

## **Abstract**

### **English**

This paper presents the numerical convergence and parallel performances of nozzle gas flow simulation using Mac-Cormack method. Here, numerical method is used to approximate the gas flow equation which consists of continuity, momentum, and energy equations. The gas flow equation is simulated and compared with analytical solution in order to show the convergence of the numerical method. Here, the result of numerical solution of nozzle gas flow is obtained in a good agreement with the analytical solution. Using discrete  $L^1$ - and  $L^2$ -norm error measurements, the errors of mach number are observed  $2.5977 \times 10^{-07}$  and  $1,6620 \times 10^{-07}$  respectively for 6400 discrete points. The performances of parallel computing are evaluated by two computers, AMD Ryzen 5 2400G (PC 1) and Intel i7 4790 (PC 2). The speedup and efficiency of parallel computing in PC 1 is shown better than PC 2. However, CPU time of parallel computing using PC 2 is shown slightly better than PC 1. The speedup in PC 1 and PC 2 is observed 4 times up to 5 times using grid points more than 1000 points and 8 threads. Meanwhile, the efficiency is resulted 53% up to 60% approximately using both computers when the grid number is more than 1000 points.