LTE UPLINK SCHEDULING IN MULTIPROCESSORS SYSTEM

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The main objective of the thesis is to design a parallel processing algorithm for LTE uplink in a multi processor system. In the thesis evaluate the performance of this algorithm with to throughput, efficiency and as algorithm complexity.

The uplink LTE scheduler algorithm can be parallelised efficiently over several digital signal processors in a multi-core environment. Is submitted algorithm are evaluated against each other in terms of throughput, time efficiency.Also, the result is compared with serial scheduling process. To simulated the uplink scheduler algorithm indicates that the parallel scheduling algorithm is able to achieve higher time efficiency than serial scheduling algorithm, while keeping the same throughput performance. The time improvement depends on the number of schedulable UEs in the system, processors number and the throughput trade-off.

In the equipment of the new generation Long Term Evolution (LTE), multi-core processors combine several microprocessors in one chip. They will be increasingly implemented in eNodeB LTE to achieve higher performance. Therefore, when developing and expanding the use of a multi-core processor system, it is necessary to modernize the current planning algorithm on a single processor platform. Scheduling in eNodeB LTE is a sequential process. The priority of planned users is set. Then for a given unit of the planning time, the scheduler assigns resources to users in accordance with the set priority level one by one until there are no more planned users or there are no spectral resources in accordance with the planning algorithm.

Such a scheduling algorithm has good efficiency for working on a single DSP platform. For a multi-core platform, it becomes very inefficient. This is due to the fact that during the process of allocating resources, low-priority user equipment cannot be scheduled. Previous users must be scheduled first. For a system of multi-core processors, the parallelism of their work does not provide parallel planning. In a sequential scheduling method, only one processor provides a scheduling process, even if there are other free processors that can provide service. The available time for the planning process is strictly limited and its value is directly proportional to the number of user devices that can transmit in one unit of time. This limits the number of serviced user devices. To enable the parallel launch of the planning process in a multiprocessor system, a larger number of user equipment can be allocated to the spectrum by increasing the number of processors. Abstracts suggest parallel planning to increase current system performance and conduct research. The planning algorithm in this case consists of the following steps.

First, at the system level, effective parallelization to several DSPs in a multi-core environment occurs and the scheduling process is divided into several DSP cores of the uplink scheduler process. UEs are divided into separate user groups, and each processor UE is provided with one processor.

The frequency resource is also divided into separate fragments and then allocated to different groups of UEs. The planning process starts in multiprocessors independently of each other. One processor is responsible for only part of the entire set of UEs and, accordingly, has access to only part of the frequency resources. A reduced number of users leads to a reduction in planning time. Therefore, for the same period of time, it is possible to schedule more users. But this parallel scheduling method can also cause a decrease in system throughput.

Available frequency resources are divided into several fragments and map each of them to a specific group of UEs. Therefore, user equipment in one group can only move inside this fragment. They cannot cross the boundary of a fragment and are located in another part of the spectrum. Thus, in comparison with sequential scheduling, a parallel algorithm can even lead to users using the worst frequency resources.

The proposed algorithm can be divided into three stages. At the first stage, preliminary planning takes place, the user equipment and the frequency band are divided into groups and fragments in accordance with various rules. Each group is mapped to one piece. At the second stage, the multiprocessor platform takes on the planning process, performs the distribution of the spectrum in parallel flows with parallel planning. At this stage, two methods are developed and evaluated: maximizing throughput and maximizing equity. At the third stage, it is necessary to use the time saved to increase the spectrum efficiency.

Using two methods for solving the problems posed, the algorithms are evaluated with each other according to the criterion of bandwidth and efficiency of the time spent. The proposed algorithm is also compared with the sequential planning algorithm according to the same criteria. Efficiency of time use, memory usage and implementation possibilities are also evaluated. The proposed algorithm is simulated and simulated. The variety of simulations performed is based on a variation of the scheduling algorithm of the eNodeB LTE uplink scheduler process.

References

1. 3GPP TS 36.101; User Equipment (UE) radio transmission and reception (Release 8).
2. 3GPP TS 36.211; Physical Channels and Modulation (Release 8).