

Abstract

A temperature uniformity index (UI) was used to quantify the spatial homogeneity of temperature in a ventilated airspace (3 m × 2 m × 1.5 m) by using a 3D-grid of temperature sensors. An airflow pattern sensor, developed to control airflow pattern in ventilated buildings, was used to predict UI in the room at different conditions. The objective of this study was to investigate the relation between the 2D inlet temperature distribution measured by the airflow pattern sensor and 3D uniformity index in the room for different ventilation rates and inlet flap positions in a room filled with empty or potato filled crates. Regression analysis was used to model the UI from the temperature measurements obtained from the airflow pattern sensor. Using 10 temperature sensors on the airflow pattern sensor, R^2 -values of 0.81 and 0.73 were found with an average standard error of 5 and 7% for UI from 15 to 96%, in a room filled with empty or potato filled crates, respectively. Results showed that 2D inlet temperature measurements can be used to predict 3D uniformity of temperature in a mechanically ventilated space.