Assigning a Task Based on Multiskill Spatial Crowdsourcing

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Abstract:  
Due to popularity of smart devices and wireless mobile networks nowadays it is possible for a crowd of people to easily participate in location-based tasks which lays the way for spatial (geo-location based) crowdsourcing process. So we are about to develop a spatial crowdsourcing platform for assigning spatial task to the worker considering the task’s required skills under specific time constraint and budget. Finding an optimal worker to assign a task is very essential which creates an important problem known as multi-skill spatial crowdsourcing. Many existing task assignment platform helps in assigning task automatically based on spatial information and skill constraints but they are not considering multi skill constraints of worker to assignment a task or process which produces an optimal solution to the hiring person or employer. To solve this problem we propose three effective heuristic approaches, including greedy, g-divide and conquer and cost-model-based adaptive algorithms to get worker-and-task assignments without any computational overhead. In addition we are going to get a feedback from the employer based on the efficiency of workers, so that the employee can improve their working efficiency based on the feedback. And other employers can easily identify the efficient employee.

Keywords: greedy divide and conquer, cost model based adaptive algorithm, emotional analysis algorithm.

I. INTRODUCTION

With advancement in smart phone technology people can easily identify and participate in some location-based tasks. Utilizing this feature an idea of spatial crowdsourcing is process which provides a platform to assign work based on spatial information. For this process to work the capable worker and the person who is willing to assign task need to register. After registration the person willing to assigning task can view the list of worker in his/her spatial location and assign the job.

1.1 Architecture

1.2 Algorithms

- g-divide and conquer
- greedy algorithm
- cost based adaptive model
- sentimental analysis

1.2.1 g-divide and conquer algorithm

In this algorithm it recursively divides the original problem into subproblems and gives solution to each sub problem and then merge that solution by resolving conflicts. The algorithm is as shown below:

Procedure MS-SC\_gD\&C {
    \textbf{Input:} n workers in Wp and m time-constrained spatial tasks in Tp
    \textbf{Output:} a worker and task assignment instance set, Ip
    \textbf{Ip}=∅
    Estimate the best number of groups, g, for Wp and Tp
    Invoke MS-SC\_Decomposition (Wp,Tp,g) and obtain subproblems Ps
    for s = 1 to g
    if the number of tasks in subproblem Ps (group size) is greater than 1
    \textbf{Ip} (*) = MS-SC\_gD\&C (Wp(Ps),Tp(Ps))
    else
    invoke classical greedy set cover algorithm to solve subproblem Ps and obtain assignment results
    \textbf{Ip} (*)
    for i= 1 to g
    find the next subproblem, Ps
    \textbf{Ip} = MS-SC\_Conflict\_Reconcile (Ip, Ip (*))
    Return Ip
1.2.2 greedy algorithm
The greedy algorithm finds one worker with highest score for task assignment. We will show the procedure of an algorithm. Greedy algorithm always makes the next available best choice.

Problem: Schedule as many presentations as possible.
Solution: Schedule the earliest finishing non-conflicting presentation.

Procedure MS-SC_Greedy {
Input: n workers in Wp and m time-constrained spatial tasks in Tp
Output: a worker and task assignment instance set, Ip
Ip = ∅
Compute all valid worker and task pairs (wi, tj) from Wp and Tp
While Wp ≠ ∅ and Tp ≠ ∅
Scand = ∅;
For each task tj ∈ Tp
for each worker wi in the valid pair (wi, tj)
if we cannot prune dominated worker wi by Lemma 2
if we cannot prune high – wage worker wi by Lemma 3
add (wi, tj) to Scand
if we cannot prune the task tj w.r.t. workers in Scand by Lemma 4
for each pair w.r.t. task tj in Scand
compute the score increase, ΔSp(wi, tj)
else
Tp = Tp - {tj}
Obtain a pair, (wr, tj) ∈ Scand, with the highest score increase, ΔSp(wr, tj), and add this pair to Ip
Wp = Wp - {wr}
Return Ip
}

1.2.3 Cost based adaptive model
Until the size of task group become one, till this algorithm will not divide the problem into sub problem like previous one. Algorithm for this procedure is as shown below:

Procedure MS-SC_Adaptive {
Input: n workers in Wp and m time-constrained spatial tasks in Tp
Output: a worker and task assignment instance set, Ip
Ip = ∅
compute the cost, costgreedy,of the greedy algorithm
estimate the best number of groups,g, and obtain the cost ,cost gdc,of the g-D&C approach
if costgreedy < costgdc
Ip = MS-SC_Greedy(Wp, Tp)
else // g-D&C algorithm
invoke MS-SC_Decomposition (Wp, Tp, g) and obtain the subproblems Ps
for each subproblem, Ps
Ip = MS-SC_Adaptive (Wp(Ps), Tp(Ps))
For i=1 to g
Find the next subproblem, Ps
Ip = MS-SC_Conflict_Reconcile (Ip, Ip (*)
Return Ip
}

1.2.4 Sentiment analysis algorithm
People who speak a language can easily read through a paragraph and quickly identify whether the writer had an overall positive or negative impression of the topic at hand. However, for a computer, which has no concept of natural spoken language, this problem must be reduced to mathematics. Without any context of what words actually mean, it cannot simply deduce whether a piece of text conveys joy, anger, frustration, or otherwise. Sentiment analysis seeks to solve this problem by using natural language processing to recognize keywords within a document and thus classify the emotional status of the piece.

Applications
- Business today often seeks feedback on their products and services.
- Before online content and social media data became abundant, companies would ask direct feedback from their customers in a a verity of ways.
- They may used hand written forms submitted on-location or via mail. Or,they have hired a telephone survey company to call customers and ask questions directly.

1.3 Literature survey
Z. Chen, R. Fu, Z. Zhao, Z. Liu, L. Xia, L. Chen, P. Cheng, C. C.Cao, and Y.Tong gMission :A general spatial crowdsourcing platform. VLDB 2014. This author presents a mechanism i.e. „gMission”. It provides a base for performing multiple crowd sourcing tasks using location information. Multiple techniques implemented like task assignment and answer aggregation. Kazemi and Shahabi proposed some similar work. As compared to that for effective results spatial crowdsourcing gMission performs operation on multiple techniques.

F. Alt, A. S. Shirazi, A. Schmidt, U. Kramer and Z. Nawaz location based crowdsourcing extending crowdsourcing to the real world. In NordiCHI 2010:Extending boundaries, 2010. They have studied how crowdsourcing can be extended beyond the digital domain. Based on a discussion of different approaches for content generation, that is explicitly and implicitly, they proposed an approach for location based crowdsourcing. Systemby this gives a platform for searching a task and provides a solution to that task.


In this they make use of sensor data from individual mobile device, then the set of mobile nodes can accept that tasks and feedback their reports. They evaluated this system using Object Finder and Rogue Finder, and results shows the results.

P. Cheng, X. Lian, Z. Chen, R. Fu, L. Chen, J. Han, and J. Zhao Reliable diversity based spatial crowdsourcing by moving workers. VLDB 2015.

In this they provide a solution to the problem of reliable diversity based on spatial crowdsourcing (RDB-SC) using time...
constraint for that spatial task present in real as well as synthetic dataset so that tasks can be completed with high reliability.

II. REFERENCES

[1] Peng Cheng, Xiang Lian, Lei Chen, Member, IEEE, Jinsong Han, Member, IEEE, and Jizhong Zhao, Member, IEEE “Task Assignment on Multi-Skill Oriented Spatial Crowdsourcing” IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING, VOL. 28, NO. 8, AUGUST 2016.


