Journal of Engineering Sciences

Vol 11, Issue 4, APRIL /2020
ISSN NO:0377-9254

FOODNET: TOWARDS AN OPTIMIZED FOOD DELIVERY NETWORK USING SPATIAL CROWD – SOURCING

Prudhvi Veeravelly[1], P. Pavani[2], D. Naga Sai Bhargav[3], Balusu Yamini Varsha[4], B. Rajendra Prasad Babu[5]

[1,2,3,4] *Department of Computer Science And Engineering, Gitam University, Hyderabad, India.*

[5] *Assistant Professor, Department of Computer Science And Engineering, GitamUniversity, Hyderabad, India.*

***Abstract*— we intended to build a Food Delivery Network (FoodNet in short) using spatial crowd sourcing (SC). It investigates the participation of urban taxis to support on demand take-out food delivery. Unlike existing SC-enabled service sharing systems (e.g., ridesharing), the delivery of food in FoodNet is more time- sensitive and the optimization problem is more complex regarding high-efficiency, huge-number of delivery needs. In particular, two on demand food delivery problems under different situations are studied in our work: (1) for O-OTOD, the food is *opportunistically* delivered by taxis when carrying passengers, and the optimization goal is to minimize the number of selected taxis to maintain a relatively high incentive to the participated drivers; (2) for D-OTOD, taxis *dedicatedly* deliver food without taking passengers, and the aim is to minimize the number of selected taxis (i.e., to raise the reward for each participant) and the total traveling distance to reduce the cost. A two-stage approach, including the construction algorithm and the Adaptive Large Neighborhood Search (ALNS) algorithm based on simulated annealing, is proposed to solve the problem. We have conducted extensive experiments based on the real-world datasets, including city-wide restaurant data, cell tower data, and the large-scale taxi trajectory data. Experimental results demonstrate that our proposed algorithms are more effective and efficient than baselines, fulfilling the food delivery service using a smaller number of taxis within the given time**

***Keywords*— Foodnet, Food Delivery Network, Crowd -Sourcing**

1. INTRODUCTION

In recent years, with the prevalence of the mobile Internet, Online Takeout Ordering & Delivery (OTOD) using smart phones has become an emerging service (e.g., KFC delivery). In the OTOD service, the user could receive the take-out food delivered by the restaurant staff after ordering online. In addition, some new platforms are developed as the new model of the OTOD service, such as Swiggy, UberEats, and Zomato. Different from the traditional delivery method that take-out food is delivered independently by staff of different restaurants, the merchants who register on these platforms could share the resources of professional delivery staff to reduce the cost. In general, the OTOD service is convenient and time saving especially for people who are taking rest at home or busy working. Though having rising development in the last few years, existing OTOD services still suffer some limitations. First, food delivery is usually completed by using bicycles or electric motorcars rather than cars in view of the delivery cost (e.g., ele.me), which decreases the delivery efficiency and results in the limited delivery range in geography because of the slow speed. Though the take-out food is delivered by cars in some platforms (e.g., UberEats), the delivery cost is quite high for the requesters if they order the food frequently. Second, most food orders appear in the same time period (e.g., lunch time or dinner time), which results in a large number of delivery requests within a short time duration. Therefore, it becomes difficult to deliver food on time during the rush hour due to the limited number of delivery staff. Merely expanding staff may solve the problem at some point, but the resources of professional delivery staff can be wasted as there are few food orders during most of the other moments of a day. Therefore, a new method is under investigated to tackle these challenges.

2. LITERATURE SURVEY

A. Technical Feasibility

Evaluating the technical feasibility is the trickiest part of a feasibility study. This is because, at this point in time, not too many detailed design of the system, making it difficult to access issues like performance, costs on (on account of the kind of technology to be deployed) etc. a number of issues have to be considered while doing a technical analysis.

1) Understand the different technologies involved in the proposed system: Before commencing the project, we have to be very clear about what are the technologies that are to be required for the development of the new system.

2) Find out whether the organization currently possesses the required technologies: Is the required technology available with the organization?, If so is the capacity sufficient? For instance – "Will the current printer be able to handle the new reports and forms required for the new system?"

B. Operational Feasibility

Proposed projects are beneficial only if they can be turned into information systems that will meet the organizations operating requirements. Simply stated, this test of feasibility asks if the system will work when it is developed and installed. Are there major barriers to Implementation? Here are questions that will help test the operational feasibility of a project:

- Is there sufficient support for the project from management from users? If the current system is well liked and used to the extent that persons will not be able to see reasons for change, there may be resistance.
- Are the current business methods acceptable to the user? If they are not, Users may welcome a change that will bring about a more operational and useful system.
- Have the users been involved in the planning and development of the project?
- Early involvement reduces the chances of resistance to the system and in
- General and increases the likelihood of a successful project.

