Submission
26 April

Genetic Algorithm Assignment

IRM2016003 Aditya Iyael

Q.1

Schemata	Matching Strings	Order(o)	Defining length(δ)
H_1 = 1xxxxxxx	A_1 = 11101111	1	0
H_2 = 0xxxxxxx	A_2 = 00010100 ; A_3 = 01000011	1	0
H_3 = xxxxxx11	A_1 = 11101111 ; A_3 = 01000011	2	1
H_4 = xxx0x01x	A_3 = 01000011	3	3
H_5 = 1xxxxx1x	A_1 = 11101111	2	6
H_6 = 1xxxxx1x	A_1 = 11101111	2	6

Schemata	Probability of Survival Mutation with $S_m(H)$	Probability of Survival with Crossover $S_c(H)$
H_1	$(0.999)^1 = 0.999$	1
H_2	$(0.999)^1 = 0.999$	1
H_3	$(0.999)^2 = 0.998$	0.8786
H_4	$(0.999)^3 = 0.997$	0.6357
H_5	$(0.999)^2 = 0.998$	0.2714
H_6	$(0.999)^2 = 0.998$	0.2714.

Formula: $S_m(H) = (1 - P_m)^{o(H)}$

$S_c(H) = 1 - P_c \frac{\delta(H)}{(l-1)}$

$P_m = 0.001$

$P_c = 0.85$

Q2.

String	Fitness
10001	20
11100	10
00011	5
01110	15

Pmutation = 0.01
Pcrossover = 0.7

$H_1 = 1xxxx$

$H_2 = 0xx1x$

Since

$$E[m_H(kH)] \geq m_H(k) \frac{f_H(k)}{f} \left[1 - P_c \frac{\delta(H)}{(l-1)}\right] (1-P_m)^{o(H)}$$

For H_1

$m_{H_1}(0) = 2$

$f_H(0) = 30/2 = 15$

$f = 50/4 = 12.5$

$P_c = 0.7$, $P_m = 0.01$

$o(H) = 1$, $(l-1) = 4$.

$\delta(H) = 0$

Expected value is

$$= \frac{2 \times 15}{12.5} \times \left(1 - \frac{0.7 \times 0}{4}\right) (1-0.01)^{\wedge} 1$$

$$= 2 \times \frac{30}{25} \times 1 \times 0.99$$

Hence $E[m_H(kH)] \geq 2.376$

Expected number may be 3 in next generation

For H_2

$m_{H_2}(0) = 2$

$f_{H_2}(0) = 20/2 = 10$

$f = 25/2 = 12.5$

$\delta(H_2) = 3$, $l-1 = 4$, $o(H_2) = 2$

Expected value is

$$= 2 \times \frac{10}{12.5} \left(1 - \frac{(0.7) \times (3)}{4}\right) (1-0.01)$$

$\Rightarrow E[m_H(kH)] \geq 0.7448$

Expected number may be 1 in next generation.