GA for TSP

(Genetic Algorithm for Travelling Salesmen Problem)

(video link - https://drive.google.com/open-id=1VU_2L3DB9Y1chTrwwtWivjGQBDn_BuXb)

Idea-

This project aims at solving the travelling salesmen problem for a set of cities. The program uses genetic algorithm to solve the problem. The program also provides a grapical representation of the solution to the problem with the help of pygame interface helping the user to easily visualise the route and its process.

Implementation Details-

The program contains three files main, front, back.

1.Main-

The main file serves as the driver of the program which initialises both the front end and back end files and iteratively call the the front end to display the details.

2.Back-

- The back end file deals with generating the set of cities and finding the solution of that set of cities via genetic algorithm.
- The algorithm creates a population of different solution of the problem and sorts them in increasing order of total distance (fitness).
- Cross over of the best chromosomes takes place with the help of Edge Recombination technique. The new population then undergoes mutation.
- The above prosess is repeated and the solution keeps on improving.

3.Front-

- The front end files deals with extracting the solution from the back end file and displaying the solution in a graphical format.

- The solution displayed corresponds to the best, average and worst solution of a particular generation.
- It also features buttons to move to the next generation of solution on either mouse click or automaticaly.
- The interface also features a slider based implemantation to select the number of cities.
- A custom graph creation mechanism is also available in which a graph of cities can be created by clicking at position of cities to obtain the solution for that set of cities.

Technology Used-

- PyGame- Used for displaying the solution of the travelling salesmen problem.
- Python3

Future Scope-

- The solution can be implemented on an actual map, where different cordinates can considerd as cities, with actual path distances to be followed between different destination.
- For implementing the problem in real life scenarios weight of traffic can be added to the solution and time can be used as a fitness criteria rather than distance.

Overall Experience-

This project provided an intresting oportunity to learn about various intresting topics. Through this project I was introduced to concept of NP hard problems and particularly about Travelling Salesmen problem. I also got the opportunity to learn some intresting algorithms such as Evolutionary Algorithm particularly Genetic Algorithm. I also learned about its implemantation in Optimization problems and also different crossover process which are efficient in different problems. I was also acquainted with different concepts of PyGame which I used for the displaying of solution in the project.