Since the proposed system was to help reduce the hardships encountered. In the existing manual system, the new system was considered to be operational feasible.

C. Economic Feasibility

Economic feasibility attempts 2 weigh the costs of developing and implementing a new system, against the benefits that would accrue from having the new system in place. This feasibility study gives the top management the economic justification for the new system. A simple economic analysis which gives the actual comparison of costs and benefits are much more meaningful in this case. In addition, this proves to be a useful point of reference to compare actual costs as the project progresses. There could be various types of intangible benefits on account of automation. These could include increased customer satisfaction, improvement in product quality, and better decision making timeliness of information, expediting activities, improved accuracy of operations, better documentation and record keeping, faster retrieval of information, better employee morale.

3. EXISTING SYSTEM

Online Takeout Ordering & Delivery (OTOD) using smartphones has become an emerging service (e.g.,KFC delivery). In the OTOD service, the user could receive the take-out food delivered by the restaurant staff after order-ing online. In addition, some new platforms are developed as the new model of the OTOD service, such as Seamless1, UberEats2, and ele.me3. Different from the traditional delivery method that take-out food is delivered independently by staff of different restaurants, the merchants who register on these platforms could share the resources of professional delivery staff to reduce the cost. In general, the OTOD service is convenient and time-saving especially for people who are taking rest at home or busy working. Limitations of existing system is Food delivery is usually completed by using bicycles or electric motorcars rather than cars in view of the delivery cost (e.g.,ele.me), which decreases the delivery efficiency and results in the limited delivery range in geography because of the slow speed, Most food orders appear in the same time period

4. PROPOSED SYSTEM

To address the above challenges, we propose FooDNet, which is a novel Food Delivery Network that fulfills the OTOD service based on SC. In particular, we solve the OTOD crowdsourcing problem by leveraging pervasive taxis running in cities. This paper significantly extends our previous work by considering different states of taxis, proposing the corresponding methods and conducting realistic experiments as well as evaluations. Specifically, we elaborate the design of FooDNet from the following two usage situations. The first one is that taxis with passengers deliver the food, named the Opportunistic OTOD Service (O-OTOD). Note that the priority of passengers is higher than food packages, which means that the taxi should pick up all food packages before picking up the passenger, and deliver food after the passenger takes off. The second one is that taxis only deliver food packages, named the Dedicated OTOD Service (D-OTOD). Note that taxis do not accept passengers' orders when delivering food, since drivers can obtain sufficient income from food delivery, such as the income should be greater than the travelling cost. Specifically, we define the places of the restaurant and the requester in an order as starting and destination areas. If the order happens in the frequent-interaction areas (i.e., there are more taxis running between the starting and destination areas), the taxi can deliver food opportunistically. For infrequent-interaction areas, the taxi needs to deliver food in a dedicated manner (i.e., without passengers). Advantages of proposed system is the first work that applies SC in the field of the OTO service, Elaborate the OTOD service in two typical situations and formulate the problems accordingly, including the O-OTOD problem and the D-OTOD problem

5. METHODOLOGY

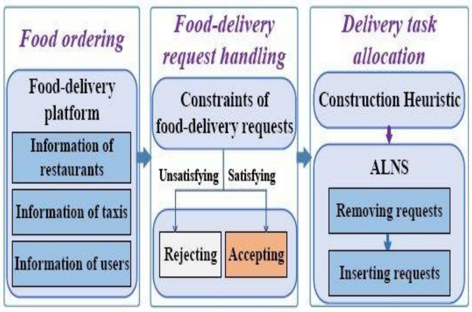

Fig.1 Block diagram of proposed system

Journal of Engineering Sciences

Vol 11, Issue 4, APRIL /2020
ISSN NO:0377-9254

5.1. FOOD ORDERING

The system has three stakeholders, namely restaurants, taxi drivers, and users. First, restaurants provide the relevant information for the system, including the location rl, the business hour rt and the food category rf. Meanwhile, the information of taxis is collected, i.e the current location, the historical trajectories, and the passenger's travel request denoted aspr (pl,pd,pt), including the current location pl, the destination pd, and pick-up time pt. When the user starts to order food in restaurant r, she should provide her request information, including the location ul, the delivery time period ut [uto,utd] (i.e., the order time uto and the deadline utd), and the kind of food rf. Finally, the food delivery request fr(rl,ul,[uto,utd],rf)is formed, where rl and ul represent the start and end points of the food order respectively.

