A Framework for Multiple Radar and Multiple 2D/3D Camera Fusion

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The simultaneous interpretation of heterogeneous sensor data, such as radar and image data, is a difficult task in information fusion. In this paper we present a framework for the fusion of these systems. The proposed algorithms are set in the context of airport runway surveillance. Every airplane starting or landing on a runway can loose some parts from its fuselage, e.g. screws. These parts can then damage the following aircrafts, which could lead to air crashes. Nowadays the airstrips are inspected visually by the airport personnel. In the following we will show how our framework can be used for the automated detection of such midget objects.

In the case considered here we combine information from multiple close-range radars to one fused radar measurement using the overlap region of the individual radars. This step is performed automatically using a feature based matching technique. Additionally, we use multiple 2D/3D cameras that generate (color) image and distance information. A possible application of this is the automatic detection of midget objects (e.g. screws) on airfields. We outline how to generate an adaptive background model for the situation on the runway from the fused sensor information. Unwanted objects on the airfield can then be detected by change detection. Tp perfom this task we use $M \in \mathbb{N}$ close-range radars and $N \in \mathbb{N}$ 2D/3D cameras to cover the airstrip. We assume the situation shown in Figure 1. In it the viewpoint change of a single camera is just a translation along the x-axis. We allow for small displacement and alignment errors.

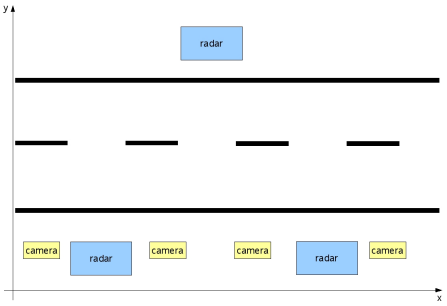

Figure 1: Situation for our fusion framework