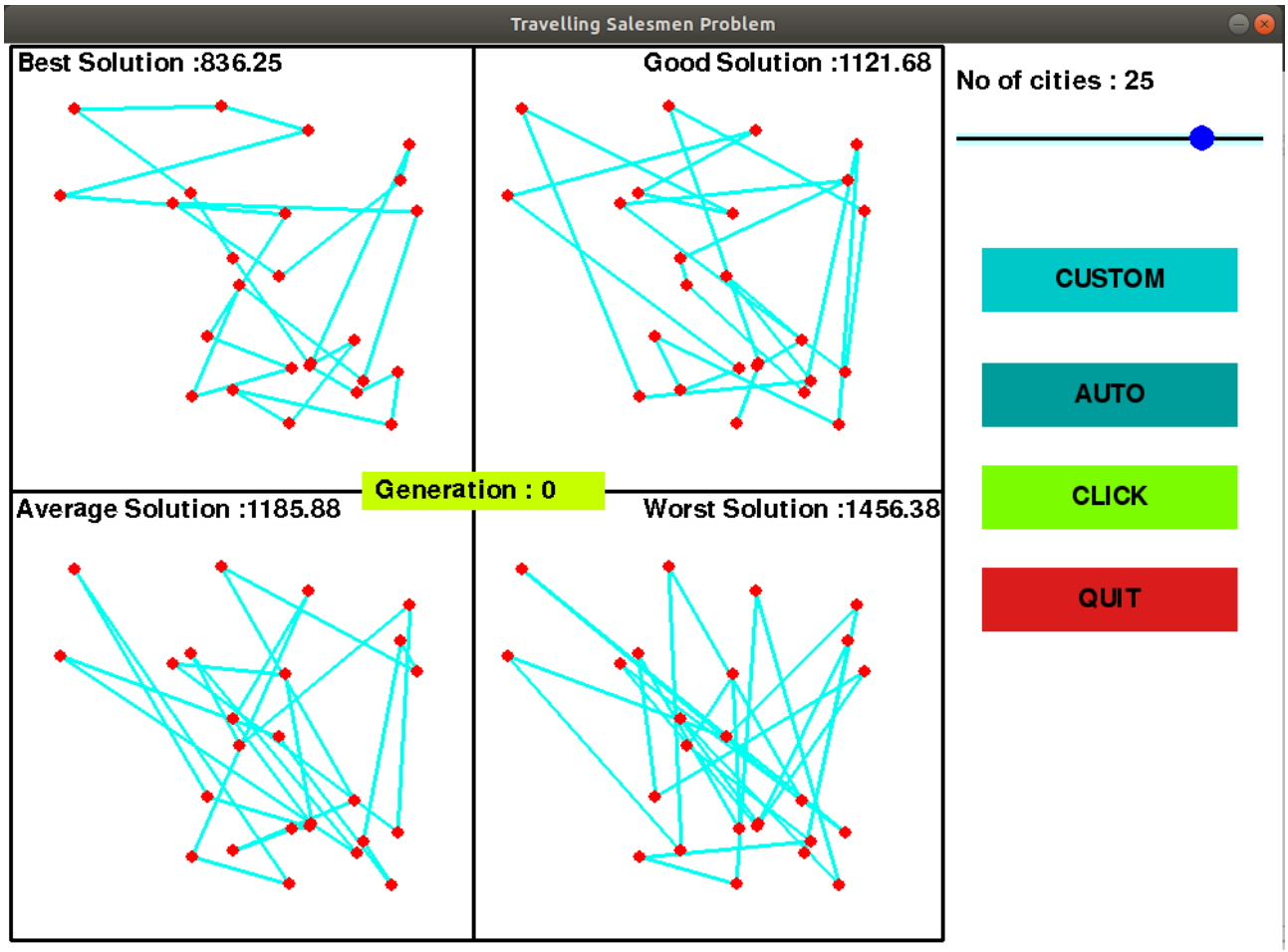
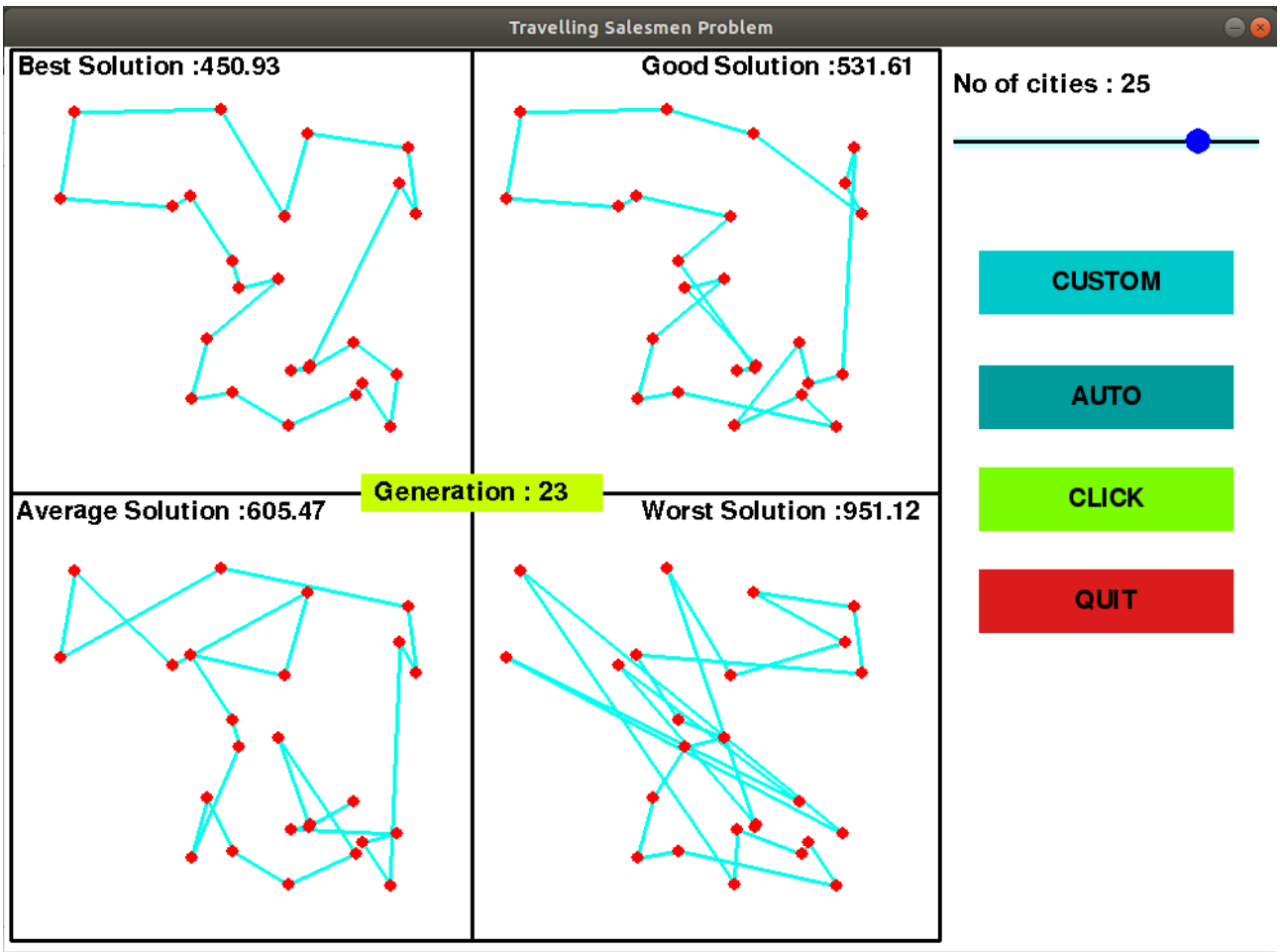


Fig 1- Solution at Generation 0 with 25 cities.

