论文

行进人体目标雷达瞬时多普勒特征分析

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摘要：

行进人体目标对雷达回波产生多普勒调制和微多普勒调制，提取目标雷达回波中的多普勒和微多普勒特征，可获得人体目标的运动速度及肢体摆动周期等信息，有助于人体目标的检测与识别。本文改进和完善了行进人体目标的线性刚体模型，得出连续波信号体制下人体目标雷达回波，推导出人体目标的瞬时多普勒频率，定性分析了目标的瞬时多普勒特征和瞬时运动特征的变化规律。利用公开的实测数据验证了本文模型的有效性，并利用时频分析工具对目标雷达回波的瞬时特征进行了仿真分析，提取出目标的瞬时运动特征。本文模型及特征提取方法可推广应用于其他信号体制的雷达回波信号分析，同时可推广应用于对目标其他运动状态的分析。

关键词：　行进人体目标；雷达回波；多普勒；微多普勒；瞬时多普勒；瞬时运动特征

Radar Instantaneous Doppler Signatures of Pedestrian

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Abstract:

Pedestrians may induce Doppler and micro-Doppler modulations on radar echoes. These Doppler and micro-Doppler signatures extracted from radar echoes could help us to obtain speeds and vibration periods of pedestrians which are of great help to improve detection and identification of human beings. In this paper, an improved human walking model which describes a pedestrian as a linear-rigid target is introduced firstly, and radar echoes of the pedestrian are acquired under the condition of continuous wave (CW) radar signal. Then formulas of instantaneous Doppler of the target are derived and instantaneous Doppler and instantaneous movement signatures of the target are analyzed qualitatively based on the model. Finally, the improved model is verified by open real measurements in Internet, instantaneous signatures of a pedestrian are analyzed by simulation studies with time-frequency transform, and instantaneous movement signatures of the target are extracted from simulation results. The model and signature extraction method discussed in the paper can be extended to calculate radar echoes of other kinds of signals, and can be also adopted in analyzing other movement states of pedestrians.

Keywords: Pedestrian Radar echo Doppler Micro Doppler Instantaneous Doppler Instantaneous movement signature

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