence/UTM; UTM will control drones. Al will control UTM







Next Steps to consider

- Work together with IAA (and other relevant stakeholders) to design/build/operate certified, multi-thematic (lowcost) drone test corridors across Ireland – establish Ireland on the International Drone Testing/Certification stage
- Increase participation in European/International Drone
 Technologies/Operations development programmes
- Identify key niche RTDI area where Irish Drone tech/services companies can lead & develop
- Initiate some initial Drone test corridors over next 3 months to 6 months





- Localised Operation
- BVLOS
- Test Corridors
- U-Space/UTM





Drone Industry Day, Tues 18th June 2019, Maynooth University

DRONE INDUSTRY SYMPOSIUM

2019

NEW BUSINESS OPPORTUNITIES AND RESPONSIBLE DRONE OPERATION IN A RAPIDLY CHANGING DRONE TECH WORLD

WHO: End-Users of drone data/services, Professional Drone Operators, Tech Developers, Entrepreneurs & Regulators

WHERE: Maynooth University

WHEN: 18th June, 2019, Registration opens @ 8.30am for 9.30am kick-off.

AGENDA

Introduction

Keynote

- Drones: EU Perspective
- Drone Tech Landscape
- Autonomous Drone Delivery Startup

Delivery Startup Alan Hicks, (CTO, Manna)

Jean-Pierre Lentz (European Commission, DG Grow)

Philip Butterworth-Hayes (Unmanned Airspace)

Responsible Operations

Regulatory Environment - Ensuring safe, non- invasive flight missions

- Data Privacy for Professional Drone Operators
- Rogue Drone Safety/Security Aspects

Recent Developments

- U-Space Services/UTM Systems
- Artificial Intelligence/Machine Learning
- Package Delivery/Cargo Drones
 Specialist Aerial Support Services

Drone Demo & Lunch (12.30pm to 2pm)

2.00pm to 3.30pm

Data Privacy Online Course - 45mins

3.30pm Close

REGISTER FOR YOUR FREE PLACE HERE: <u>WWW.UFLYTE-DRONE-SYMPOSIUM.EVENTBRITE.IE</u> Registration closes 11th June 2019

U-FLYTE, A STRATEGIC RESEARCH PARTNERSHIP, COORDINATED BY MAYNOOTH UNIVERSITY AND FUNDED BY SFI & INDUSTRY PARTNERS



avelopment Fund

All Welcome

More information

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