Fig 2- Solution at Generation 23 with 21 cities.



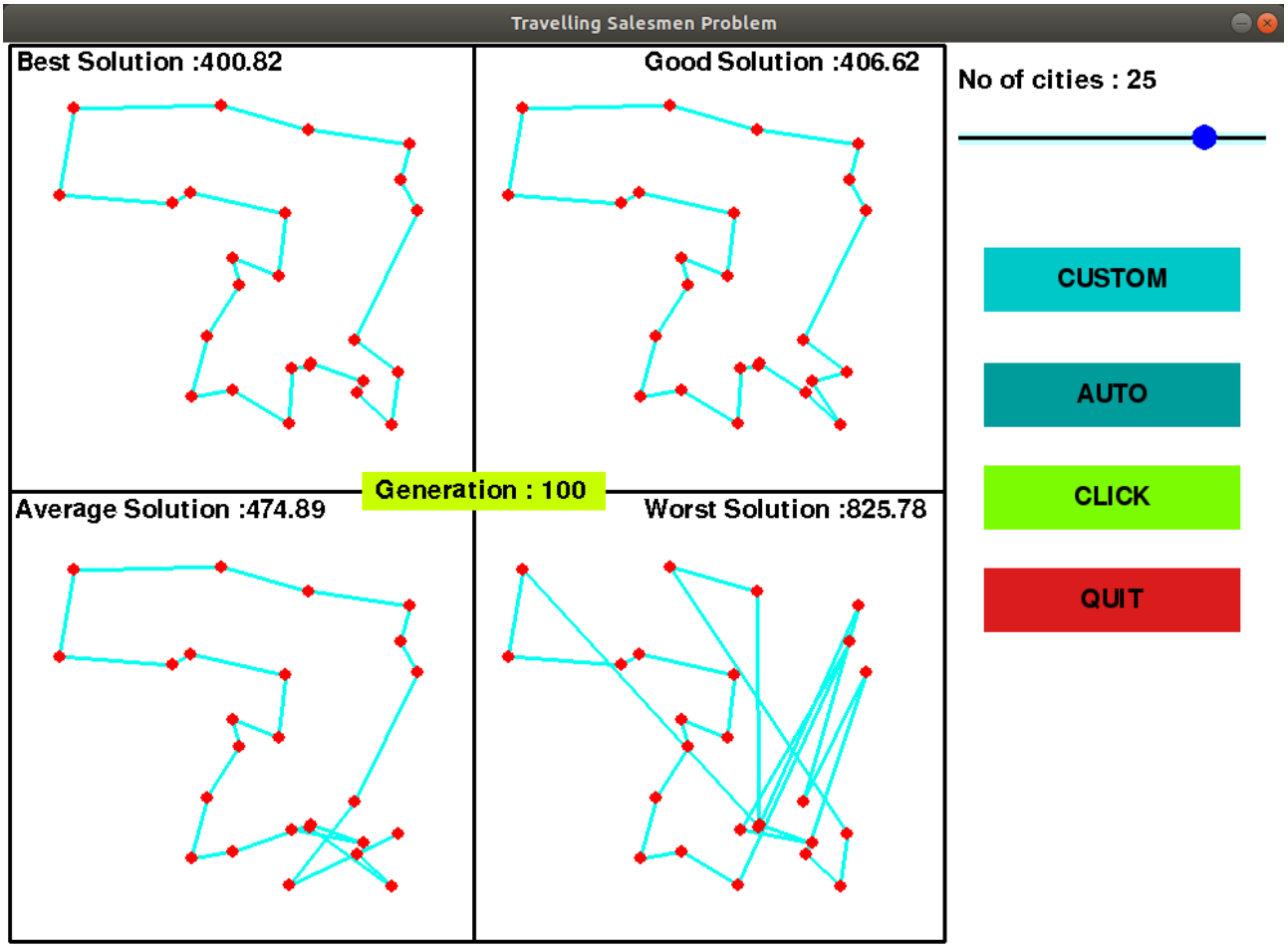


Fig 3- Solution at generation 100 for 21 cities.

Fig 4- Generating Custom Graph based on User Input.