CHAPTER 4

ANALYSIS AND DESIGN

4.1   Analysis

The program is build on Java Programming where in the program the input data stored in the linked list that contain the room name, length and width. And for the population that generated by program is stored in the array list.

The main program is do in several step below

1.   Gen Encoding

Genetic coding is used to identify chromosomes that affect the length of Genes. So every input of room will be the chromosome that arrange the Gen. If the individual consists of 6 rooms then the number of chromosomes formed is 6 chromosomes each individual.

2.   Initial the Population

Population formation is performed by forming a large number of populations that comprise the same number of chromosomes but each of its chromosomes varies. This population will be formed as many as 10 individuals each population.

3.   Evaluation of Match Functions

Evaluation Functionality Match is used to find the value of each individual's fitness. And each individual will have their individual fitness value.

4.   Selection

The selection process is done with rank-based fitness. In this selection of individuals whose fitness value is higher possibility to use. Selection will take 4 individuals with the highest fitness value.

5. Crossover

Crossover process will be done with 4 selected individuals. Crossover process will be performed by selecting the first individual blocks randomly and exchanged with the second individual with the same block (Sihombing, 2014).

6.   Mutation

The mutation process used is swap mutation (Heidari & Movaghar, 2011). Four parent chromosomes and four chromosomes of children generated from the crossing process will be selected again to find the best fitness value, and will be taken 4 individuals with the greatest fitness value. The process of mutation is done by first searching for the offending chromosomal blocks and then be exchanged the individual chromosomes. Then the individual will be saved.

7.   Checking The Stop Factor

Checking The Stop Factor conducted to evaluate whether the resulting individual is suitable (meet the criteria). The criteria used are Individuals having the value of fines == 100%. If the value of fitness is less than that it will be done Genetic cycle algorithm back. And the Maximal cycle is 100 cycles when 100 cycles do not get fitness = 100% then the individual with the greatest fitness score will be the end result.

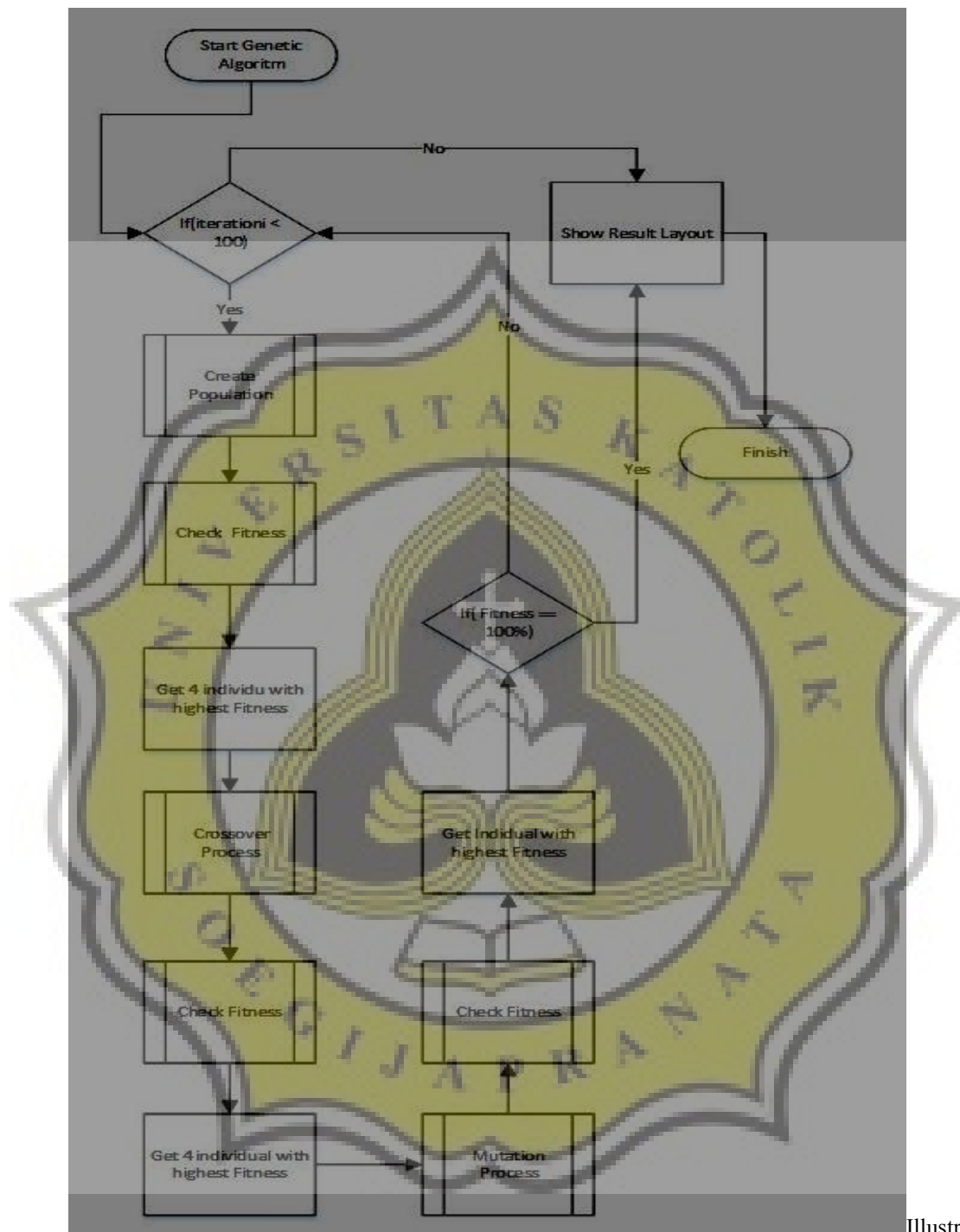Below is flowchart that represented the full program:

