



Miniature Radar Detector

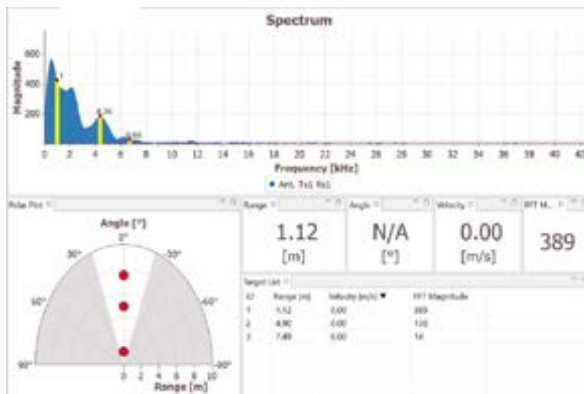


Abb. 1 Graphical User Interface to visualise the results



Abb. 2 Housing with sensor and camera

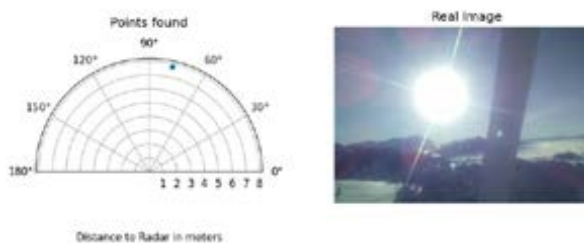


Abb. 3 Successful detection of a wind turbine blade

Problem definition

Radar systems are intended to support unmanned aerial systems in the detection of obstacles during flight. To achieve this, it must be possible to measure the distance to these obstacles. In this thesis, the evaluation of different radar modules is carried out to test their suitability for measuring distances on a UAV. The concrete use case is the detection of wind turbine blades during the maintenance of offshore turbines. The drone will be above the engine room and must not come too close to the rotor blade.

Solution

In order to fulfil the evaluation, a research has to be carried out in a first step to create an overview of the available low-cost radar systems. Subsequently, a radar system has to be found, which fulfils the conditions of the catalogue of requirements. On the basis of this requirement specification, a target is set in order to guarantee the acceptance of the development. The selected radar systems must then be put into operation and run through various test scenarios.

Implementation

Depending on the design of the radar module, additional components are procured to enable distance measurement in the respective tests. Thus, a control module is put into operation which controls the sensor, processes data or provides a communication interface. As the final test is carried out on a wind power plant, a wireless module is necessary which allows remote access to the sensor. Furthermore, the energy supply must be guaranteed during the flight tests. In order to visually display the results during the tests, a graphical user interface should also be made available. Further a housing is required to protect the modules and enable them to be attached to the drone.

Results

This work has shown that distance measurement with radar sensors is possible for the concrete use-case. The suitability as a safety feature is also possible for small distances in communication with additional software and algorithms. Furthermore, it was shown that low-cost radar systems can be quickly embedded with other systems, and several things could be measured, such as distance, speed and angle to an object. However, due to limited time, only a small part of the possible solutions for distance measurements by radar was covered.

Outlook

Since it could be shown that radar systems are suitable as distance meters for UAVs, a concrete system can be designed for the use-case.