# Winter School 2010

**The Chinese University of Hong Kong**

*January 24-30, 2010*

*Room 1009, 10/F., William M.W. Mong Engineering Bldg., CUHK*

## Online Algorithms for Sorting Buffers

*By*

**Prof. Ho Leung Chan**

*Assistant Professor, Department of Computer Science*

*The University of Hong Kong*

**Abstract:**

We consider the online sorting buffer problem: There is a sequence of n items, each associated with a color from a finite set U. The order of the items are fixed. We are given a buffer of size k, which initially contains the first k items in the sequence. In each step, the algorithm can choose a color, say c, for the buffer. The buffer will then serve all items inside it with color c. Served items will be removed from the buffer, leaving some spaces and the next items in sequence will be fed into the buffer. If some newly fed items have color c, they will be served continuously and the next items will be fed again. The step ends when all items inside the buffer are not of color c. The algorithm then chooses another color c' and the next step begins. The objective is to minimize the number of steps taken to serve all items in the sequence. In the online version, only the colors of the items inside the buffer are known and we have no information about the later part of the sequence. An online algorithm is said to be c-competitive if for any sequence, its number of steps taken is at most c times that of the optimal.

The online sorting buffer problem models a number of important applications, e.g., scheduling for hard disks, design of graph cards and manufacturing in car plants. We will show that some natural algorithms like FCFS and largest-Color-First performs badly and are \Omega( sqrt{k} ) and \Omega( k )-competitive, respectively. We will then give an algorithm that is O( log2 k )-competititve. It is open whether some algorithm can be o( log2 k )-competitive.

**Biography:**

Ho-Leung Chan studied Computer Engineering in HKU and graduated with a bachelor degree in 2002. Then he continued his PhD study in Computer Science there and graduated in 2007. He worked as a postdoc in University of Pittsburgh and Max-Planck-Institut fur Informatik from 2007 to 2009, and returned to HKU as an assistant professor afterwards. His research is mainly on the design and analysis of algorithms, especially on the area of online scheduling.