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Spatial Crowdsourcing using Multi Skill Orientation

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ABSTRACT: Crowdsourcing is an emerging business model where tasks are accomplished by the general public; the crowd. Crowdsourcing has been used in a variety of disciplines, including information systems development, marketing and operationalization. It has been shown to be a successful model in recommendation systems, multimedia design and evaluation, database design, andsearch engine evaluation. Despite the increasing academic and industrial interest in crowdsourcing, there is still a high degree of diversity in the interpretation and the application of the concept. Nowadays there is fast development in smartphone devices with crowd sourcing platforms. So, attention from the database community towards spatial crowdsourcing is more. Particularly, the spatial crowdsourcing sending requests to worker for their tasks using their current live positions. In this system, Admin have to take part and assume a spatial crowd sourcing system and each worker have some special qualified set of skills for spatial task like building a house, painting a wall, roof, and performing live shows for an events which is having limited time and budget constraints and qualified skill set. System will provide solution to the problem of multi-skill spatial crowd sourcing (MS-SC), it will find an important beneficial solution to worker and task assignment methodology, so that users of the system are able to match the skills of worker with the user defined tasks. By using this approach workers as well as task user will get more benefits which is maximized with budget constraint. Hence, it proves that this problem is NP-hard. So that propose a system or providing solution to the given problem with three effective approaches, with greedy, g-divide and conquer and cost-model-based adaptive algorithms to assign qualified skilled worker for user task which is beneficial for workers as well as crowds. Through this extensive experiments with crowds and worker dataset which includes there whole information i.e. skill set with respected worker and crowd with their profile, so we are going to give the efficient and effective solution to our given problem for that we will use real as wellas synthetic datasets..

KEYWORDS: Crowdsourcing, Cost-model based adaptive algorithm, g-divide-and-conquer algorithm, greedy algorithm, Multi Skill Spatial Crowdsourcing.

I. INTRODUCTION

Consider, a spatial crowd sourcing scenario, in which each worker has a set of qualified skills, whereas each spatial task s time-constrained, under the budget constraint and required a set of skills. Under this scenario, there is an important problem, namely called as multi skill spatial crowd sourcing, which finds an optimal worker and task assignment strategy, such that skills between workers and tasks match with each other and workers benefits are maximized under the budget constraint. System prove that the MS-SC problem is NP-hard and intractable. Therefore, system propose three effective heuristic approaches, including greedy, g-divide and-conquer and cost-model-based adaptive algorithms to get worker-and-task assignments. Through extensive experiments, system demonstrates the efficiency and effectiveness of our MS-SC processing approaches on both real and synthetic data sets. In the system, user login into the application they have to update their profile in complete way along with their professional working data. They also select the field of the working category which helps the application to select user based on the task. Every user has the ability in the application to post any specific work on any location as per their requirement. These data are captured from the user and it's been used for processing in the server side and the task allocation on android device based on the location we get to know the person available within that location or the nearest person located in

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that location with skill set of same work category as required in there. In task confirmation once user is found then the user gets a notification in the application to accept the task request.

After the acceptance task person is decided and the details are shared so that they can further go ahead. After the task, if the user is not satisfied or any one has any sort of complaint then they can feed in the compliant inside the application along with the task person name. In the system Admin can login from their web server and can view all the user looking for their task to be done and who is been allocated to whom. Also if any user gets a work complain of more than five times then that user is reflected in the admin side and then admin can block that user so that user cant login into the system again. With the progress of mobile devices and wireless broadband, a new eMarketplatform, termed spatial crowdsourcing is emerging, which enables workers to perform a set of spatial tasks posted by a requester. Smart devices such as smartphones and tablet computers have become much more popular and widespread over the past decade. They are now fundamental communication and computing devices in people's everyday lives. Moreover, they can embody various sensors, including, but not limited to, microphone, camera, GPS,gyroscope, accelerometer, magnetometer, barometer, temperature sensor, humidity sensor, and ambient light sensor. Through the Internet connection capability of smart devices, such embedded sensorshave the potential to form mobile and wireless sensor networks.

