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基于广义Kalman估计的机载雷达高精度控制系统

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High Accurate Control of Radar System on Plane-Board Based on Ex tended Kalman Filter

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摘要 研究了在某型现役机载雷达系统中, 采用广义Kalman 滤波器方法来预估目标机的俯仰角和方位角,产生跟踪目标用的雷达天线驱动信号, 替代传统的速率陀螺测量元件来补偿本机机动所造成的扰动的方法,同时对探测信号本身所具有的延迟起到了补偿作用。对目标的运动采用直角坐标系中的Singer 模型描述, 而对测量信号则是应用极坐标系中的描述, 采用广义Kalman 滤波器来完成估计, 即在每一步的估计和控制中对计算测量方程进行线性化结果, 实现两种坐标系的转换。通过应用Matlab/ Simulink 软件对整个系统的建模、设计及仿真研究, 得到了满意的结果。

关键词: 雷达控制   Kalman滤波器   控制系统   仿真   Matlab/Simulink

Abstract: The application of extended Kalman filters to compensate for the disturbance from plane movements fort he radar system on the plane-board is researched in this paper instead of tradit ional met hods which used velocity gyro. Now in t he plane-board radar antenna system, the extended Kalman filter is adopted to estimate the elevationand azimuth angles of a tar get plane as driving signals for the radar system to track the target. At the same time,t he new method can also compensate for the delay of detection signals. I n addit ion, target movement is describedwith the Singer model in an orthogonal coordinate system and the measurement signal is estimated by an extendedKalman filt er in the polar coordinate system, that is to say, measur ement equations ar e linear ized in each step tomake the conversion of t he equat ions to the orthogonal coor dinate system. With Matlab/ Simulink softwar e the modeling, design and simulation are successfully finished and satisfactory results are also obtained.

Keywords: radar control   Kalman filter   control system   simul ation   Matlab/Simulink

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