Faculty of Electrical Engineering & Computer Science
Master Degree Course Electronics Engineering, MSc EE

HSB
Hochschule Bremen
City University of Applied Sciences

Master 2020

Eike Kluge

Investigation and implementation of a simulation model to improve aircraft survivability based on the RCS signature.

ABSTRACT - Masterthesis

Active radar systems transmit radio waves, which are reflected by flying objects. This reflection is received and processed to detect and locate the flight object. The strength of this echo depends among other transfer parameter on the radar cross section (RCS) of the aircraft. Based on the aircraft geometry, structure and material, each aircraft type has its own specific radar signature. In most cases, radar detectability of an aircraft is described on the basis of a mean value for the whole radar signature. By taken into account the signature, with respect to the direction of arrival (DoA) of the radar waveform, new and improved flight maneuvers become possible.

This thesis investigates how knowledge about the own radar signature could be used in a radar guided threat scenario to increase the aircraft survivability.

For this investigation a simulation environment is introduced. This environment contains different simplified models e.g. a kinematic model, guidance algorithm, active radar and radar signature model as well as a rendering model for visualization. The kinematic model aims to simulate the motion of the flight object depending on the aerodynamical and mechanical properties. The guidance algorithm corrects the heading of a flight object to follow an path to a designated target or point. A radar and signature model is included to consider the radar method, antenna parameters and scatter parameters. Finally, by utilizing the radar signature of an aircraft, different flight maneuvers and attitudes are simulated to analyze self-protecting maneuver techniques.