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Visual modeling of laser-induced dough browning

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Abstract

A data-driven model that predicatively generates photorealistic RGB images of dough surface browning is proposed. This model was validated in a practical application using a CO_2 laser dough browning pipeline, thus confirming that it can be employed to characterize visual appearance of browned samples, such as surface color and patterns. A supervised deep generative network takes laser speed, laser energy flux, and dough moisture as an input and outputs an image (of 64×64 pixel size) of laser-browned dough. Image generation is achieved by nonlinearly interpolating high-dimensional training data. The proposed prediction framework contributes to the development of computer-aided design (CAD) software for food processing techniques by creating more accurate photorealistic models.

Keywords: infrared laser, dough, browning, generative model, deep learning, deconvolution

1. Introduction

Visualization tools—what designers use to communicate complex concepts through rendered images —are of preeminent importance when new food products are designed. Modeling software that can produce more accurate visuals of processed food will aid in the development of this technology by creating more compelling and realistic models. The aim of this paper is to create a robust model for generating laser-induced dough browning.

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