

# AMBOS

# Christoph SULZBACHNER



Abwehr von unbemannten Flugobjekten für Behörden  
und Organisationen mit Sicherheitsaufgaben

# Austro-European Security Research Innovation Days

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**Christoph Sulzbachner**



**Hans Peter Stuch**



# The AMBOS Project



**Abwehr von unbemannten Flugobjekten für  
Behörden und Organisationen  
mit Sicherheitsaufgaben**

**Countermeasures for unmanned aerial  
vehicles for authorities and emergency and  
rescue organizations**

**Sponsored within the frame work of the**

**Ziviles Sicherheitsforschungsprogramm in Germany  
and the KIRAS program in Austria**

Sponsored by:



**AMBOS is a bi-national project**

Sponsored by:



## Motivation and Basic Concept

### Detection

- Recognize drones flying towards or into a safe zone

### Verification

- Evaluate the detection results and decide, whether – and if yes then which – interventions shall be applied

### Intervention

- Perform the selected interventions against inbound flying drones to prevent it from penetrating the safe zone

## Goals

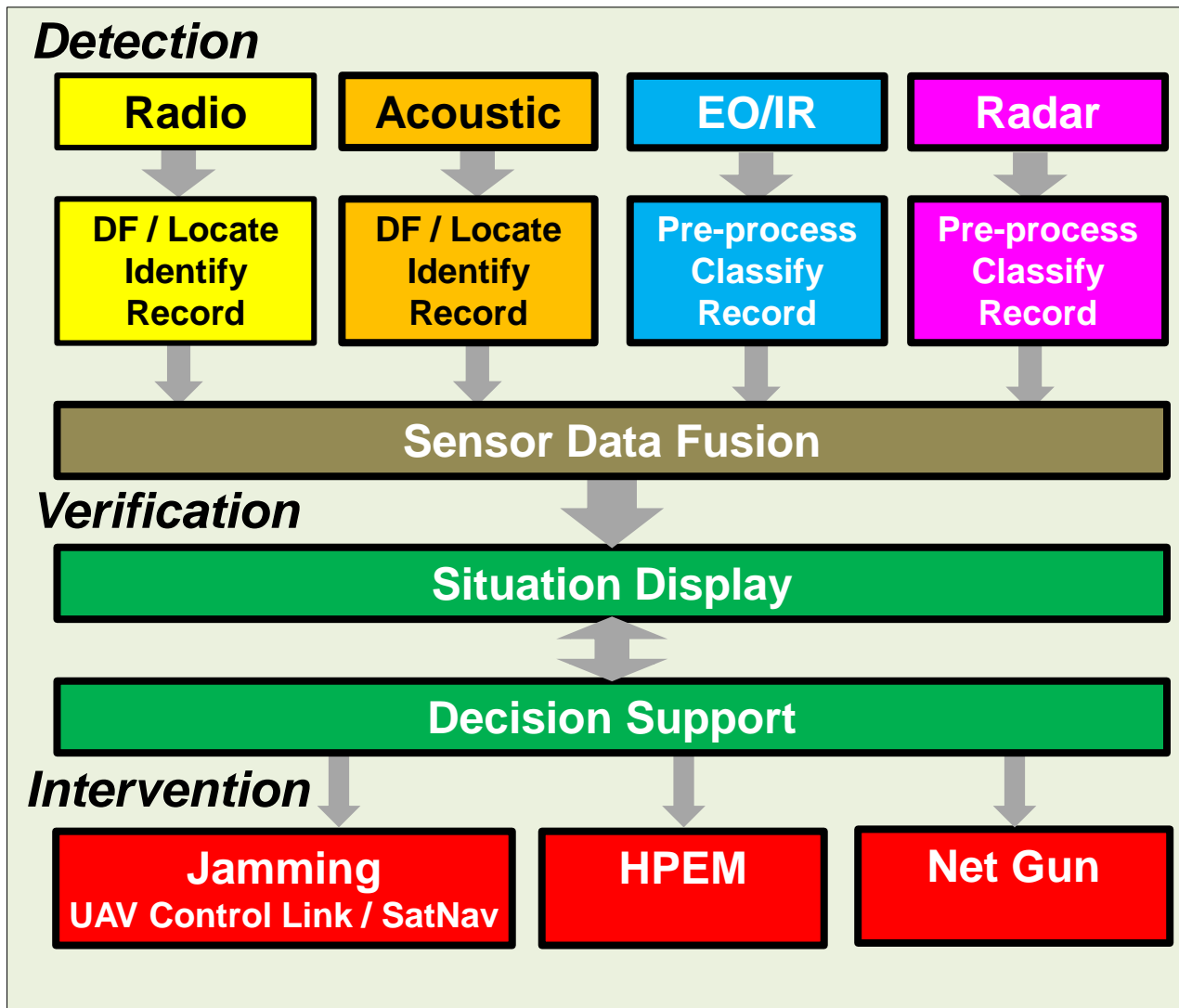
Implementation of Demonstrator Systems – one each in Austria und Germany

