Research of suitable cash control method for realtime processing

Kentarou Murooka

School of Information Science,
Japan Advanced Institute of Science and Technology

February 14, 2007

Keywords: real time, cache, context, reload,task ID.

1 Introduction

The processor is built into most equipment such as home appliance, an information terminals, and industrial equipment in a modern information society. It is built in the machine and the equipment like this and the computer system that controls is called an embedded system. Especially high reliability and real time are requested in the embedded system.

As for these systems, because the engine control and the error margin movement of plant become fatal situations to control the equipment etc.,very high reliability is requested high trust.

A real-time life is to operate filling the time that the system provided requirement. This real time hangs as a theme in this research, the cash system of the processor is paid to attention especially, and it aims at the improvement of the realtime processing ability of the processor for building in.

2 Estimate of footprint and cash parameter

The switch of the context of the task happens frequently in the real time system. The mistake in the state of the transition of the reload it that should the reload of the line of a new task every time the context happens, and causes at that time greatly influences real time.

The realtime processing ability of the processor is improved by paying attention to the mistake in this state of the transition of the reload it in this research and decreasing the mistake. Then, one cash is first analyzed and the behavior of the cash system is analyzed by regarding the competing model of two tasks, and seeing the appearance into which the two tasks alternately change. Then, it proceeds to a discussion by using the concept of footprint. Footprints are sets of lines for an arbitrary task to touch the cash of the association level infinity.

3 System that targets it

The trace of the address of each task was scheduled at random in this research and an artificial real time system was simulated. The trace of the address of each task passed the profile that was able to decide the feature of each task to the address generator as a parameter, and generated the trace of each task.

4 Substitution control method that uses task ID

It happens there is no line not accessed in usual LRU when the line of a task necessary because it is automatically bundled off after LRU stack is necessary

Then, the line that introduces task ID in this research and substitutes it is done based on the level of priority, and the line of priority high task is left in cash. The Miss frequency in the state of the transition of the reload on the real time system in which the switch of the task frequently happens because it does so it can be decreased. That is, because it comes to be able to be able to take it out promptly when it wants the line where it wants it, the improvement of the realtime processing ability of the processor can be expected.

There is something based on the priority of the both parties at the end when basing on dynamic priority to the running frequency of the task when having based on static priority to the resource of cash as a substitution control method proposes by this research. Moreover, the priority kind was assumed to be only two kinds (High and Low) in this research.

The system designer is deciding static priority to the resource of cash beforehand. It controls so that it may divide into priority High and the line of the given task may on cache it.

To decide High and Low of the running frequency of each task at a decided cycle and to on cache the task of High, dynamic priority to the running frequency of the task is controlled.

For the combination by four kinds of to divide, to give the level of priority from two kinds (priority High and Low) when basing on the priority of both parties, and to substitute the line of the lowest task, it controls.

5 Experiment result and consideration

In the substitution control based on priority, it was shown that the cash mistake in the task with high priority suppressed it to an initial mistake lowest by the simulation result. It was an association level that the task of installing on an initial mistake appeared more than the number of tasks with high priority. It was proven to be able to on cache the line of the task with high priority by doing the substitution control by using new information of task ID giving it to the tag of the estimate and the cash of a in a word appropriate cash parameter.

6 Conclusion

It was proven to be able to achieve the cash system that effectively worked to the context switch of the task happening frequently by the real time system very by the simulation with the simulator that mounted the substitution control mechanism and the cash parameter proposed by this research.