

## AeroecologyCam AC1: bio monitoring using optical systems

### System description:

The optical system is used for the observation and evaluation of flying animals in connection with the BirdScan (AVLR) radar systems or as a stand-alone product. With the help of high-performance cameras and subsequent video processing, objects are extracted from the video stream in real-time. The resulting image series are stored in a database and can be manually classified / labelled. By comparing the labelled tracks with the radar echo signatures the classifier of the BirdScan radar system can be trained for improved pattern recognition.



Figure 1: AeroecologyCam AC1

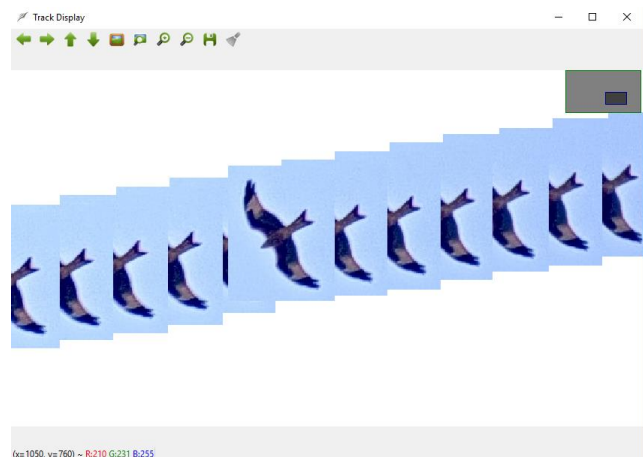


Figure 2: Optical track of a red kite

### **General description:**

The system consists of an optical 4k- camera with zoom lens and a server for real-time evaluation. The manually labelled tracks can be used in order to train the radar system classifier for local species. A semi-automatic process matches the radar echoes with the optical tracks so as to gain labelled echo data.

The setup allows to record information for each target in real-time:

- Automatic recording of passing objects as tracks (image series) in a database.
- The position of the object in the video frame in order to extract further features

Selection of calculated track features:

- speed (pixels per second)
- flight direction (in degrees)
- average size in pixels
- timestamp

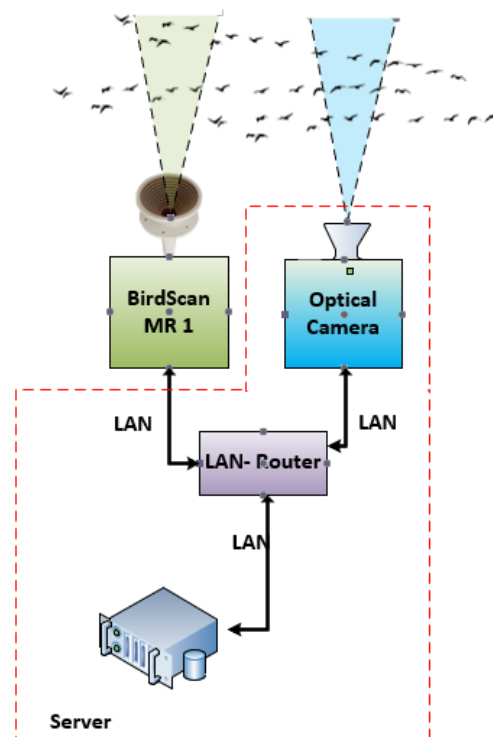


Figure 3: System- Overview

**Analysis software:** The video stream of the camera is continuously analyzed for passing birds. As soon as an object is detected, the images belonging to this object are extracted and stored in a database as image series (track). Features are calculated for each track. These features can be used to avoid false detections by means of appropriate filters. Furthermore, the optical tracks can be matched with the radar database based on time and other features in order to assign the corresponding radar signature to the track.