Illustration 4.1: Input Room Data Flowchart

Input begins by entering the length and width of the land then program will count the wide of the land. Input will be dynamically entered as desired. The user can not enter the data again if the data area is more than the land area. Then data will save on linked list.

Illustration 4.2: Genetic Algoritm Process Flowchart

Genetic algorithm will do in 100 times iteration and there some sub process. The process with create population, check fitness, select best 4 individual, crossover, check fitness, select best 4 individual, mutation, check fitness, select the best individual in the process,
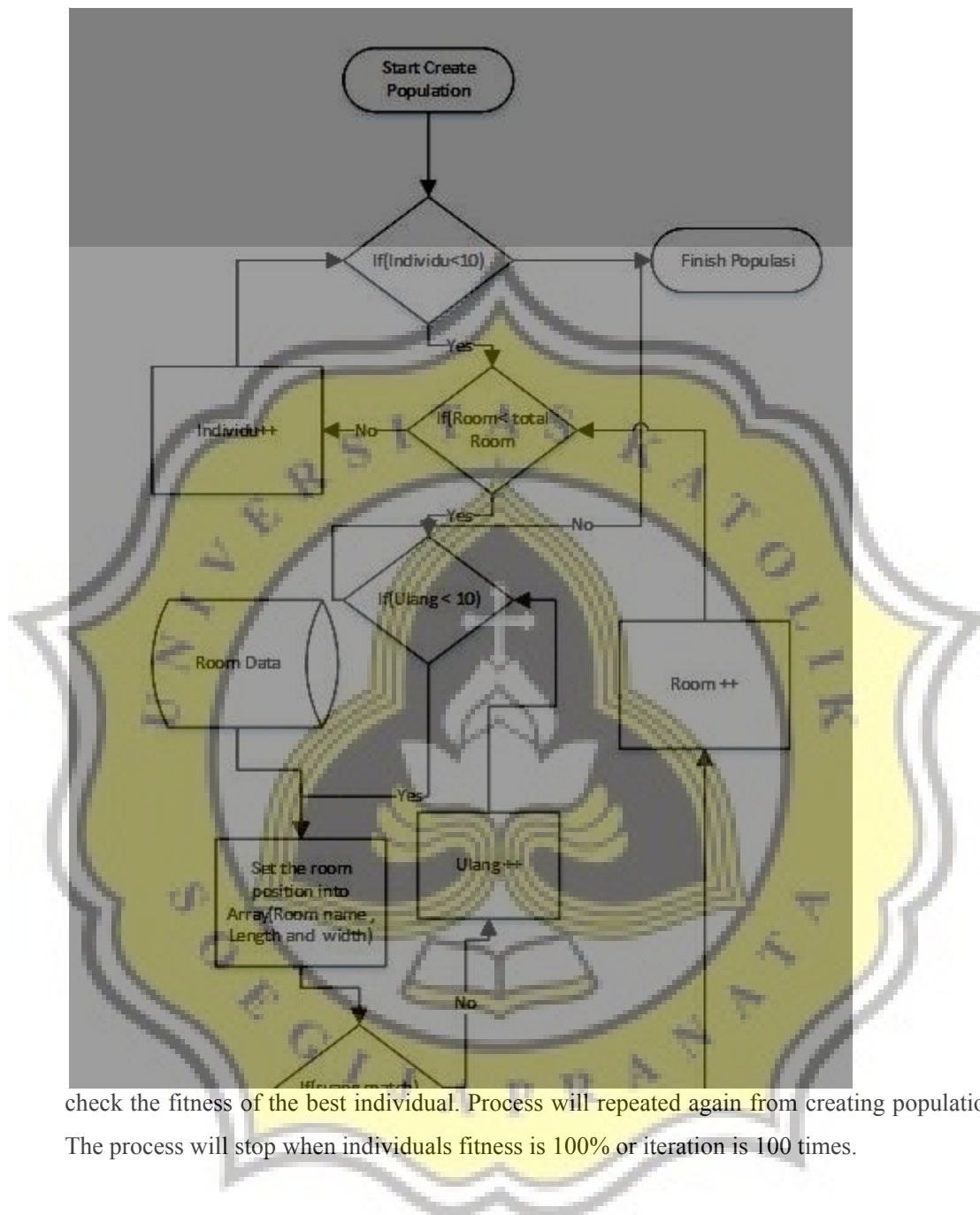
check the fitness of the best individual. Process will repeated again from creating population. The process will stop when individuals fitness is 100% or iteration is 100 times.

