# THE APPLICATION OF FINITE VOLUME METHODS TO STUDY THE NATURAL CONVECTION PHENOMENA IN A 2D RECTANGULAR CAVITY

BY

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## ABSTRACT

The phenomenon of the steady natural convection inside the two-dimensional square enclosure which is horizontally heated is investigated numerically. The natural convection is assumed to occur when one of the sidewalls is heated and cooled at another wall while the top and bottom wall are remain adiabatic. The heated wall is assumed to have the uniform temperature which is higher than the cold sidewall temperature. The finite volume method is used to solve the governing equation based on stream-function-function formulation. The program has been validated by comparing the result of the constant temperature with the previous studies and revealed good agreements. The important parameters involved in this analysis are (1) Rayleigh number, the ratio of temperature difference and (2) Prandtl number, the media of fluids. The Nusselt number (Nu), representing the non-dimensional temperature gradient is the main consideration for the result output. The results are presented in the range of $10^3 \leq Ra \leq 10^6$ where laminar flow is expected. The numerical result of air Pr=0.71 and water Pr=7.0 are presented to find out the effect of Rayleigh numbers on the average Nusselt number along the hot wall and cold wall respectively. The result show the average Nusselt number varies accordingly along the hot wall and increase with the increased of Rayleigh numbers. The maximum value of average Nusselt number for all the values of the hot wall temperature variation occurs for Rayleigh number $Ra=10^6$. In conclusion, the Finite Volume method is very much suitable for analyzing the heat transfer phenomenon inside a 2D cavity or rooms.