Genetic Algorithm to determine the best sequence of vehicles to be scheduled for smart traffic system.

In This Algorithm, like its name suggests we would be using the genetic structure to be able to solve computational problems in a very structured manner. This how the Biological genetics work in relation to the Algorithm.

- First, an individual contains Chromosomes.
- These Chromosomes contain Genes.
- Also, we have what is called the Fitness value or function.
- This Fitness value/function is based on the performance of the Chromosomes in everyone.
- Hence the fittest individuals are those individuals with the best or highest performing Chromosomes.
- These individuals are selected and then they undergo mutation, so that the Genes from these individuals are applied to the next generation so that the system can achieve better results going forward.

Applying this system to schedule our Smart Traffic System; we do it in the following way.

- The Cars here are the Genes, these cars make up a car sequence, in a particular lane.
- This Car sequence can relate directly to the Chromosomes.

- Furthermore, multiple Chromosomes are generated, for better assessment. Cars in the various sequences have different scheduling sequences, different arrival times, different length of queue and so on.
- In addition, the sequence (Chromosome) with the best fitness value is then selected based on its performance.
- Furthermore, the Chromosome with the best fitness is selected and then Mutation takes place so this sequence can be passed onto the next generation.
- The above process of selecting a fitness value, Mutation, and gene exchange will occur repeatedly until the Algorithm is terminated.

PSEUDOCODE FOR ALGORITHM.

START
  Generate the initial population
  Compute fitness
REPEAT
    Selection
    Crossover
    Mutation

Compute fitness
  UNTIL population has converged
STOP

PSEUDOCODE FOR V2I COMMUNICATION

- Initialize Motion,

- Request initial status of car
  Check speed ;

  If speed is < i (where I is the maximum speed the car should possess before entering traffic)

  Then the car should enter a queue,

  Else,

  Remain out of queue.

- Initialize Camera and sensors.
  Check Camera and sensor status ;
  If camera and sensors are ON,
  Enter Queue
  Else,
  Remain out of queue
  Camera checks surroundings,
  If Car is out of collision area,
  Enter Queue
  Else,
  Remain out of Queue
- Active sensors detect pavement markings.
  If sensor returns a signal
  Car joins queue
  Else,
  Remain out of Queue
- RSU requests information from arriving car via the VANET(Vehicle Adhoc Network)

  RSU sends message to cars

- The cars receives this message and keeps broadcasting this message in a loop till it arrives its destination.
- Car requests information from Main control unit about the traffic situation.
- When Car approaches RSUs it sends and receives messages from RSU through beacons, Requesting the shortest and best path to its destination.
- Communication between RSUs is mainly short range communication.