Fig. 1 A sample line graph using colors which contrast well both on screen and on a black-and-white hardcopy

Figures must be numbered using Arabic numerals. Figure captions must be in 10 pt Regular font. Captions of a single line must be centered whereas multi-line captions must be justified (e.g. Fig. 1). Captions with figure numbers must be placed after their associated figures, as shown in Fig. 1.

5.2. FOOD-DELIVERY REQUEST HANDLING

After the user submits the food-delivery request, the system will determine whether to accept it. Based on the information of the restaurants and taxis, as well as the user's request, the system will accept the food request fr if it satisfies the constraints. Particularly, if the user and the restaurant are located in frequent-interaction areas, it falls into the O-OTOD mode, and the constraint will rely on the order time. In addition, if the regions are within frequent-interaction areas, the order will be handled under the D-OTOD mode, where both the order time and the taxis' income should be considered as constraints.

5.3. DELIVERY TASK ALLOCATION

The system will allocate accepted food-delivery tasks to proper taxis. The selection method is mainly divided into two steps. First, we apply the heuristic algorithm to obtain the initial feasible solution. Second, ALNS optimizes the initial solution by removing and inserting requests continually based on the local search framework. Finally, the optimized solution is obtained, i.e., the planned route of each selected taxi.

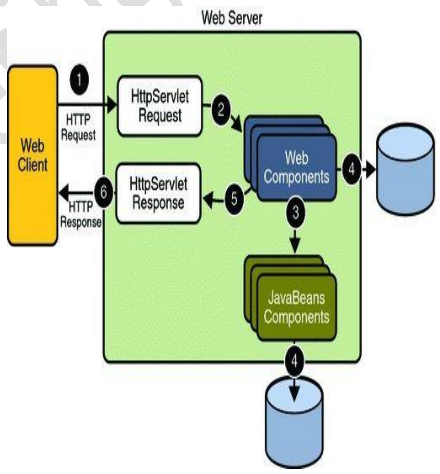

Fig.2 Architecture of proposed system

5.4. SOFTWARE REQUIREMENTS

Operating System: Windows 7
User Interface : HTML, CSS
Client-side Scripting: JavaScript
Programming Language : Java
Web Applications: JDBC, Servlets, JSP
IDE/Workbench: My Eclipse 8.6
Database: Oracle 11g
Server Deployment: Tomcat 7.0

