

# Gaussian Process Modeling and Optimization of Profile Response Experiments

Hussam Alshraideh

Department of Industrial Engineering

Jordan University of Science and Technology, Irbid, 22110, Jordan

Enrique del Castillo

Department of Industrial and Manufacturing Engineering

The Pennsylvania State University, University Park, PA 16802, USA

December 14, 2012

## Abstract

Experiments where the response of interest is a curve or “profile” arise in a variety of applications in engineering practice. In a recent paper (Journal of Quality Technology, 44, 2, pp. 117-135, 2012) a mixed effects, bayesian approach was proposed for the bayesian optimization of profile response systems, where a particular shape of the profile response defines desired properties of the product or process. This paper proposes an alternative spatio-temporal Gaussian Random Function process model for such profile response systems, which is more flexible with respect to the types of desired profiles shapes that can be modeled, and allows to model profile-to-profile correlation, if this exists. The method is illustrated with real examples taken from the literature, and practical aspects related to model building and diagnostics are discussed.

Keywords: Functional Responses, Gaussian Random Function Processes, Separability, Robust Parameter Design.