UAV – Retina

Leveraging drone sensors for decision support

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Fondazione Bruno Kessler

JCP Connect

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Agenda

Overview

I. Introduction

II. Interviews of the users

III. Drones in realistic cases

IV. Our solution

V. UAV Retina platform components

Introduction

Usage of drone sensors data for decision support

How automated drones with reliable communication and data analysis could be used to help society?

Initially, we had 3 concepts:

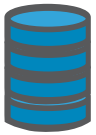
- Firefighters
- Search & Rescue Teams (Avalanches)
- Military (Detection of Improvised Explosives)

Interviews of the users

Get to know current processes, needs and visions of potential users

Interviews of the users

Identified potential needs



Vision of the scene with
a refreshed top view

Information transmission

Detection of danger
targets & sources

Exploiting the data history
for analysis and training

Drones in realistic cases

Drones are already in use in many cases, but…

Notre Dame in Paris

April 15th 2019

Lubrizol factory, Rouen

September 26th 2019

Drones in realistic cases

… there exist limitations *

* Based on interviews with units that already use drones during their missions

Sensor Operators

- **Continuous** check of video stream
- No possibility for **multiple** streams

} information overload

- One operator per one drone
- Reading IR images – training required

Pilots

- Flight range limitation – line of sight
- Checking multiple signals
- One operator per one drone
- Extra pilot required (*in the Netherlands)

Our solution

Platform components

UAV Retina is all about the software and communications, not a hardware

Commercial drone

DJI or Pixhawk open-source controller based

Communication payload

Upwards: drone control

Downwards: position and video

Ground station

Mission control

Video analysis

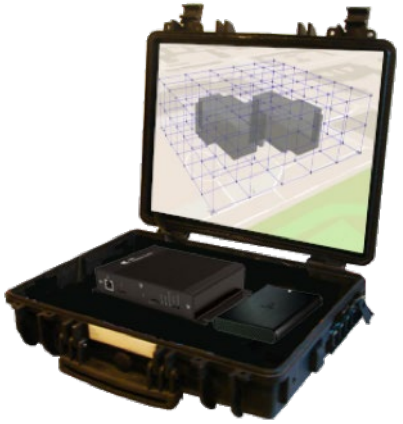
Platform components

Automated flights

- Area of interest marked by the user
- Route optimization module:
  - Generates grid-based waypoints
  - Estimates battery consumption between waypoints
  - Computes optimal route taking battery consumption into account
  - "Save the Drone box" - identifies when the drone needs to land

