Nattapong Moonpluck 2007: Covariance Matrix Interpolation for Laplace's Equation with Correlated Boundary Value. Master of Engineering (Industrial Engineering), Major Field: Industrial Engineering, Department of Industrial Engineering.
Thesis Advisor: Associate Professor Peerayuth Charnsethikul, Ph.D. 158 pages.

In this work, a numerical method for interpolating the covariance matrix of solution for Laplace's equation under random correlated boundary conditions is proposed, illustrated and implemented. Computationally, the proposed approximation method is programmed in Matlab and tested on two and three dimensional problems. For larger scale problems, a domain decomposition approach is suggested. In the result, the numerical model determined approximate solution of covariance matrix effectively. The maximun absolute percent error with respect to an exact solution generated by the direct Fourier method is 0.162017. Besides, a single PC can handle the numerical model only on small domain sizes especially on three-dimensional problem, the maximum number of variables in the related linear equation system is 10^6 variables. Furthermore, a domain decomposition method applied to the model results in an increasing time consuming of a single computing facility. The time consuming increased, whereas the iteration used in the calculation of the model decreased.

Nattapong Moonpluck — Student's signature

P. Charnsethikul — Thesis Advisor's signature

24 / 10 / 2007