- Systematical investigations of the included components with respect to the performance regarding defence against Unmanned Aerial Vehicles
  - Basis: Scenarios described by users of such systems
  - Demonstrate possible features
  - Identify limits
  - Define / describe a product
  - Identify necessary additional research

Project time: 2 years

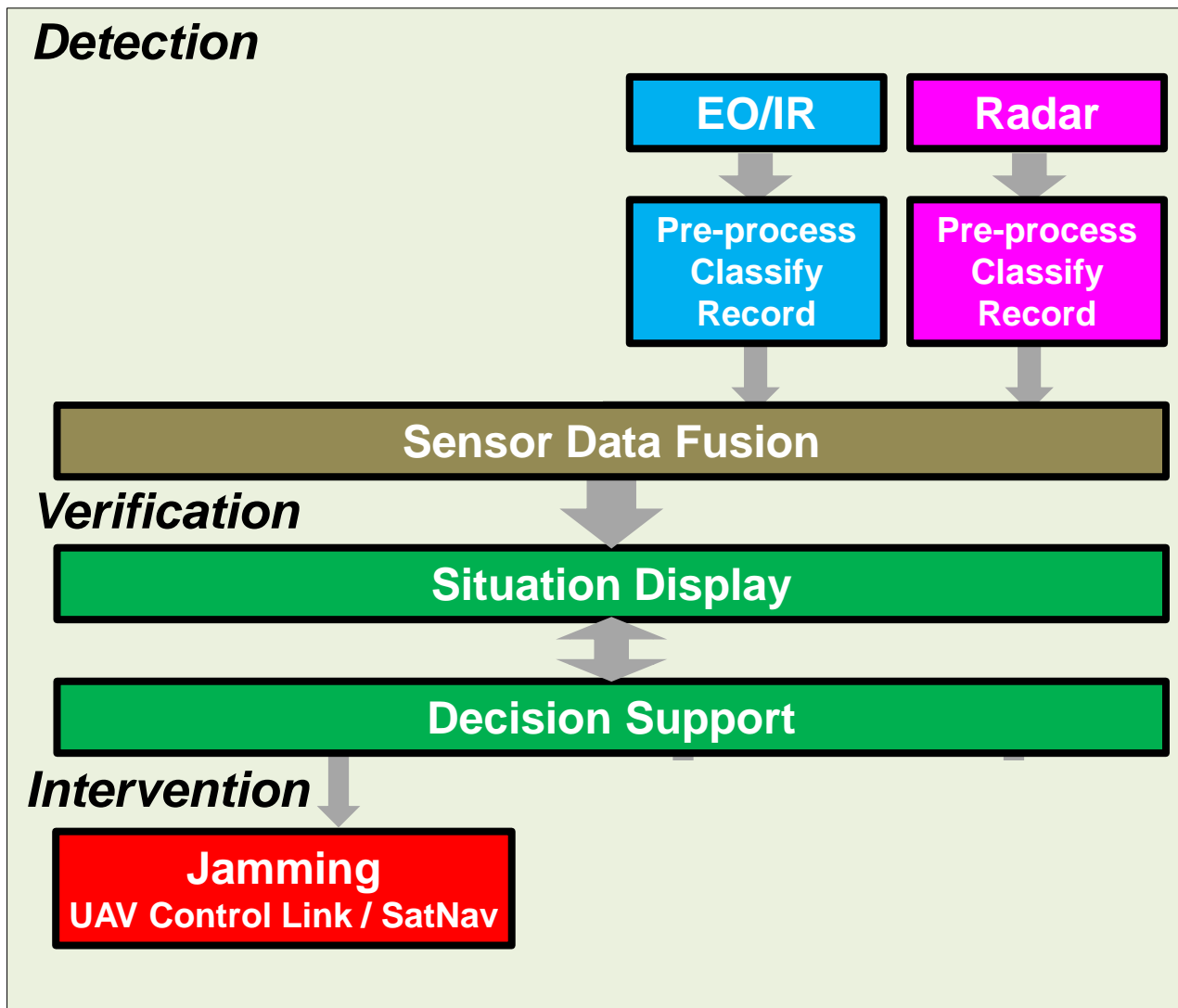
# Structure of the System

Complementing research: Civic, legal, ethic



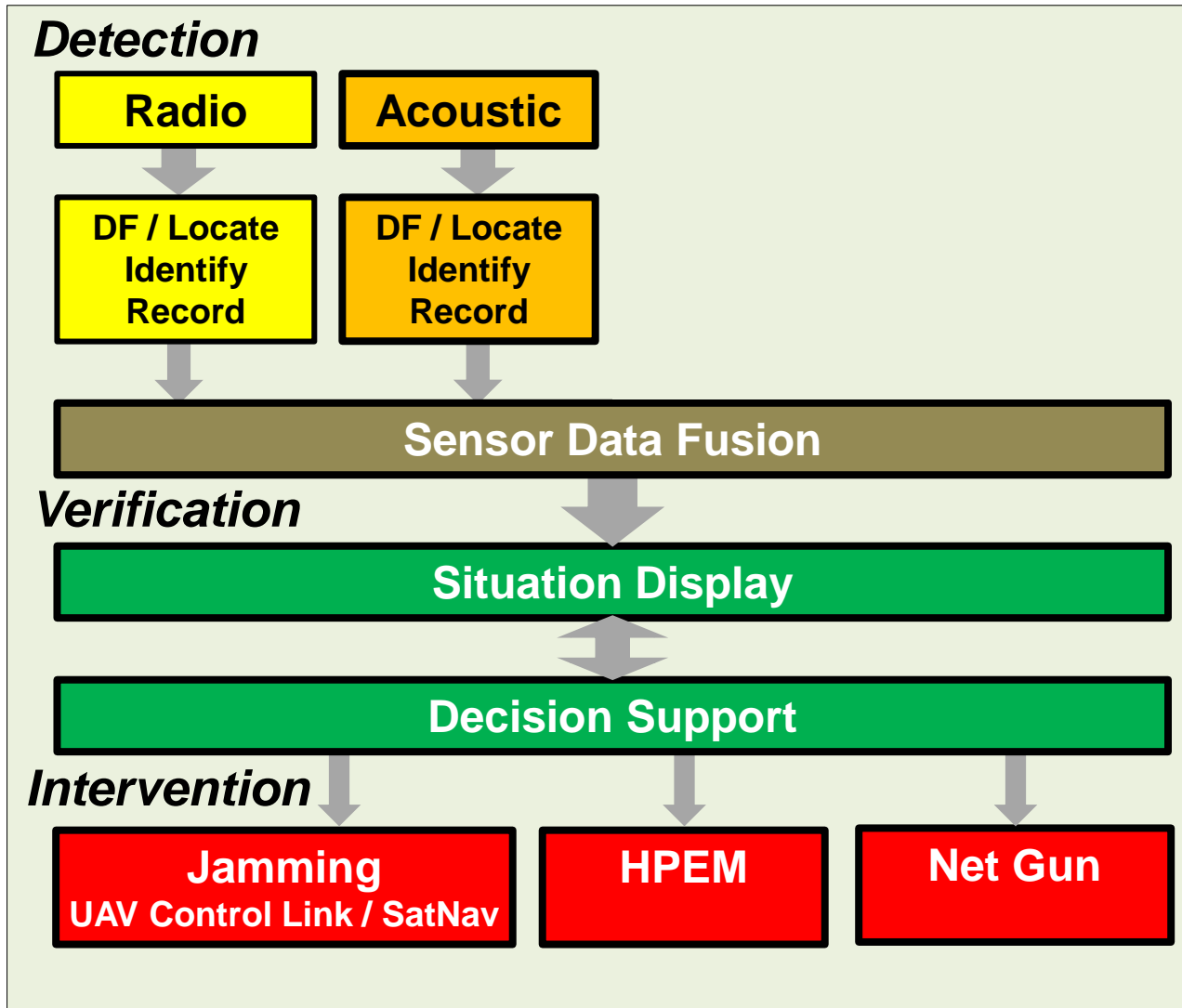
# Focal points of the Austrian approach

Complementing research: Civic, legal, ethic



# Focal points of the German approach

Complementing research: Civic, legal, ethic





# Austrian Partners

Lead: AIT Austrian Institute of Technology

Coordinator: Christoph Sulzbachner

## RESEARCH



## INDUSTRY



## USER



# German Partners

Lead: Fraunhofer-Institute FKIE

Coordinator: Hans Peter Stuch

## RESEARCH



Hochschule für  
Wirtschaft und Recht Berlin  
Berlin School of Economics and Law

## INDUSTRY



## USER



# Scientific and technical approaches for the UAV-detection

## Acoustical Detection

Testing of complementing approaches

Hardware

- Diehl: Local centric microphone array
- IDMT: Distributed sensors

Algorithms

- FKIE: Deterministic approach