This potential has led to the emergence of mobile crowd sensing, which can also be called sensing as a service. In previous work task assignment using spatial crowdsourcing without considering location based information to achieve better accuracy, and prior works, they studied how to select a proper worker set for a particular task. They studied crowdsourcing problems,according to location based information as a parameter they distribute tasks to workers. In these kind of problems, workers are not required to accomplish tasks on sites. In this MS-SC problem, my focus is on finding an assignment such that the spatial and temporal conditions can be met, according to skills required by the tasks can be supported by workers, and the assignment score is maximized. Thus the existing methods like this cannot be directly applied.so that some spatial crowdsourcing platform requires workers to physically move to some specific locations, and perform the requested services by task user, such as taking photos/videos, waiting in line at shopping malls, and decorating a room. As an example, some previous worksstudied the small-scale or specified campaigns benefiting from participatory sensing techniques, which utilize smart devices (equipped by workers) to sense/collect data for real applications. Kazemi and Shahabi classified the spatial crowdsourcing systems from twoperspectives: peoples motivation and publishing models. From the perspective of peoples motivation, the spatial crowdsourcing can be categorized into two groups: reward based, in which workers can receive rewards according to the services they supplied, and self-incentivized, in which workers conduct tasks voluntarily.In this work, studying MS-SC problem based on the reward based model, whereworkers are paid for doing tasks. However, with a different goal, this MS-SC problem targets at assigning workers to tasks by using our proposed algorithms, such that the required skills of tasks can be covered, and the total reward budget (i.e., flexible budget can be maximized. According to the publishing modes of spatial tasks, the spatial crowdsourcing can be also classified into two categories: worker selected tasks (WST) and server assigned tasks (SAT). In particular, for the WST mode, spatial tasks are broadcast to allworkers, and workers can select any tasks by themselves. In contrast, for the SAT mode, the spatial crowdsourcing server willdirectly assign tasks to workers,based on location information of tasks/workers.

Some prior works, on the WST mode allowed workers to select available tasks, based on their personal preferences.However, for the SAT mode, previous works focused on assigning available workers to tasks in the system, such that the number of assigned tasks on the server side, the number of workers self-selected tasks on the client side, or the reliability-and-diversity score of assignments is maximized. In particular,tackles the problem of reliable diversity based spatial crowdsourcing (RDB-SC), which finds a worker-and-task assignment strategy that maximizes the assignment score.

II. RELATED WORK

Spatial crowd sourcing focused on assigning workers to tasks to maximize the total number ofcompleted tasks, the number of performed tasks for a workerwith an optimal schedule or the reliability-and diversity scoreof assignments. However, they did not take into accountmultiskilling covering of complex spatial tasks, and the assignment score with respect to task budgets and workers' salaries(excluding the travelling cost). Thus, we cannot directly applyprior solutions to solve our MS-SC problem.Recently Micro-task crowdsourcing has become a popularapproach to

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effectively tackle complex data managementproblems such as data linkage, missing values, or schemamatching. However, the backend crowd sourced operatorsof crowd-powered systems typically yield higher latenciesthan the machine reusable operators; this is mainlydue to inherent efficiency differences between humans andmachines. This problem can be further exacerbated by thelack of workers on the target crowdsourcing platform, orwhen the workers are shared unequally among a number ofcompeting requesters; including the concurrent users from thesame organization who execute crowd sourced queries withdifferent types, priorities and prices. Under such conditions,a crowd-powered system acts mostly as a proxy to thecrowdsourcing platform, and hence it is very difficult toprovide efficacy guarantees to its end-user.

III. PROPOSED ALGORITHM

In this system, user login into the application they haveto update their profile in complete way along with their professional working data. They also select the field ofthe working category which helps the application to selectuser based on the task. Every user has the ability in theapplication to post any specific work on any location as per their requirement. These data are captured from the user andits been used for processing in the server side and the task allocation on android device based on the location we get toknow the person available within that location or the nearestperson located in that location with skill set of same workcategory as required in there. In task confirmation once useris found then the user gets a notification in the application toaccept the task request. After the acceptance task person isdecided and the details are shared so that they can further goahead. After the task, if the user is not satisfied or any onehas any sort of complaint then they can feed in the compliantinside the application along with the task person name. In the system Admin can login from their web server and can viewall the user looking for their task to be done and who is beenallocated to whom. Also if any user gets a work complain ofmore than five times then that user is reflected in the adminside and then admin can block that user so that user cantlogin into the system again.

A. *Solution suggested in proposed system:*

- Three effective heuristic approaches, including greedy, g-divide and conquer and cost-model-based adaptive algorithms to get worker-and-task assignments, through extensive experiments.
- We demonstrate the efficiency and effectiveness of our MS-SC processing approaches on both real and synthetic datasets.
- System will provide solution to user's task as worker who is having better score.

