SORTING REGISTERS

Specialized processor contains N (e.g., 1 billion or 1 trillion) specialized sorting registers to sort any data set (smaller than the number of sorting registers) in linear time. The keys may be (e.g.) 64 bit integers, floating points, or short strings.

Each sorting register (SR) has two fields, key and location. Sorting is done based on the key value, and original data item is found with the location field.

PARALLEL BUBBLE SORTING

Sorting is done alternating even and odd steps. In even step, each key in even numbered SR is compared to the key in the following SK, and the register contents are interchanged if needed. Pairwise comparisons and possible interchanges are independent of each other, and they can be performed massively in parallel. In odd step the same is done for all odd numbered SRs. The same compare circuits can be used both in even and odd steps.

Sorting is completed in at most n steps (Habermann 1972). Sorting may also be speeded up with many PBSs. They could be controlled by the same device driver which first spreads the work by giving each PBS their own block to sort, and then merges the output arrays from multiple PBSs before returning the control to calling application. Another alternative would be to implement them as separate devices under higher level PBS device controller, just like one device controller may control multiple hard disks.

SYSTEMS WITH MANY PBSs

If the key sets are very large, sorting can be speeded up with many PBSs. They could be controlled by the same device driver which first spreads the work by giving each PBS their own block to sort, and then merges the output arrays from multiple PBSs before returning the control to calling application. Another alternative would be to implement them as separate devices under higher level PBS device controller, just like one device controller may control multiple hard disks.

REFERENCES