

# ABSTRACT

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## **Designing and Building Computer Parallel Prototype by Using Microcontroller AT89C52 : Star Topology**

(vii + 104 pages, 5 tables, 83 figures, 2 appendices)

Many complex mathematical problems involve heavy calculations (such as image processing and weather prediction) that can be done through computer. However, this kind of calculation will be very tedious for a single computer, as it uses a lot of resources (CPU, memory, etc.) and processing power. The right solution for this matter is the implementation of parallel processing. Usually, people implement this technique by using many computers and this way does involve – sometimes a very complicated one – a complex mechanism of both computation and communication.

Microcontroller is a device that satisfies the minimum requirement of a simple computer system. Equipped with the external memory chip, microcontroller can demonstrate how a minimum computer system works. Therefore, it is a great idea to use microcontrollers to build a prototype of parallel computer. This device will give a better understanding and a simpler way in analyzing the mechanism of a parallel machine.

In this experiment, the prototype of parallel machine is built based on the star topology and SIMD architecture. It consists of a master processor and a number of slaves arranged in a module. The slaves can be configured up to 4 slave processors. The computer is used as the dummy terminal for entering the data to master processor through software as the interface. Next, the master processor will forward the data to slave processor. The mathematical operation which is applied here is addition. Master processor will collect calculation results from the slaves at the end of a session and send the result to the computer. The computer software can also generate log files. This log file is used to analyze parallel processing in a simpler way through many cases experimented using the parallel module.

This parallel module is moderately flexible in configuration. It can accommodate flexible amount of data ranging from 0 to 100. It can also detect flexible number of attached slave processors. By experimenting using one slave, two slaves, three slaves, and four slaves operating on the same group of data, the log files will show the tendency of execution time. In average, the increasing number of slaves will decrease the overall execution time (give speed up) by 0.2 – 5 percents. In summary, the implementation parallel processing should consider both computation and communication (computation-to-communication ratio). Both of them should be in a balance proportion.

References : 13 (1993-2005)