Objective-driven UX

Automated flight control

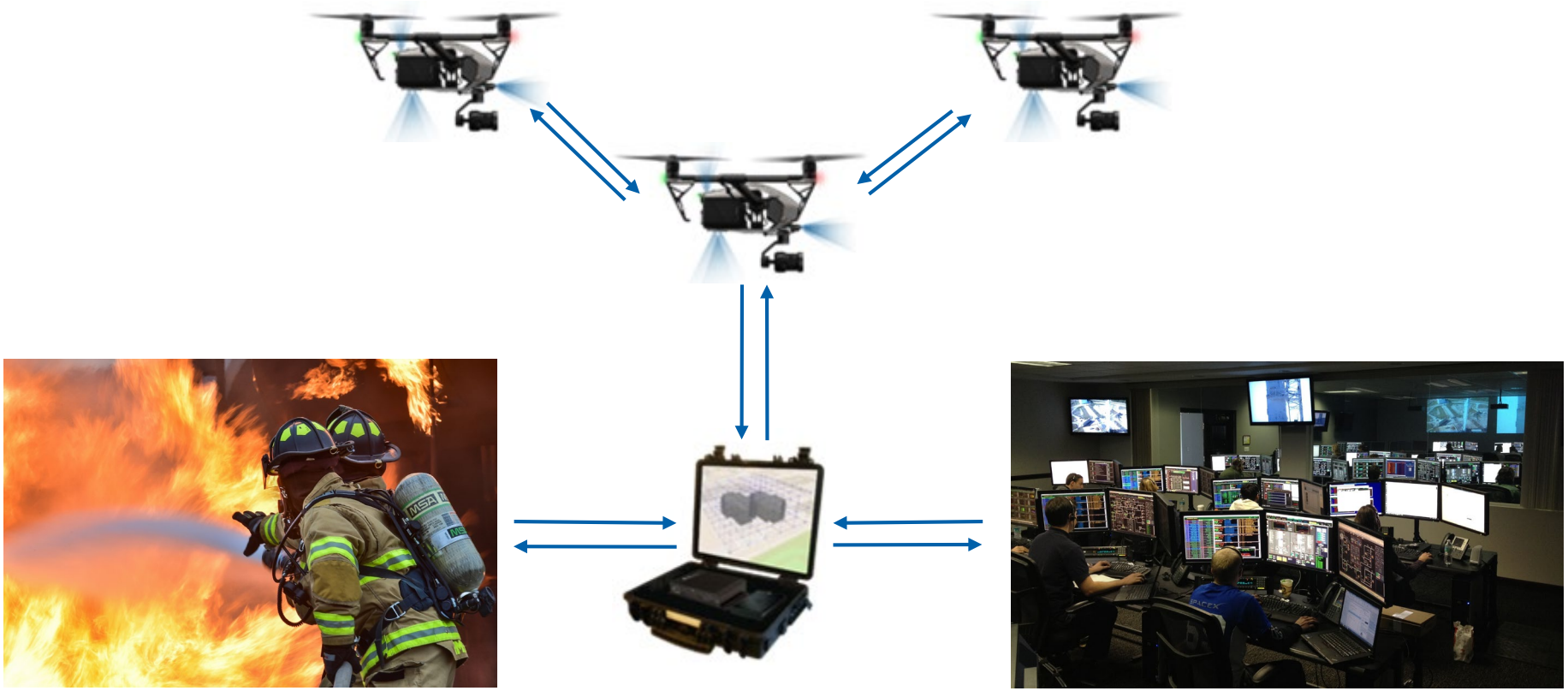


Platform components

Automated flights – our solution

Platform components

Communication between platform elements and stakeholders



Local HQ

Distant coordination center

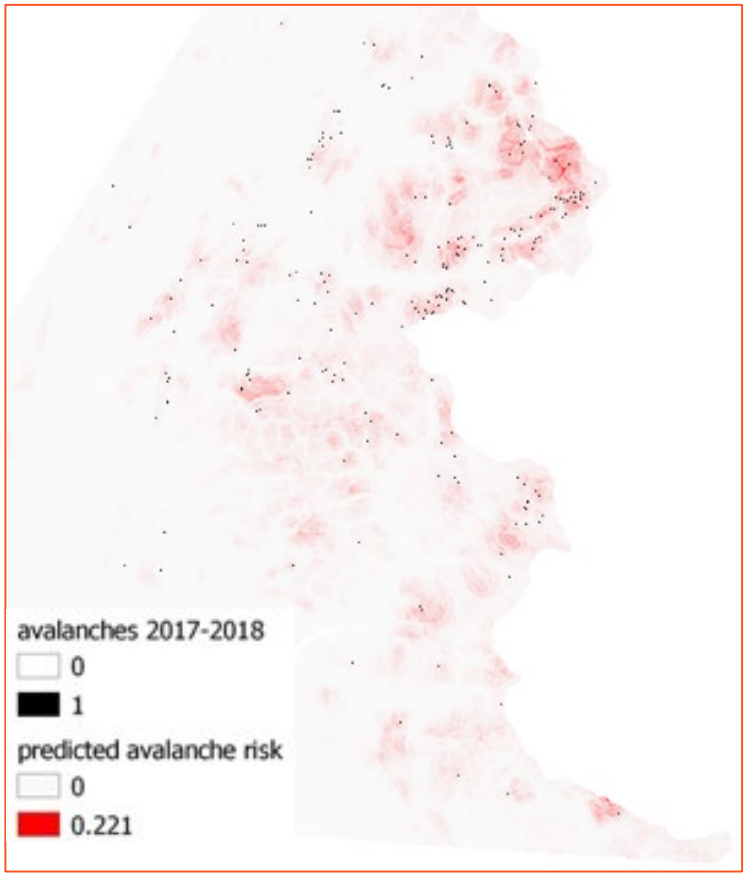
Platform components

Predictive algorithms to identify potential locations of threat upfront the mission

- Historical events
- Geographical information:
  - Elevation
  - Aspect
  - Slope steepness
  - Proximity of people (ski resorts, roads, settlements, etc)
  - ...

Applicable for: mineral mining,
road wearability,
canal wearability,
...

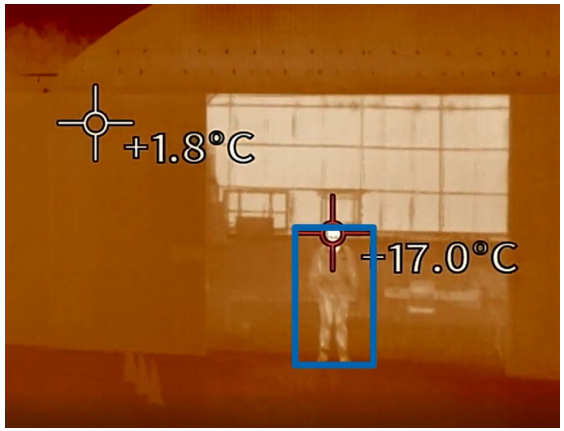
Risk map



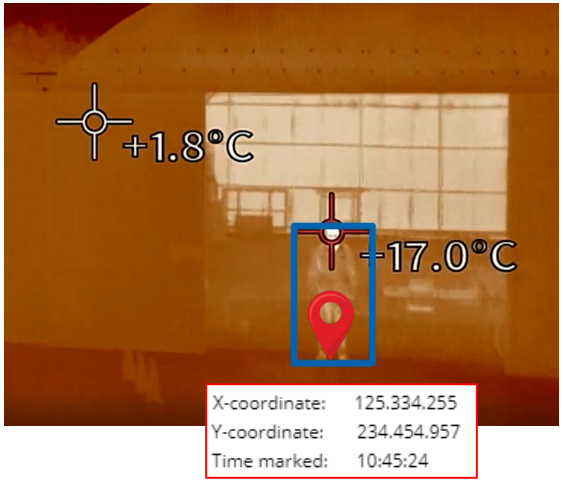
Platform components

Real-time people detection using infrared and RGB cameras

People detection



Coordinate estimation of the identified object



Alter the route plan based on this information

Platform components

Real-time people detection using infrared and RGB cameras

Bright Cape

Contact information

Armand Starczewski
DDEX Consultant
E: a.starczewski@brightcape.nl
M: +31 6 13 30 85 57

Ieva Brantevica
Data Scientist
E: i.brantevica@brightcape.nl
M: +31 6 25 22 26 76

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Thank you for
your attention