5.5. HARDWARE REQUIREMENTS

Processor :Intel core i3 or above
Hard Disk :500GB or more

6. RESULTS

Part 1 : CUSTOMER ORDERING THE FOOD

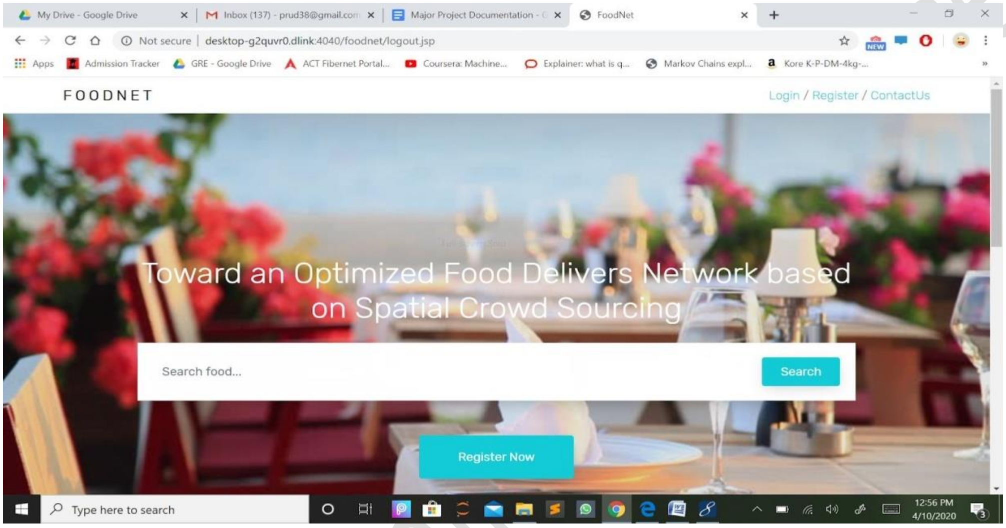

Fig.3 Opening web page of the foodnet website

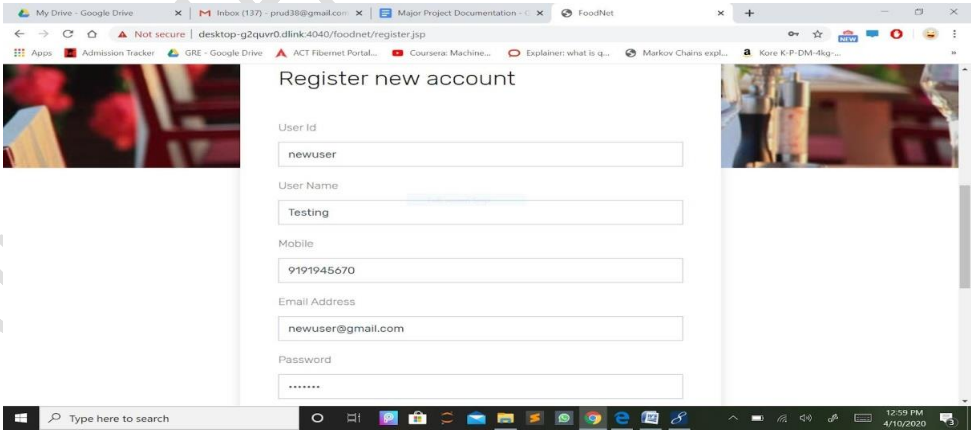

Fig.4 Registering a new account into the Foodnet Website

JES Journal of Engineering Sciences
Vol 11, Issue 4, APRIL /2020
ISSN NO:0377-9254

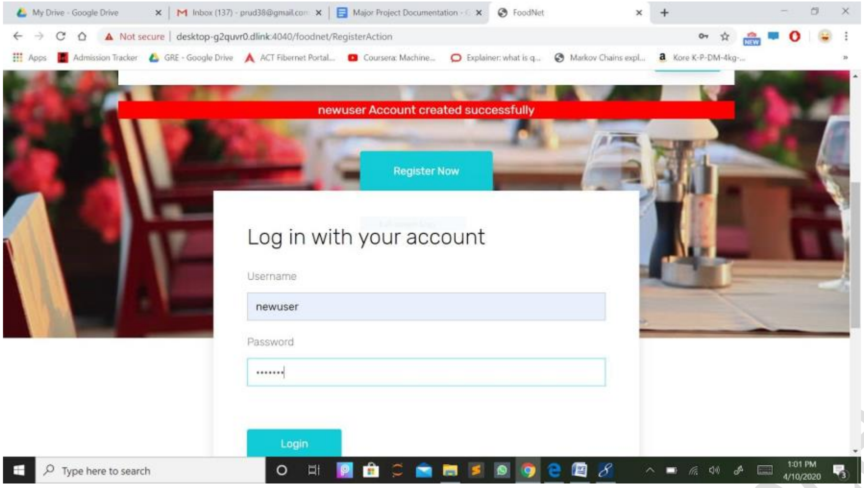

Fig.5 New Account Created Successfully and Login into the website with your credentials

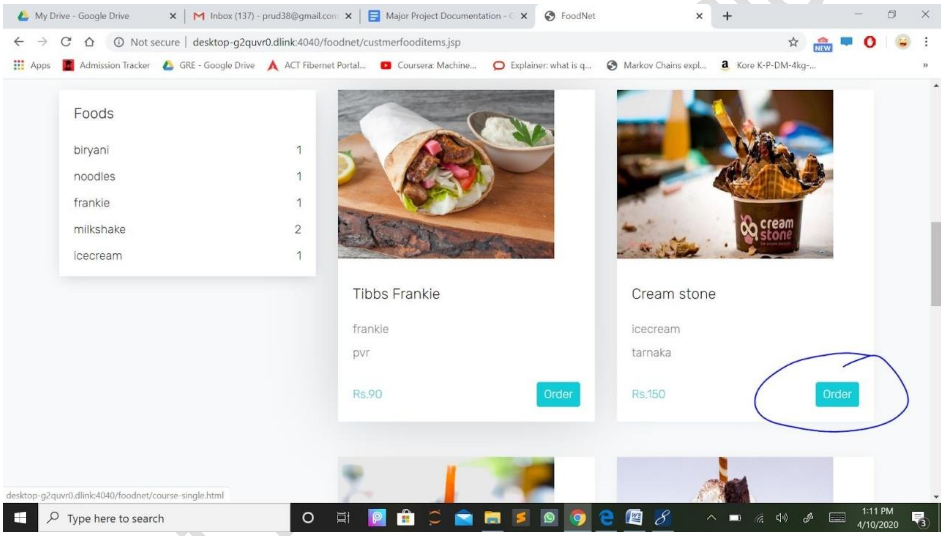

Fig.6 Takes the user to the Menu Page of the food items.

