Abstracts

A microwave imaging radar in the near field for anti-collision (MIRANDA)

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The architecture of the MIRANDA system is based on four transmitters and a planar array of intelligent receiving cells, each one with the microwave front-end integrated with a digital signal processor (DSP). These cells are digitally connected in chain by high-speed data links, and their microwave front-ends are coherently synchronized with the transmitted signal. The reconstruction process is performed in a distributed manner on the DSP net in order to obtain the images of the observed scenery and the speeds of the obstacles in real time. This solution requires low-complexity microwave circuits, but heavy computation if a conjugate phase-matched filter is directly implemented. In order to obtain the real-time operation, we have proposed a new microwave imaging radar algorithm, the 3-D image reconstruction algorithm (MIRA-3D), which is able to reconstruct the image without aberration in the far field, as well as in the near-field zones of the array and is able to acquire the radial speeds of the scattering centers. In consideration of the space available for the installation of the system in the bumper, the radar front-end must be of small dimensions. The required imaging field-of-view is quite large, therefore, the size of the receiving cells must be small to fit within the proper inter-element lattice; for this reason, the realization of a two-dimensional array requires a multilayer microwave circuit. In this paper, the multiprocessor implementation of MIRA-3D integrated with the radio frequency front-end is described.

❑ Return to main document.