Discrete Mathematics Seminar

Time: Friday, 31 January 2014, 1:00 – 2:00 PM
Location: 238 Derrick Hall
Title: Second Order $(\Phi, \rho, \eta, \theta)-$Invexities and Parameter-Free $\epsilon-$Efficiency Conditions for Multiobjective Discrete Minmax Fractional Programming Problems
Speaker: Dr. Ram Verma, Mathematics Department

Abstract:

First a general framework for a class of second order $(\Phi, \rho, \eta, \theta)-$invexities is introduced, and then some parameter-free sufficient efficiency conditions leading to $\epsilon-$efficient solutions to multiobjective discrete minmax fractional programming problems of the form (P) are established. The obtained results generalize and unify a wider range of investigations in the literature on applications to multiobjective fractional programming, while these findings can be utilized as a resource in order to measure the efficiency or productivity of a system. We consider based on the generalized $(\Phi, \rho, \eta, \theta)-$invexities of functions, the following multiobjective fractional programming problem:

(P)

$$Minimize\Big(\frac{f_1(x)}{g_1(x)}, \frac{f_2(x)}{g_2(x)}, \cdots, \frac{f_p(x)}{g_p(x)}\Big)$$

subject to $x \in Q = \{x \in X : H_j(x) \leq 0, j \in \{1, 2, \cdots, m\}\}$,
where X is an open convex subset of $\Re^n$ (n-dimensional Euclidean space), f_i and g_i for $i \in \{1, \cdots, p\}$ and H_j for $j \in \{1, \cdots, m\}$ are real-valued functions defined on X such that $f_i(x) \geq 0$, $g_i(x) > 0$ for $i \in \{1, \cdots, p\}$ and for all $x \in Q$. Here Q denotes the feasible set of (P).

The obtained results can also be applied to discrete minmax multiobjective fractional integral programming (optimal control) problems of the form (P^*).

Consider the fractional programming for variational problem of the following form:

(P*)

$$\min_x \left\{ \sum_{1 \leq i \leq p} \max \frac{\int_a^b f^i(t, x, \dot{x})dt}{\int_a^b g^i(t, x, \dot{x})dt} \right\}$$

$$\text{subject to } x \in PS(T, R^n), x(a) = \alpha, x(b) = \beta,$$

$$\int_a^b h^j(t, x, \dot{x})dt \leq 0, j \in \mathrm{m} \equiv \{1, 2, \ldots, m\},$$

where functions $f^i, g^i, i \in \mathrm{p}$ and $h^j, j \in \mathrm{m}$ are continuous in t and have continuous partial

derivatives with respect to x and $\dot{x}$; $T = [a, b]$ denotes the time space, and $PS(T, R^n)$ stands for the state space of all piecewise smooth functions $x : T \to R^n$ with norm defined by $\|x\| = \|x\|_\infty + \|Dx\|_\infty$ and D is the differential operator on $PS(T, R^n)$ defined by

$$y = Dx \text{ if and only if } x(t) = x(a) + \int_a^b y(s)ds.$$