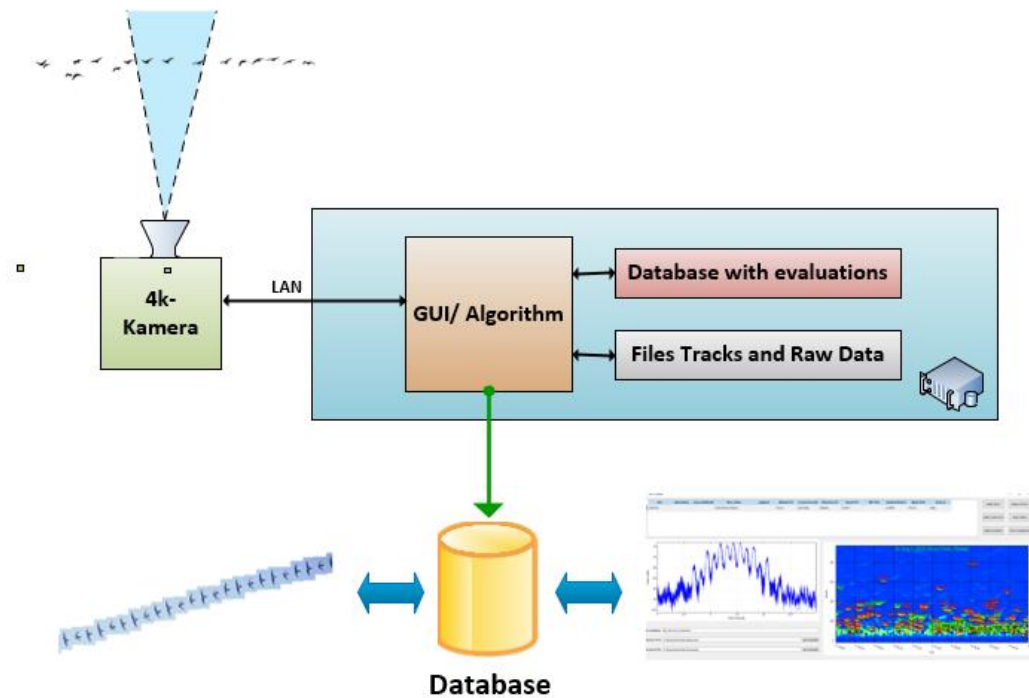


Figure 4: System Overview Software

**Time synchronization with the radar data:**

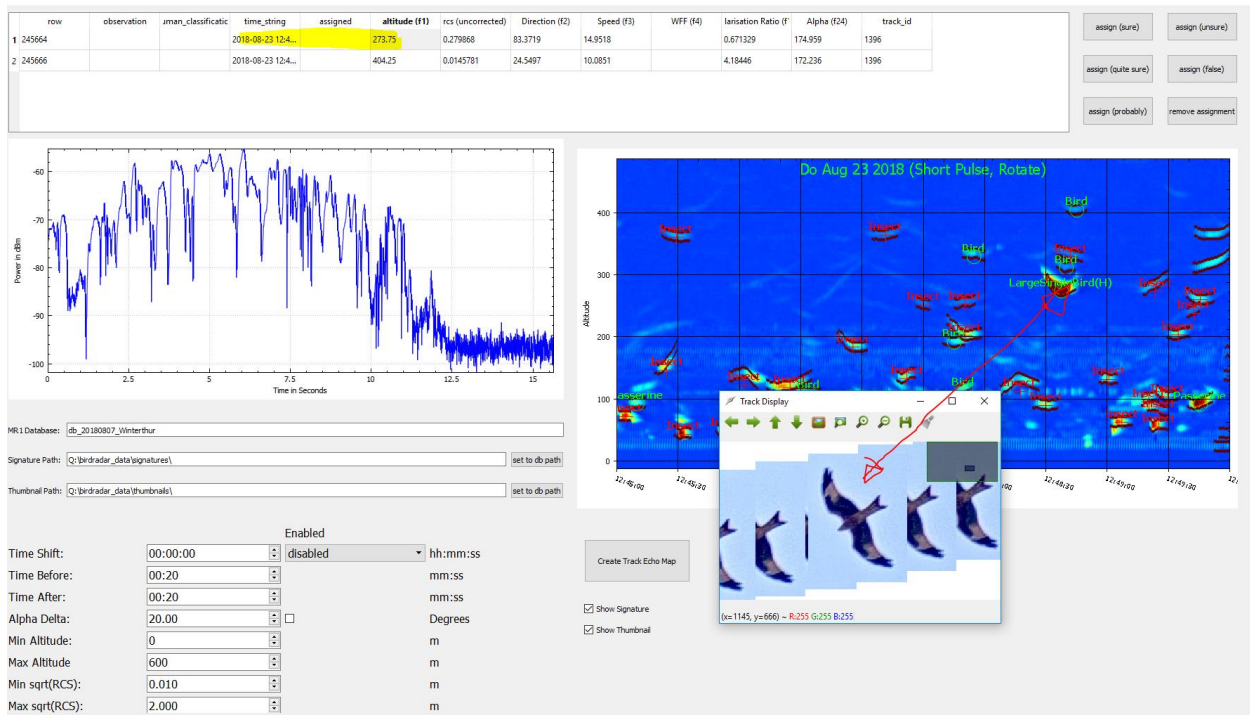


Figure 5: Synchronization with the radar data

Semi-automatic comparison with the MR1 database based on adjustable criteria. The final assignment between radar-echo and optical track must be done manually. The tracks of the image series can be labeled manually and (after matching to a radar-echo) then be used as labeled radar-echo.

**Analysis for low altitudes:** Due to the adjustability of the optical zoom, even low heights can be monitored. The angle of aperture and the detection range can be variably adjusted according to requirements.

**Product Specification:**

<b>System designation:</b>	<b>AeroecologyCam AC1</b>
	<ul style="list-style-type: none"> <li>- Species recognition in connection with Bird-Scan radar system</li> <li>- Stand-alone use for near-field monitoring</li> </ul>
Area of application	Research, environmental studies, continuous long-term monitoring
Sensing technology	Optical camera with zoom lens
Horizontal field of view (optical)	84°- 12°
Camera resolution	4k- Camera (8MP), 50 fps
Network	LAN, WAN, LTE
Range (optical)	Small birds about 400m, large birds up to 1000m
Analyses	Semi-automatic comparison with the MR1 data-base, optical tracks, speed (pixels per second), flight direction (in degrees), average size in pixels
Operation	automatic 24h/ 7d
Power consumption	230V / 700W max. (including 300W heater and air conditioning unit)
Operating temperature range (ambient)	-40°C to 40°C (-40°C to 55°C upon request)
Maximum temperature range (standby with electrical power supply)	-40°C to 55°C
Storage temperature range	0°C to 55°C
Humidity	10-90%
Environmental protection	IP66
Dimension (LxWxH)	600x300x600 mm
Weight	50kg