

Development of 3D Thermal Models to Analyze Building Power Loss

Radiative heat loss from external surfaces is a large component in overall building heat loss, and efficient methods of measuring total radiative heat loss from buildings need to be further developed. 3D thermal model analysis of such facilities can aid substantially in understanding heat loss. High-overlap radiometric images can be obtained using small aerial drones outfitted with an infrared camera, and photogrammetry algorithms can generate 3D thermal models which contain the composited radiometric data of such images. Multiple 3D models have been produced (in the OBJ file format) of buildings in the University of North Georgia's Dahlonega campus. Current work is being done to analyze model properties, such as accuracy in representing energy and power loss through radiated heat. Developed software for this project calculates radiated heat from a building model's external surfaces, and utilizing the Stephan-Boltzmann relationship, finds the power lost due to radiated heat. This work is tending towards developing a workflow for easily assessing the energy and power loss from a structure using small aerial systems for thermal imaging and power loss calculation software. Future work will be done to understand the accuracy of the currently used power loss calculation. Additional 3D thermal models of buildings in the University of North Georgia's Dahlonega campus will be created, which allows further development of the 3D thermal model creation process.