A Smart Burn and Spill Proof “SAFE” Microwave that Spares the Salad: Novel Application of Levenberg-Marquardt Algorithms in Bayesian Analysis for Real-Time Numerical Thermodynamic Modeling

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The microwave oven is a commonplace appliance used by millions worldwide. Even after half a century from its commercialization, this technology has remained static and no fundamental improvement has occurred. Although economical, the platform remains relatively unsafe: all common cooking apparatus are primarily user-selected time driven, with NO understanding of the food status causing over/undercooking and fire hazards. Even the smartest of the breeds require food-type, weight, etc. as inputs. Preventing a burn, although a fundamental objective, has not been possible until this interdisciplinary innovation. This project pioneers a novel application of Levenberg-Marquardt algorithms and Bayesian analysis for real-time thermodynamic modeling of heat propagation, and radiation focus management. Employing a multi-iterative systems engineering approach, over 1000 heat-absorption scenarios have been analyzed resulting in complete auto-detection of a broad spectrum of food-types. A low-cost, touchless thermopile sensor enables a cooking experience for lip-ready food. With only single parameter measured, bounded interdependent food characteristics have been solved. A plethora of smart features are included such as remote control, selective heating, infrared-map-telemetry and Bluetooth-enabled personalization. This innovative, original work introduces sophisticated IoT cloud-driven machine-learning, allowing a truly burn/spill-proof and zero-user-input experience. A fully-functional prototype was created by retrofitting an ordinary oven Intel CISC platform. This new scientific field opens numerous industry adoption possibilities, including preemptive heat-based bio-decontamination and curbing cost of food industry. Can you imagine living without it when it hits the market?

Awards Won:

Third Award of $1,000

International Council on Systems Engineering - INCOSE: First Award of $1,000

European Organization for Nuclear Research-CERN: Second Award of $1,500