This population will be formed as many as 10 individuals each population. The Individuals gen (room) room will be placed randomly process will do 10 times if the room is not found. If the room is found then the data will be stored in array.
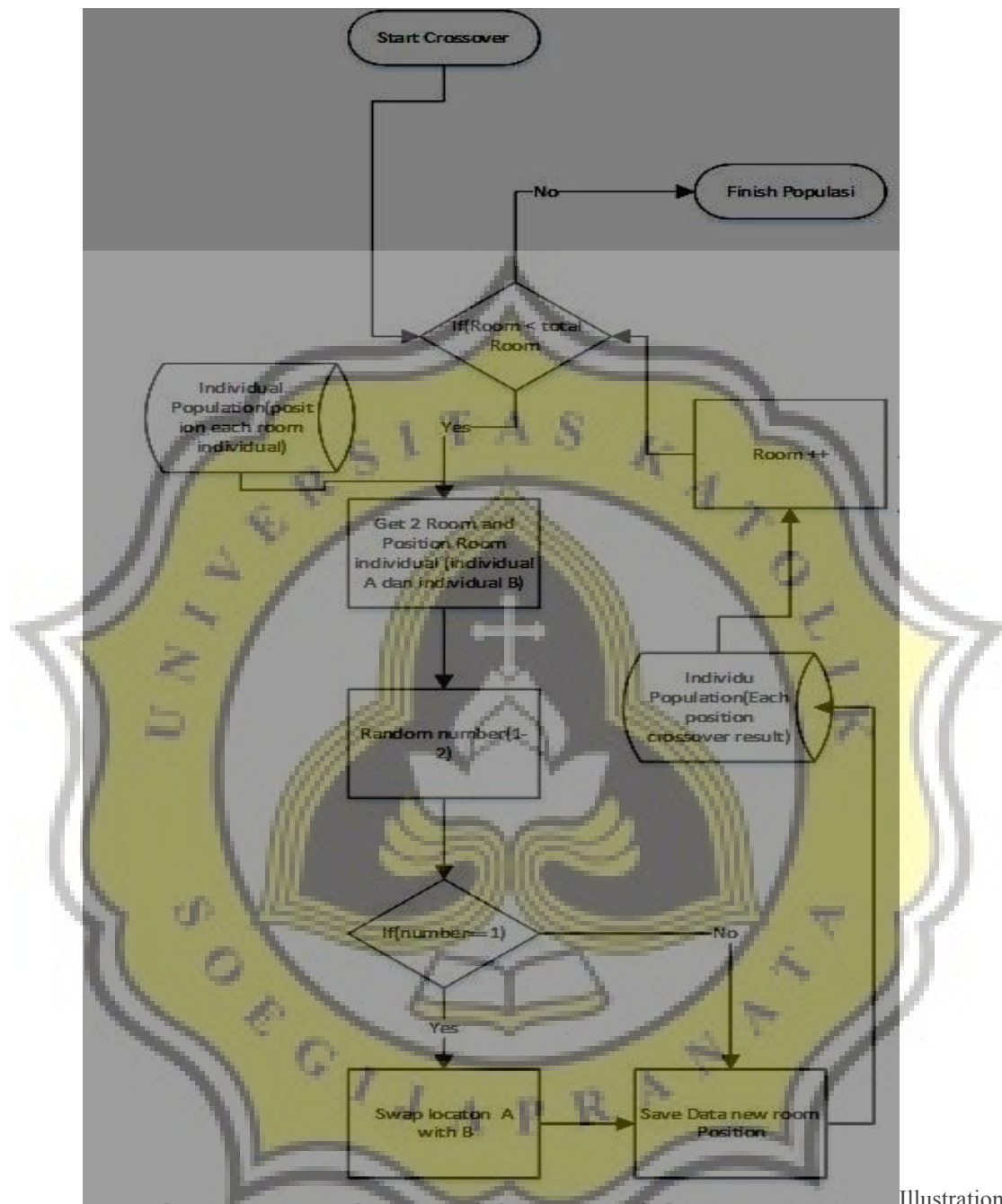
Illustration 4.4: Crossover Flowchart

