Parallel Programming on Embedded Multicore System ESP32

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Abstract

The following documentation will focus on the principles of parallel programming in general and the mathematical background. In addition to the different parallel programming architectures, the various models for their implementation are also discussed. Moreover, in this thesis the prerequisites for mathematical calculation models, which are suitable for Parallel Programming, are elaborated.

For a practical example, the ESP32 microcontroller was chosen, an embedded multicore system. After a brief introduction to the hardware itself, further details of the project structure and the development of the application will be presented. Therefore, a short example will be explained to focus on the basics of parallel programming.

Finally, the aim of the project and the documentation is an automatic benchmark setup and a webfrontend result overview for visualization purposes, which will be discussed in more detail in the conclusion.

Declaration

I hereby certify that I have done the final thesis on my own, that I have completely and accurately stated all the aids I have used and identified everything individually, which was taken from the work of others unchanged or with modifications.

The topic of the submitted work was jointly with Mr. / Mrs. (...) (Bachelor and Master Thesis No. (...)).

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Chapter 1

Introduction

Multicore systems are becoming increasingly popular as part of digitization and Industry 4.0 and are playing an increasingly important role in data processing and automation. On the other hand, in addition to efficiency in energy consumption, performance in terms of computation time is required.

Especially for embedded systems mathematical models as well as numerical solutions are suitable, which can be executed both simply and parallel. The question arises to what extent parallel execution of different sub-tasks to calculate a problem increases the desired cost factor in terms of energy consumption and computational efficiency.

In order to develop an optimal solution, the hardware platform must be included in addition to the mathematical model. Only then can suitable prerequisites and characteristics be worked out in order to enable an evaluation of "Parallel Computation Taks on Embedded Multicore Systems".

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Additional documents

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