ASSIGNMENT 6

Due November 20, 2003

Problem 7

For each vector in the current population, $\mathbf{x}^{(i)}$, there are a fair number of strategies for generating trial vectors, $\mathbf{u}^{(i)}$. We consider here the following 5 strategies:

$$\mathbf{u}^{(i)} = \mathbf{x}^{(\text{best})} + f(\mathbf{x}^{(r1)} - \mathbf{x}^{(r2)}), \tag{1}$$

$$\mathbf{u}^{(i)} = \mathbf{x}^{(r_1)} + f(\mathbf{x}^{(r2)} - \mathbf{x}^{(r3)}), \tag{2}$$

$$\mathbf{u}^{(i)} = \mathbf{x}^{(i)} + \lambda(\mathbf{x}^{(\text{best})} - \mathbf{x}^{(i)}) + f(\mathbf{x}^{(r1)} - \mathbf{x}^{(r2)}), \tag{3}$$

$$\mathbf{u}^{(i)} = \mathbf{x}^{(\text{best})} + f(\mathbf{x}^{(r1)} - \mathbf{x}^{(r2)} + \mathbf{x}^{(r3)} - \mathbf{x}^{(r4)}), \tag{4}$$

$$\mathbf{u}^{(i)} = \mathbf{x}^{(r_1)} + f(\mathbf{x}^{(r2)} - \mathbf{x}^{(r3)} + \mathbf{x}^{(r4)} - \mathbf{x}^{(r5)}), \tag{5}$$

Here $\mathbf{x}^{(r1)}$, $\mathbf{x}^{(r2)}$, $\mathbf{x}^{(r3)}$, $\mathbf{x}^{(r4)}$, and $\mathbf{x}^{(r5)}$ are randomly chosen but mutually distinct vectors in the current population. The current best vector is $\mathbf{x}^{(\text{best})}$. The amplitudes of difference vectors are controlled by f. For strategy 3, λ controls the basic vector, given by the original vector $\mathbf{x}^{(i)}$ for $\lambda = 0$ and by the best vector $\mathbf{x}^{(\text{best})}$ for $\lambda = 1$. For simplicity here, we will set $f = 1$ for strategy 3, but adjust λ to achieve good convergence.

Strategy 2 was used in the Differential Evolution program that I put on the course website. For this homework you will have to replace that by one of the other strategies. Vary the parameters there to achieve the best convergence (the fewest number of function evaluations).

Use strategy 1 if your last name starts with a B, E or C. Use strategy 3 if your last name starts with a K or L. Use strategy 4 if your last name starts with a J or S. Use strategy 5 if your last name starts with a M, P, R or T.