The crossover done by swapping the room each individual. Here the program will randomize the numbers between 1 or 0. When 1 then the room will be in exchange while 0 then the room will remain. The process will be done on the whole room.
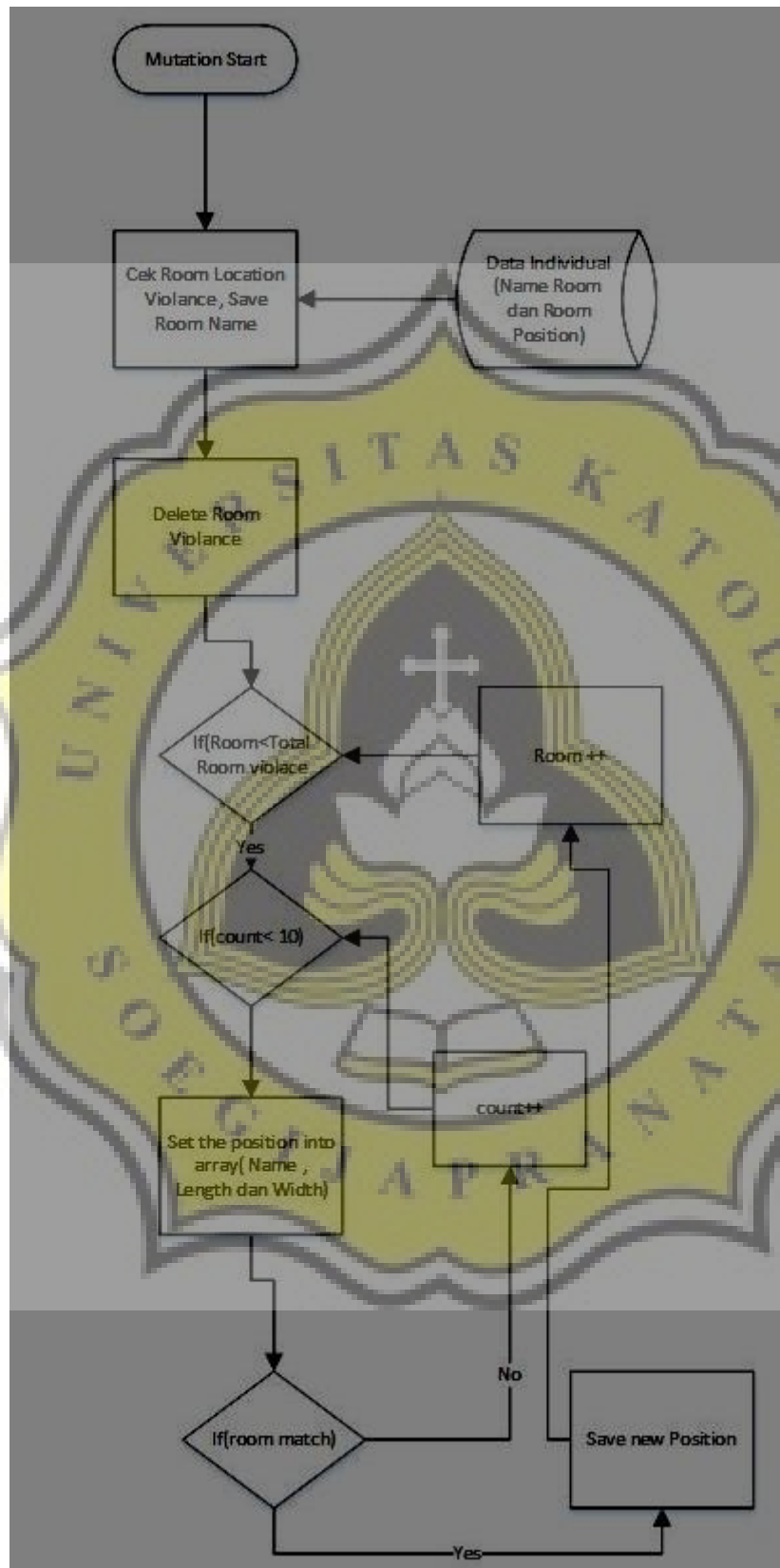
Illustration 4.5:
Mutation Flowchart

