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moviOS: a Real-Time Multiprocessor Operating System for Multimedia Applications

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Abstract

Operating systems have become a key factor for the success of today's mobile devices. With the rising capabilities of the underlying hardware, the complexity of managing these capabilities grows similarly. In the last years, multi-core hardware has been a major challenge for operating systems and it starts to shape also the real-time subdomain. These challenges, along with one of the best solution for managing complex resource allocations – called hierarchical scheduling – are briefly presented in the Introduction part of this paper. Related work done in the domains of real-time operating systems, multi-core resource allocation and hierarchical scheduling is presented from both the commercial/industrial and the research/academic points of view. The next section is introducing the heterogeneous multi-core platform that will be used for running the real-time operating system proposed in this paper, which is described in detail in section IV. The way the operating system is managing the hierarchical structure of applications and task, the used scheduling policy together with the approach of memory management are described in detail. An important subject of this paper, found in section V, represents the API expression of parallelism and synchronization in the source code of applications that comprises multiple tasks. These API details are accompanied by possible usage scenarios, along with an implemented experimental example, which demonstrates the capabilities of the presented operating system. Finally the main conclusions are briefly recalled and the future research directions are detailed. These future research proposals represent a result of the challenges and experience gained, during this research.

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