

$$\left\{ \begin{array}{l} \max \sqrt{x_1} + \sqrt{x_2} + \sqrt{x_3} \\ \text{subject to:} \\ x_1^2 + 2x_2^2 + 3x_3^2 \leq 1 \\ x_1, x_2, x_3 \geq 0 \end{array} \right. \quad (1)$$

Let us code each solution by a chromosome  $V = (x_1, x_2, x_3)$ . Then the subfunction of checking the feasibility of  $V$  may be written as follows,

If  $(x_1 < 0 || x_2 < 0 || x_3 < 0)$  return 0;  
 If  $(x_1^2 + 2x_2^2 + 3x_3^2 > 1)$  return 0;  
 Return 1;

where 0 represents *infeasible*, 1 *feasible*. It is easy to know that the feasible set is contained in the following hypercube

$$\{(x_1, x_2, x_3) \mid 0 \leq x_1 \leq 1, 0 \leq x_2 \leq 1, 0 \leq x_3 \leq 1\}$$

which is simple for the computer because we can easily sample points from it. For example, we can take

$$x_1 = \mathcal{U}(0, 1), \quad x_2 = \mathcal{U}(0, 1), \quad x_3 = \mathcal{U}(0, 1) \quad (2)$$

where the function  $\mathcal{U}(a, b)$  generates uniformly distributed variables on the interval  $[a, b]$ . If this chromosome is infeasible, then we reject it and regenerate one by (2). If the generated chromosome is feasible, then we accept it as one in the population. After finite times, we can obtain 30 feasible chromosomes.

A run of GA with 400 generations shows that the optimal solution is

$$\mathbf{x}^* = (0.636, 0.395, 0.307)$$

whose objective value is 1.980.