Part 2: OPERATIONS DONE BY THE ADMIN

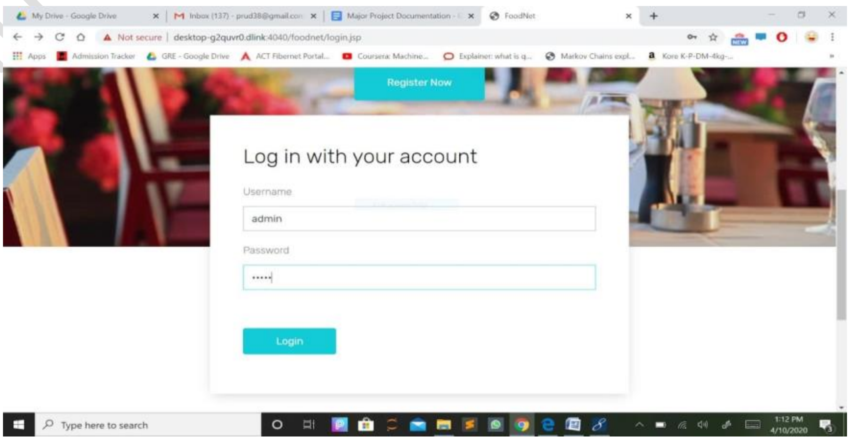

Fig.7 Login through the admin credentials

Vol 11, Issue 4, APRIL /2020
ISSN NO:0377-9254

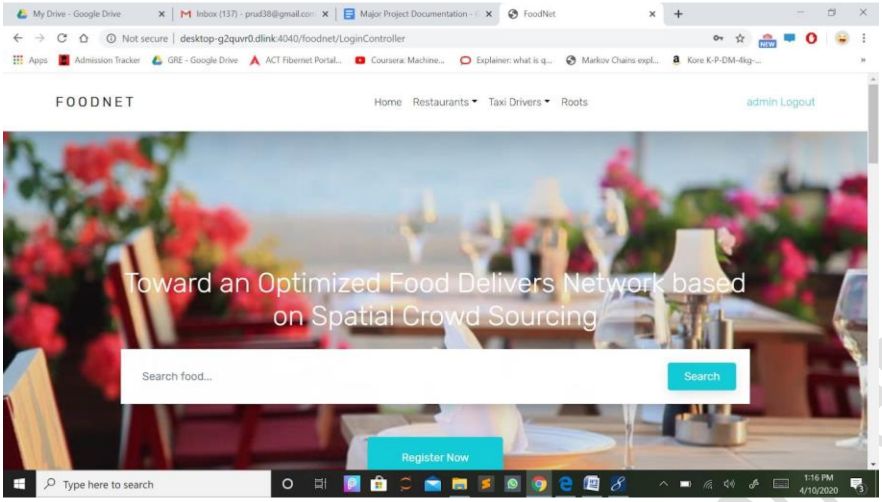

Fig.8 Admin has the ability to upload new restaurants, Drivers and establish new routes

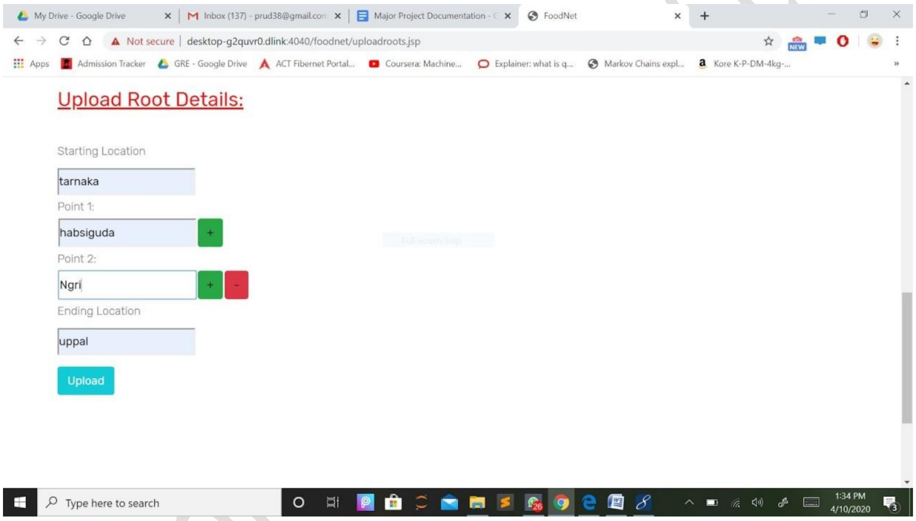

Fig.9 Establish a new route.

