UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

THE ANALYSIS OF SPACE EFFICIENCY AND HEAT DISTRIBUTION IN BROWNIES PANS

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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ABSTRACT

In baking brownies, the two most important things that bakers try to achieve are space efficiency and quality of the baked brownies. In terms of space efficiency, square shape pan is said to be the best shape in maximizing the space used in an oven. While, in terms of quality of brownies which is determined by heat distribution, brownies in round pan is perfectly cooked compared to square pan. The main objectives of this project are to analyze the heat distribution in baking brownies in square and round pan and to determine the best shape of pan that is fully utilizing the space in the oven. For spatial optimization part, Minimum Bounding Rectangle (MBR) technique is applied to find the shape of brownies pan that fully utilizes the space in an oven. On the other hand, for heat distribution analysis, the square pan shape used the method of finite difference method while the round shape pan applied separation of variable method in Bessel differential function. It is proved that square pan is the best pan shape in maximizing the usage of oven space and in the matter of heat distribution, round pan is evenly distributed better than square pan.

1 INTRODUCTION

It is a very common in our daily life to bake cake, bread, and brownies with an oven. Brownie pan which is mostly used for baking brownie come in various types, styles, and sizes in order to meet customer demands. The most common ones are rectangular, square and circle pans. Although heat can be distributed evenly in a round pan shape so that the brownie will not be overcooked or scorched, but commonly,rectangular shape pan is widely used in bakery industry. The reason why rectangular shape brownie pan has better application is because most ovens used are rectangular in shape. So, using round pan shape is not so efficient in terms of occupying space.

In this project, a deeper look at the space efficiency and heat distribution problems arising from cooking brownies in an oven which types of pan shape that will maximize packing efficiency. For the heat problem, there are two types of shapes that will be considered in this project which are circle and square shapes..

Throughout all the paper has been studied, to make and produce perfect brownies, we must take the important characteristics of brownies to get the perfect baked brownies. First of all, the researcher must study about the space efficiency of brownies pan to well-fit in the oven. The researcher also need to study about the heat distribution among the types of pan. In this study, only square pan and circle pan only for consideration.

For the part of space efficiency, the naive method is used. This method divided into two step, constructing the rectangle and tiling the rectangle. To solve and find the value of exact space, in this research, the best application to produce the result about which one is the best pan will be optimize .

In terms of heat distribution, for the square pan shape, it will be solved by using finite difference method and the result gained from Mathematica command to get the actual visualize of the square pan shape after a few minutes in the oven. And for the circle pan shape, this will