Development of Software Correlator for Geodetic VLBI using Multi-core CPU

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Recently, as the computer performance improves, software correlator for geodetic VLBI system is developed. The K5 software correlator is a software correlation processing system that the NICT develops. Yokohama National University (YNU) has improved the processing speed of this software using dynamic bitset technology. Moreover, we have implemented parallel processing with PC Beowulf cluster using MPI, and improved the processing speed, too.

But MPI is a parallel processing that memory destributed, there is a possibility of the processing speed decrease by the data transfer. Additionally, CPU is shifting toward multi-core type in a recent trend. Therefore, besides use of the PC cluster, the parallel processing with one PC using multi-core CPU has become possible for VLBI correlation. Thus to avoid the processing speed decrease for the data transfer, we have examined the parallel correlation processing system that shared memory type.

We are examining the following two for the parallel processing method that shared memory.
(1) Multi thread programming using OpenMP
(2) Multi thread programming using POSIX thread
In the programming with OpenMP, we insert the compiler directive into the ordinary programming code. Compared to POSIX thread, this coding is easy. But efficiency of parallelization depends on the compiler, the performance improvement by the tuning cannot be expected too much.
On the contrary, coding becomes complex in the programming with POSIX thread. But a precise tuning is effective.

We will make a status report for the parallel correlation VLBI processing system by examining these programming methods.