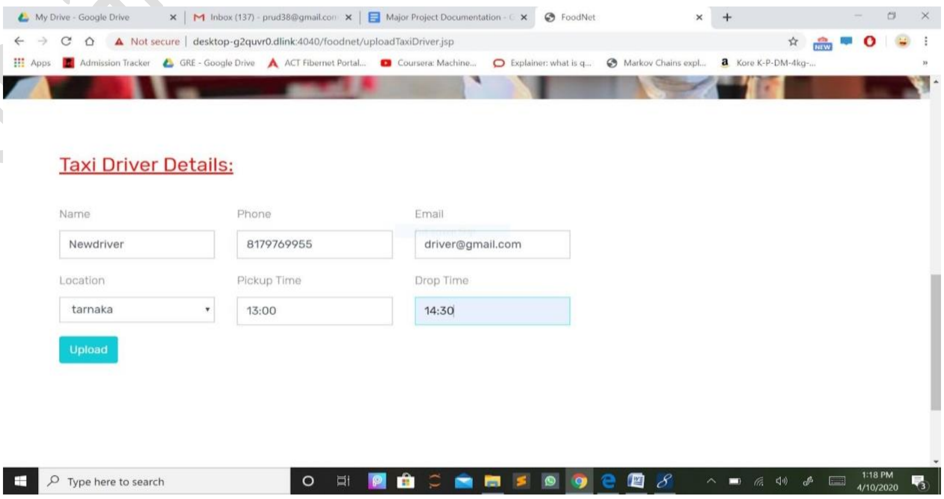

Fig.10 Enter Taxi driver details

Vol 11, Issue 4, APRIL /2020
ISSN NO:0377-9254

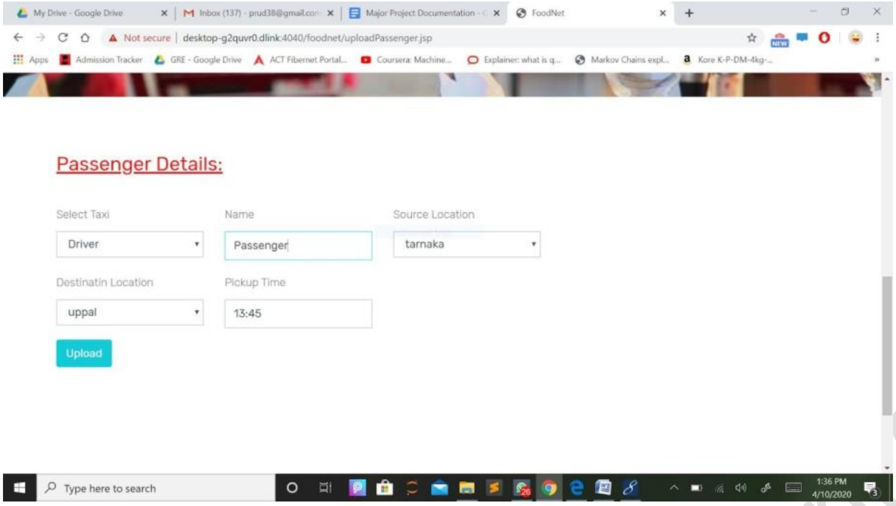

Fig.11 Upload a passenger who is assigned to the same driver

Part 3 : OPERATIONS DONE BY THE RESTAURANT

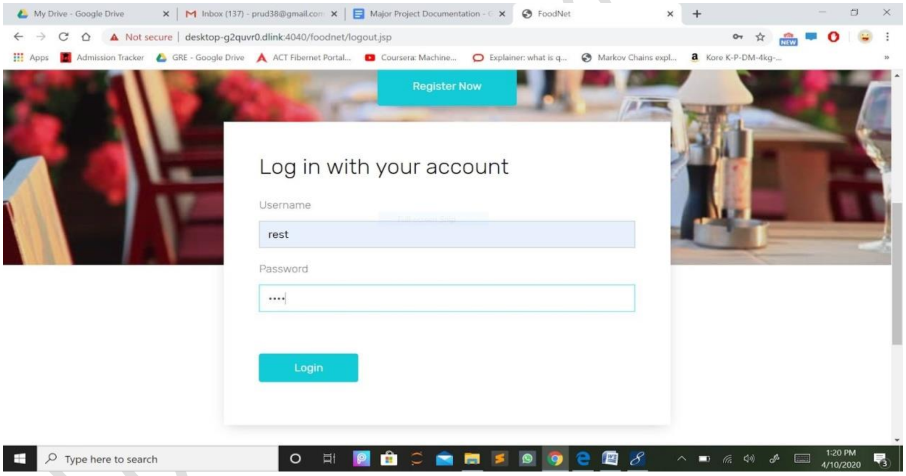

Fig.12 Login using the restaurant credentials

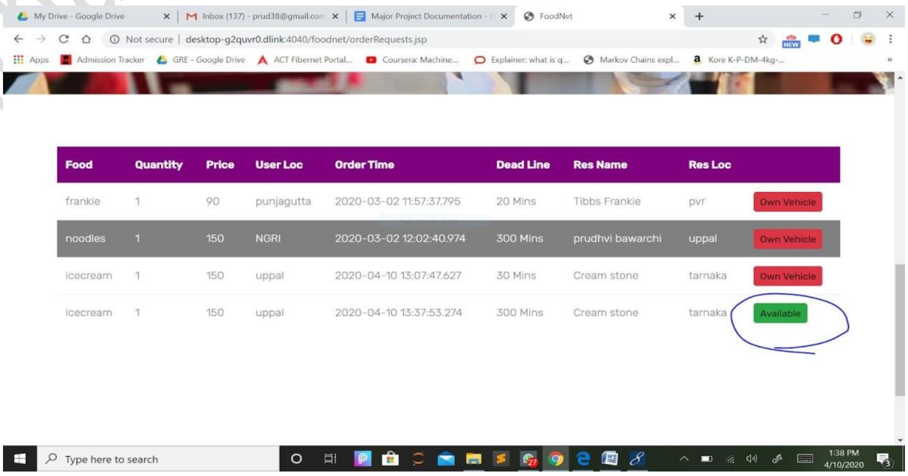

Fig.13 A taxi is waiting which is going in the same route

Vol 11, Issue 4, APRIL /2020
ISSN NO:0377-9254

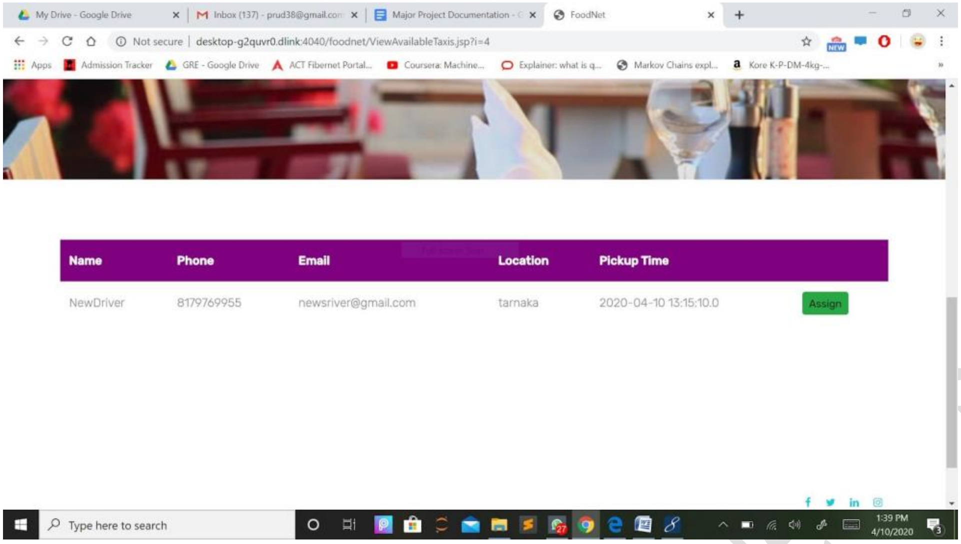

Fig.14 Assign the Order to that Taxi

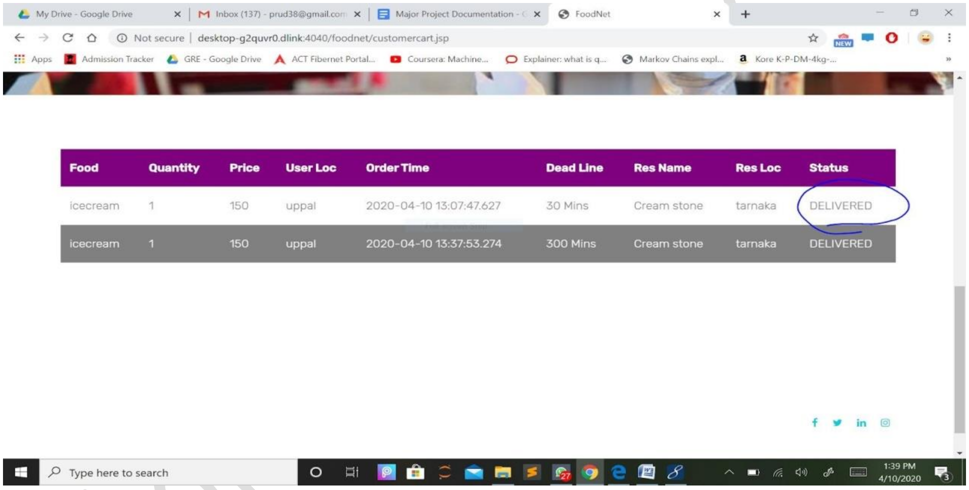

Fig.15 Open the User's cart and you can see the food delivered since a driver is opportunistically assigned by the Restaurant (O-OTOD)

7. CONCLUSION

Therefore, we present a novel framework called FooDNet for food delivery by using the existing resources of taxis, which can save the human resource, reduce the delivery cost, and improve the delivery efficiency. Specifically, we propose two problems: O-OTOD problem starts from the given taxis routes to carry passengers, and then inserts food delivery requests in the