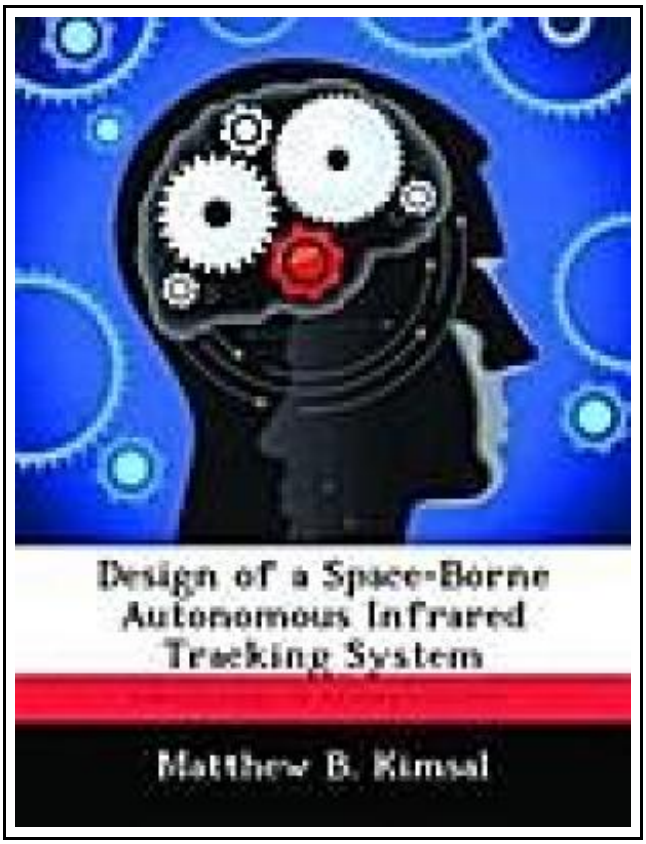
Design of a Space-Borne Autonomous Infrared Tracking System



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DESIGN OF A SPACE-BORNE AUTONOMOUS INFRARED TRACKING SYSTEM

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Biblioscholar Okt 2012, 2012. Taschenbuch. Book Condition: Neu. 246x189x6 mm. This item is printed on demand - Print on Demand Neuware - Complete characterization of the space environment in support of the United States' goal of Space Situational Awareness is not currently achievable. When confronted with recent increases in the deployment and miniaturization of microsatellites by numerous nations, the questions of foreign space capabilities are magnified. This study sought to determine the feasibility of and experimentally demonstrate a microsatellite capability to autonomously loiter about and track a target satellite. Various methods of passive remote sensing were investigated to determine the best means of detecting and tracking a target in space. Microbolometer-based infrared sensors were identified as the best sensor for several reasons, primarily due to their ability to track in the absence of light. A representative system was constructed for demonstration in AFIT's SIMSAT laboratory. Software modeling results identified open-loop instability, and therefore the requirement for closed-loop control. A simple PD control algorithm served as the basis for control, and a pseudo-feed-forward term was added to improve the results. The feed-forward term was derived form orbital dynamics as the rate at which the chase satellite traverses around an ellipse formed in the target's frame of reference. Reduction in pointing errors of up to 67% were found in simulations. Non-optimal yet successful tracking results were obtained in the laboratory with a hardware-in-the-loop model for both step and moving inputs. With minor modification, this infrared tracking system could be implemented onboard a microsatellite. 104 pp. Englisch.

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