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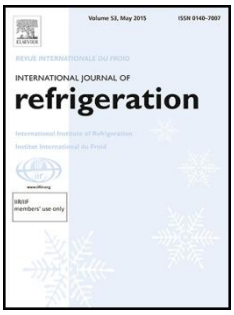

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Mathematical application to analyze the thermal behavior of a domestic refrigerator: influence of the location of the shelves

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Highlights

- Mathematical methods are used to analyze the thermal behavior of the compartments
- Thermal maps were used to find the most appropriate shelves location
- The moving variance in freezer is 43 times higher than in freshfood compartment
- Temperature derivatives allowed the precise detection of stability
- Temperature derivative is 6 times higher in freezer than in freshfood compartment

Abstract

This paper presents a mathematical application in the thermal analysis of a domestic refrigerator. The main idea of this work is to observe and analyze the thermal effect in the fresh food compartment when the glass shelves are changed of location. Thus, it is proposed the use of the moving variance to analyze the thermal distribution of the refrigerator compartments and the use of finite differences to examine the temperature change rate by computing the temperature derivative with respect to time. Additionally, it is proposed the use of 2D interpolation methods to build thermal maps in order to analyze the mean and variance of the temperature when the locations of the shelves change. These maps are a very important tool to find a good combination of the shelves locations to attain a proper temperature for the best conservation of perishable food.

Keywords: Domestic Refrigerator, Thermal Analysis, Shelf Location, Moving Variance, 2D

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