

# Combinatorial testing in Japan

## - History, applications, techniques and tools -

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Combinatorial testing (CT) began to spread in the United States in the mid-1990s. Many papers on CT have referred to Mandl's paper (\*1), which was published in 1985, as the first paper on this technique. However, in fact, the application of Design of Experiments (DoE) to software testing had been started in 1983 by Fujitsu Limited in Japan. CT was devised independently in the US and Japan in the early 1980s.

Since the early 1970s, in the inspection department of Fujitsu's mainframe computer software division, test cases were generated from 'Test factor analysis tables' which were filled out factors and their states (e.g. parameters and their values) of software. In 1983, a method was devised to apply DoE to determine the combination of these factors and states. A tool for this method was also developed. Thus, this method became the standard technology for test case design in Fujitsu. In the late 1980s, though a few case studies of the application of DoE were reported from NEC or IBM Japan, this method was not widely spread in Japan after a while.

On the other hand, after publishing AT&T's OATS paper (\*2) in 1992, techniques of CT came to be developed by many researchers and practitioners in the US. In fact, Fujitsu had introduced the above method to AT&T in 1989, and this method was referred in the development of OATS. The courses of development of CT in Japan and the US seem to indicate that there was a difference in the ability of the software testing communities in both countries.

Currently, CT has been widely spread in Japan since Fuji Xerox's HAYST method which utilizes orthogonal arrays was published in 2003 and IWATSU's PictMaster which provides Japanese GUI for Microsoft PICT was developed and published in 2007. Application of CT is progressing in many companies, and many testers consider that CT is one of the must-have testing techniques.

This presentation gives an overview of the status of combinatorial testing in Japan, including its history, applications, techniques and tools.

(\*1) R. Mandl, "Orthogonal Latin squares: An application of experiment design to compiler testing," CACM, vol.28, no.10, pp.1054-1058, Oct. 1985

(\*2) R. Brownlie, J. Prowse and M. S. Phadke, "Robust testing of AT&T PMX/StarMAIL using OATS," AT&T Technical Journal, vol.71, no.3, pp.41-47, 1992

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