Detection and Perception

open tasks at Falcon Vision

Everything that concerns sensor technology and data analysis.

LVS - Lawinenverschüttetensuchgerät

Antennas, radio signals, Electronics, embedded systems

- Build a drone-compatible avalanche transceiver. Avalanche beacons are usually used to find avalanche victims. Based on such a device we need a custom receiver that will receive the radio signals and then transmit them to ROS.

Radio signal analysis

Model identification, radio signal diffusion, optimization, parameter estimation, C++, Python

- From received radio signals, W-Lan, mobile radio, LVS device, ... a position must be estimated. For this, a model (Heuristics, neural network, ...) must be developed, which describes the relationship between position and signal.
- Later the same will be done with a micophone to evaluate acoustic signals.
- http://docu.falconvision.org/software/signal-strength-model.html

Radio signal analysis - Filter

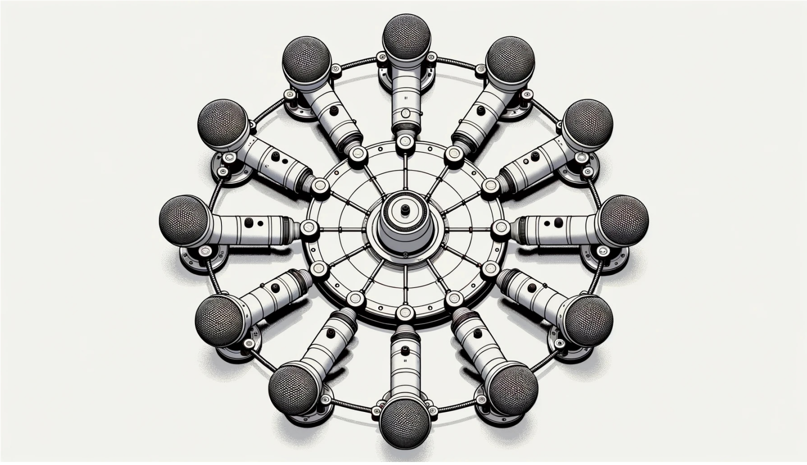
Digital filter, radio signal, optimization, parameter estimation, C++, Python

- The received radio waves must be filtered. What are signals from the drone, what are interferences, e.g. from motors, and what are the signals that contain information about a missing person.
- Later the same will be done with a micophone to evaluate acoustic signals.

Directional microphone array

Microphone polar pattern, audio signal, Electronics, embedded systems

- Multiple microphones that are drone compatible and can determine from which direction an audio signal is coming, e.g. to locate a person calling for help.
- **Acoustic cameras,** https://www.youtube.com/watch?v=QtMTvsi-4Hw



Visual detection

Image processing, neural networks, C++, Python, OpenCV, YOLO

- People detection on RGB and thermal image data. In forests and mountainous regions.
- https://opencv-tutorial.readthedocs.io/en/latest/yolo/yolo.html

LowLevel Sensor Fusion

C++, Python, Kalman filter,

- To realize the estimation of positions robustly and in motion many measurements have to be combined, IMU, GPS, camera, radio, audio... this can be done e.g. by means of Kalman filters.
- https://www.kalmanfilter.net/default.aspx

High Level - Sensor Fusion

C++, Python, Kalman filter,

- Other data must be processed at a much higher level. Hiking maps, information from the emergency command center, and current position estimates must be merged at a high level and conclusions drawn. For example, is it realistic to receive readings above the trail when we have information that the person has fallen from the trail? This can be realized e.g. with Language Models like ChatGPT.