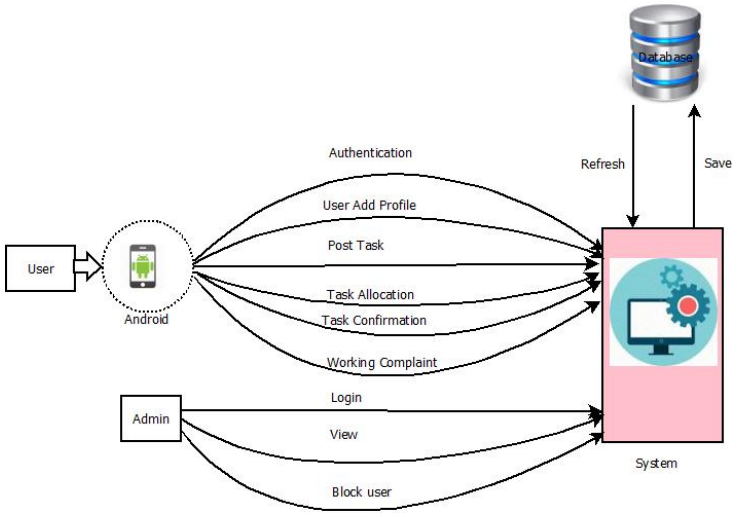

Fig.1.Architecture of Proposed MS-SC System

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IV. SYSTEM ARCHITECTURE / SYSTEM OVERVIEW

Fig.1 shows the architecture of proposed system which consist of following modules.

A. Dataset Collection

It includes all information about worker and user who is having some task with their attributes. Data inserted in database when workers doing their registration or filling information with their skills and characteristics then this information is added into the database, like workers user information is also added into the database into the number format and retrieval is in normal format.

B. Authentication

Every user in the application has to register them so that they can use their credentials to login into it. During login the password is verified from server side and hence only valid user can login into the application.

C. Add Profile

One they login into the application they have to update their profile in complete way along with their professional working data. They also select the field of the working category which helps the application to select user based on the task.

D. Post Task

Every user has the ability in the application to post any specific work on any location as per their requirement. These data are captured from the user and its been used for processing in the server side.

E. Task Allocation

As the complete working of the application is on android device, based on the location we get to know the person available within that location or the nearest person located in that location with skill set of same work category as required inthere. Task allocation process is done by admin by comparing the result of three algorithms.

F. Task Confirmation

Once the user is found then the user gets a notification in the application to accept the task request. After the acceptance task person is decided and the details are shared so that they can further go ahead.

G. Working Complaint

After the task, if the user is not satisfied or any one has anysort of complaint then they can feed in the compliant insidethe application along with the task person name.

H. Admin View

Admin can login from their web server and can view allthe user looking for their task to be done and who is beenallocated to whom. Also if any user gets a work complain ofmore than five times then that user is reflected in the adminside and then admin can block that user so that user cant logininto the system again.

I. Greedy Algorithm

The greedy algorithm finds one worker with highest scorefor task assignment. Algorithm: Processing of algorithm basedon event ids []
Step 1 :Select max count of solution.
1) Choose eventid , by setting eventid = groupid, whereuserid = groupidare chosen by calculating max count from dataset.
Step 2 :If check given solution is equal to input then get finalresult and goto step 5.
Step 3:Then check other max count ofsolution but is less than previous max count solution and gotostep 1.
Step 4:Then check given solution is equal to input thenget final result goto step 5.
Step 5:Stop.

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J. g-Divide and Conquer Algorithm

In this algorithm it recursively divides the original probleminto sub problems and gives solution to each sub problem andthen merge that solution by resolving conflicts. The algorithmis as shown below: Processing of algorithm based on dividingand merging of best group. []

Step 1: Estimation of bestnumber of Group g.

Step 2: Decompose or divide the MS-SCproblem into sub problems.

1) Decompose problem into sub problem (m/g) involvingspatial task.

2) If sub problems contain only one task then apply greedyalgorithm.

Step 3: Merging sub problem by resolving conflicts.

1) If we obtain assignment i.e. worker set for each subproblem then merge them into single worker and taskassignment set.

K. Cost-Model Based Algorithm

Until the size of task group become one, till this algorithmwill not divide the problem into sub problem like previous one.Processing of algorithm based on estimation of best numberof group. []

Step 1: Estimation of best number of Group.

Step 2: Total cost of solving MS-Sc problem in g-Divide andConquer approach is minimized.

1) Cost of Fd.

2) Decomposition of sub problem Fc.

3) Merging sub problem by resolving conflicts Fm.

L. Mathematical Model

When we solve problem we need to analyses the difficultylevel of our problem. There are three types of classes providedfor that. These are as follows:

1. P Class.
2. NP-hard Class.
3. NP-Complete Class

1. P Class(polynomial class problem):

Class p is a class of decision problems that can be solved inpolynomial time by(deterministic) algorithms. This class ofproblem is called polynomial.