- IDMT: Statistical approach

## Optical Detection

Machine Learning used for classification of UAV

## Radio Reconnaissance

Use of Software Defined Radios and COTS-Products

=> Cost-effective approach

Application of State-of-the-Art signal processing algorithms  
basis for further optimization

# Scientific and technical approaches for the UAV-detection

## Sensor Data Fusion

Application of a Fusion Engine

Based on scientific methods not just the combination of sensor data – but the fusion of the information

## Situation Display and Decision Support

In close contact with the users decision strategies are designed and developed for the operation in real time software environments

Human-in-the-Loop Approach

# Challenges

## Acoustical Detection

Achieving robustness for the detection – incl. direction finding and classification of UAV in operational scenarios with real ambient noises

## Optical Detection

Find an optimal configuration regarding resolution, number of cameras, computing power etc.

## Radio Reconnaissance

Detection of a multitude of RF-signal characteristics – incl.

- the pairing phase UAV ↔ remote control
- Manufacture specific communication in up- & downlink

Direction finding of the the UAV and the remote control

Limited reaction time due to rapid attack scenarios

- Detection + signal analysis + direction finding

Operation in urban environment (vs. line-of-sight scenarios)

# Challenges

## **Sensor Data Fusion**

Achieving robustness of the detection results in a sense of True/Positive, True/Negative, False/Positive and False/Negative

## **Situation Display and Decision Support**

Displaying the complex operation environments and the dynamic time critical police specific decision finding

## **Intervention: Jamming, HPEM und Net Gun**

Achieving maximum range – causing minimal collateral damage

## **Entire AMBOS System**

Design technical solutions, which provide maximum performance within the legal, societal and ethical context

## Contacts

### **Fraunhofer-Institute for Communication, Information Processing und Ergonomics FKIE**



Fraunhoferstr. 20, Germany – 53343 Wachtberg

#### **Point of Contact**

Hans Peter Stuch | +49 228 9435-850 | [hans-peter.stuch@fkie.fraunhofer.de](mailto:hans-peter.stuch@fkie.fraunhofer.de)

### **Austrian Institute of Technology**



Donau-City-Str. 1, Austria – 1220 Wien

#### **Point of Contact**

Christoph Sulzbachner | +43 664 8251342 | [christoph.sulzbachner@ait.ac.at](mailto:christoph.sulzbachner@ait.ac.at)