routes. D-OTOD problem only handles food delivery requests with taxis in idle load, and designs the optimal taxi routes and schedules for a number of food delivery requests with pickup and drop-off points. In addition, the two-stage method is proposed to solve the above two problems, which consists of the construction algorithm and the ALNS algorithm. Evaluations based on three real-world datasets showed that our proposed algorithms could get the better solution compared to the baseline methods.

REFERENCES

[1] L. Jiao, A. M. Tulino, J. Llorca, Y. Jin, and A. Sala, "Smoothed on- line resource allocation in multi-tier distributed cloud

Vol 11, Issue 4, APRIL /2020
ISSN NO:0377-9254

networks," IEEE/ACM Trans. Netw., vol. 25, no. 4, pp. 2556–2570, 2017.

[2] L. Jiao, A. M. Tulino, J. Llorca, Y. Jin, A. Sala, and J. Li, "Online controlofcloudandedgeresourcesusinginaccuratepredictions," in IWQoS, 2018, pp. 1–6.

[3] N. Buchbinder, N. Jain, and I. Menache, "Online job-migration for reducing the electricity bill in the cloud," in IFIP Networking, 2011, pp. 172–185.

[4] R. Urgaonkar, S. Wang, T. He, M. Zafer, K. S. Chan, and K. K. Leung, "Dynamic service migration and workload scheduling in edge-clouds," Perform. Eval., vol. 91, pp. 205–228, 2015.

[5] X. Qiu, H. Li, C. Wu, Z. Li, and F. C. Lau, "Cost-minimizing dynamic migration of content distribution services into hybrid clouds,"IEEETrans.Para.andDist.Comp.,vol.26,no.12,pp.3330– 3345, 2015.

[6] S. Ren, Y. He, and F. Xu, "Provably-ef□cient job scheduling for energyandfairnessingeographicallydistributeddatacenters,"in ICDCS, 2012, pp. 22–31.

[7] A. Ksentini, T. Taleb, and M. Chen, "A markov decision process- based service migration procedure for follow me cloud," in ICC, 2014.

[8] S. Wang, R. Urgaonkar, M. Zafer, T. He, K. S. Chan, and K. K. Leung, "Dynamic service migration in mobile edge-clouds," in IFIP Networking, 2015, pp. 1–9.

[9] R. Urgaonkar, S. Wang, T. He, M. Zafer, K. Chan, and K. K. Leung, "Dynamic service migration and workload scheduling in edge-clouds," Performance Evaluation, vol. 91, pp. 205–228, 2015.

[10] S. Wang, R. Urgaonkar, K. Chan, T. He, M. Zafer, and K. K. Leung, "Dynamic service placement for mobile micro-clouds with predicted future costs," IEEE Trans. Para. and Dist. Comp., p. in press, 2016..