2. NP- complete(Non deterministic Polynomial completeproblem):

Class NP is the class of decision problems that can be solvedby non-deterministic polynomial algorithm. This class ofproblems is called non deterministic polynomial.

3. NP Hard (Non deterministic polynomial time hardproblem):

A problem L is NP-hard if and only if satisfiability reducesto L. Only a decision problem can be NP complete howeveroptimization problem may be NP hard.We used a set theory concept to represent the mathematicalmodel for the system, which consist of different sets forinput,process, rule and output. This system that is MS-SCproblem is NP-hard.

1) Set Theory: Let,

$S = \{I, P, R, O\}$ (1)

Where,

S: MS-SC system
I: Set of inputs
P: Set of processes
R: Rules or constraints
O: Set of outputs/Final output

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1) I = {i1, i2}
Where,
i1: Authentication.
i2: Posting Task.

2) P = {p1, p2, p3, p4, p5}
Where,
p1:Registration of user and worker.
p2:Log In.
p3:Task Allocation to worker.
p4:Task Confirmation.
p5:Working Complaint from user.

3) R = {r1}
Where,
r1:Only valid user can log in into system.

4) O = {o1}
Where,
o1: Task Assignment.

2) Venn Diagram: Venn diagram shows the mapping of theinput,process and output relation of the system. It also representthe interaction between different processes along with inputand output.

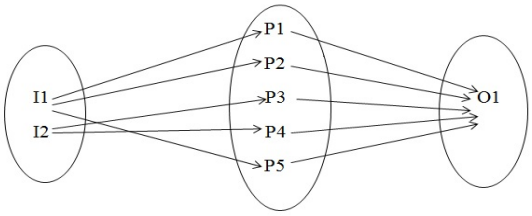

Fig.2. Venn diagram.

V. SYSTEM ANALYSIS

A. Software Requirement

This system requires Android Platform for implementation,for that system uses android environment and PHP foralgorithms and web services and fro database system usesMySQL and tested on meet up database that is syntheticdataset and on real database from workers and users perspective.Synthetic dataset containing number of record like groupid, user id, user event, event group etc attributes. For example,event group consist of event id and group id, user event tableconsist of user id and user event that is which user or workerparticipated in which event and user group consist of user idand group id in which the workers who handled the multipletask/events with different number of event groups are presentin this table.

We are applying the above mentioned algorithms on thisdatabase as well as on real database according to user taskand his/her request. The result of this execution of algorithm isnumber of best or optimal groups or workers. For selecting bestworkers group or best worker for user's task we are going to compare the score of all three algorithms. The following figureshows admin dashboard in that admin can view user, blockuser and view users location on google

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map.User can do theirregistration and their profile and post their task according theirrequirement. As like user worker has to register with system and apply for that task.

As system performing operation on synthetic dataset andconsidering some limited records for operation, System selecting event and searching for an user id who is participating innumber of events with different groups, if the person or user ispresent in dataset then system displays the user id with maxcount. If such record is not present in dataset then it displaysempty table or error message to the user. Partial results of greedy algorithm are shown in following table.

Table 1. Results using Greedy Algorithm

ID	Select Event ID	Max Count	Best User ID
1	90301	3	182
2	90200	-	-
3	90202	2	178
4	90101	2	184

VI. SIMULATION RESULTS

The performance of the system can be measured in termsof its recall and precision. Recall measures the ability of thesystem to retrieve all the workers that are relevant, whileprecision measures the ability of the system to retrieve only the workers that are relevant. They are defined as:

$$\text{Precision} = \frac{\text{Number of relevant workers retrieved}}{\text{Total number of retrieved}}$$

$$\text{Precision} = \frac{A}{A + B}$$

$$\text{Recall} = \frac{\text{Number of relevant workers retrieved}}{\text{Total number of relevant workers}}$$

$$\text{Recall} = \frac{A}{A + C}$$

VII. CONCLUSION AND FUTURE WORK

In this paper, we are providing solution to the problem of(MS-SC)multi-skill oriented spatial crowdsourcing, inwhich we are going to assigns the time constrained and multiskilling-required spatial tasks with dynamically moving workers from one location to another, so that the skills of that worker will apply on the present task. This task can be covered by skill set of workers so that the task assignment score with workerskill is maximized by using the heuristic approaches that arethe algorithm which we are implementing in this system, sothat this system will gives us a skilled worker set for an appropriate task with user requirement with time constrainedas well as budget constraints, so that user can further choose the skilled worker for their task by their score. We are provingthat the processing of the MS-SC problem is NP-hard, and thus we propose three approximation approaches (i.e., greedy,g-DC, and cost model-based adaptive algorithms), which can efficiently give MS-SC solution.

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