The mutation done by checking the fitness of each room. When the room is violate the room will mutated. The location of room will set random until the process be done on the
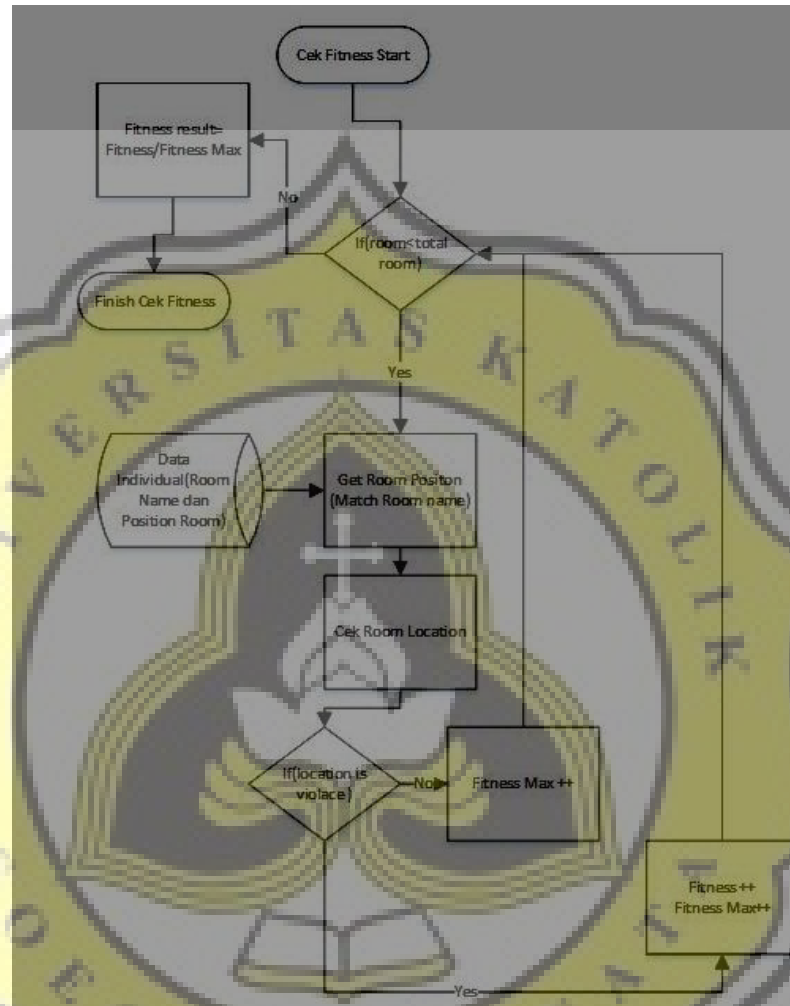

Illustration 4.6: Cek Fitness Flowchart

whole room.

The checking fitness done by checking the fitness of each room. When the room is violate the number of violations will increase. The fitness will be counted his check with the number of violations that occurred.

4.2 Design

To find how how the Genetic Algorithm to get optimal Floor plan the program is test using different data of amount room, condition, and stair positions.

On checking chromosome fitness quantity testing will use the following formula:

$$P(hi) = \sum_{j=0}^{J} Pj(hi)$$

where:

$hi = Represents\ the\ room$

$P(hi) = Represents\ the\ fitness\ of\ individual$

$Pj = Represents\ the\ pinalty\ for\ violation\ of\ Jt$

$The\ maximum\ fitness\ formulation\ reaches\ optimal\ where\ the\ fitness\ is\ 1\ (100\ percent)$

$$F = \frac{1}{P(hi)}, 1$$

where:

$F = Represents\ measure\ of\ the\ adequancy\ of\ chromosome$

$P(hi) = Represents\ the\ fitness\ of\ individual$