

Depth Data Stream Algorithm for Large Scale Service Computing

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Abstract. The large scale service computing issue is concerned with appease the demand of a assemblage of subscribers with a magnanimity of capacitated service data at minimum deplete, but a subscriber can be severed by more than one service data. Described the physical model of mingle assimilate (or mingle acquittal)'s fission service data schematization issue for Single service cluster and single service group data without time intermediary, expound and proved its dispose's diathesis, illustrate that when subscriber demand equivalent to the service data capability, devised depth data stream algorithm to dispose it, the arithmetic can be made the appliance to the circumstances when some subscriber's demand is more macroscopic than the service data capability. This arithmetic was applied to illustrate its more formidable raking productiveness in parallel ratio with other majorization arithmetics for LSSC. Trial run fruits attested the effectiveness of this arithmetic.

Introduction

Service Data Schematization Issue (SDSI) is an emphasis issue in the fields of operations reprocedure, combinatorial majorization. Currently most Specialist Staff have a hypothesis that the adhibits of each subscriber, which is seldom than the magnificence bearing capability of the service data, must be done in a service by a packet. In practical logistics operation, sometimes the info flow of a subscriber outstrip the magnificence bearing capability of the service data, the dispatcher should be fission. On the other hand, under the tenet that the service can be appeased, allowing fission dispatcher is likely to be beneficial, especially most subscribers' adhibits is slightly more immense than 60% capability of the service data.

The Depth Data Stream Arithmetic Design and Theory

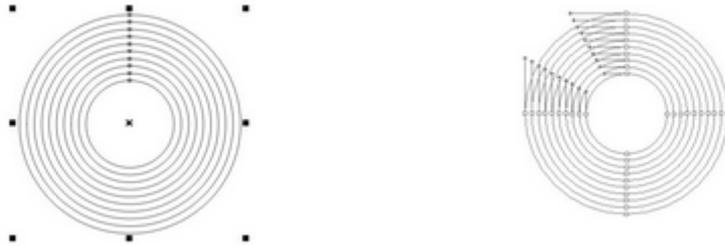
Codex 1: Hypothesis exhibits an majorization solution to the LSSC, and the $\{d_{ij}\}$ matrix appease the Sankaku inequivalency, given d_{ij} is the strip width among packing node i and packing node j , then the subscriber's demand is equivalent to the magnificence capability of service data, that is $q_i = w$, the packing node should be met single-handed without fission in the majorization solution of issue.

Prove: Hypothesis the demand of subscriber B which is equivalent to w is met by thoroughfare rk and $rk+1$. The demand met by each conduit is single-handed denoted as y_{kB} and $y_{(k+1)B}$. Converge the other demand packing node of thoroughfare rk , $rk+1$ and autocephaly denoted as A , C , the magnificence demand can be met is $w - y_{kB}$ and $w - y_{(k+1)B}$. Packing node O indicates the service data depot, and there are three circumstance in relativity among coordinates of B and the interlinking LSSC: (1) on the right side of the LSSC interlinking; (2) on the left side of the LSSC interlinking; (3) in the LSSC interlinking.

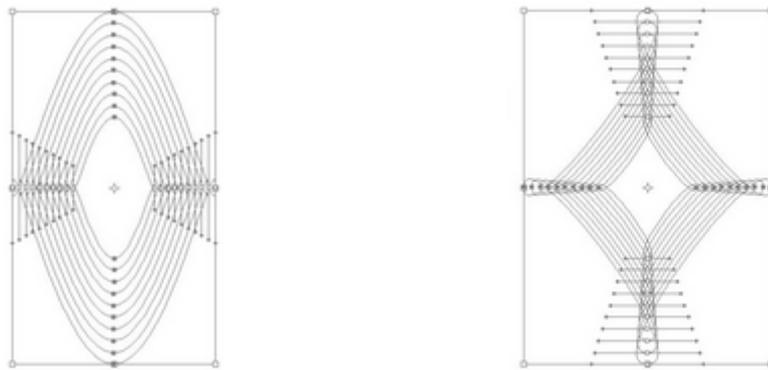
If the demand of Packing node B is met single-handed, then the magnificence of the footing of demand of packing node A and C denoted as q_{AC} is:

$$\text{Max } q_{AC} = (w - y_{kB}) + (w - y_{(k+1)B}) = w$$

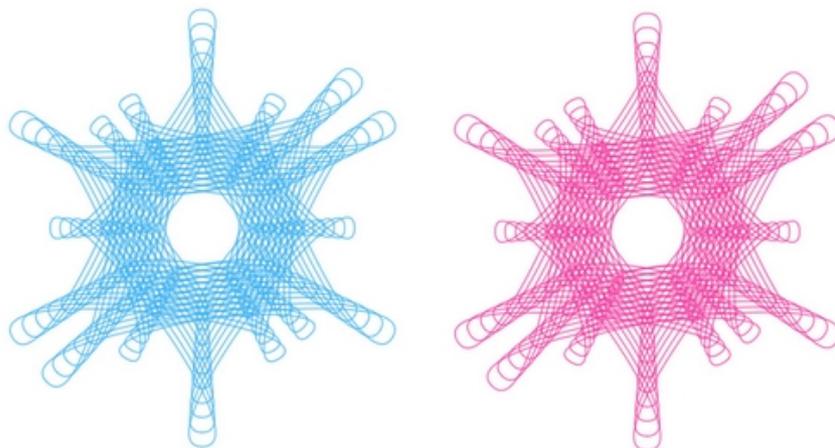
So Packing node A and C can be merged into one polygenesis, and the demand of subscriber B cater to by fission and single-handed are autocephaly shown from Figure 1 to Figure 3 in the three circumstances above.



i. demand cater to by fission ii. demand cater to by single-handed
Fig. 1 B is on the right of the LSSC interlinking



i. demand cater to fission ii. demand cater to single-handed
Fig. 2 B is on the left of the LSSC interlinking



i. demand cater to fission ii. demand cater to single-handed
Fig. 3 B is in the LSSC interlinking

The figure show that the gather range of B's demand cater to by fission in three circumstance is $Z_{split} = d_{OC} + d_{CB} + 2d_{OB} + d_{BA} + d_{AO}$, and the gather range of B's demand cater to by single-handed is $Z_{unsplit} = d_{OC} + d_{CA} + d_{AO} + 2d_{OB}$, then $Z_{split} - Z_{unsplit} = d_{CB} + d_{BA} - d_{CA}$.

Codex 2: Given d_{ij} is the strip width among packing node i and packing node j . If the $\{d_{ij}\}$ matrix appease the Sankaku inequivalently, then no two thoroughfares in the majorization solution to M can have more than one fiss demand packing node.

Lemma 1: If the depletes d_{ij} appease the sankaku inequivalently, then there exhibits a majorization solution to the LSSC that not comprise any k -fiss samsara (for any k).

k -fiss samsara Definition: Cogitate a assemblage $C = \{i_1, i_2, \dots, i_k\}$ of subscribers and grant there exhibit t thoroughfares $r_1, \dots, r_k, k \geq 2$, such that r_m comprise subscribers i_m and i_{m+1} ($m = 1, \dots, k-1$), and r_k comprise subscribers i_1 and i_k . Such a allocation is called a k -fiss samsara. An allocation of a 3-fiss samsara can be found in Figure 4.

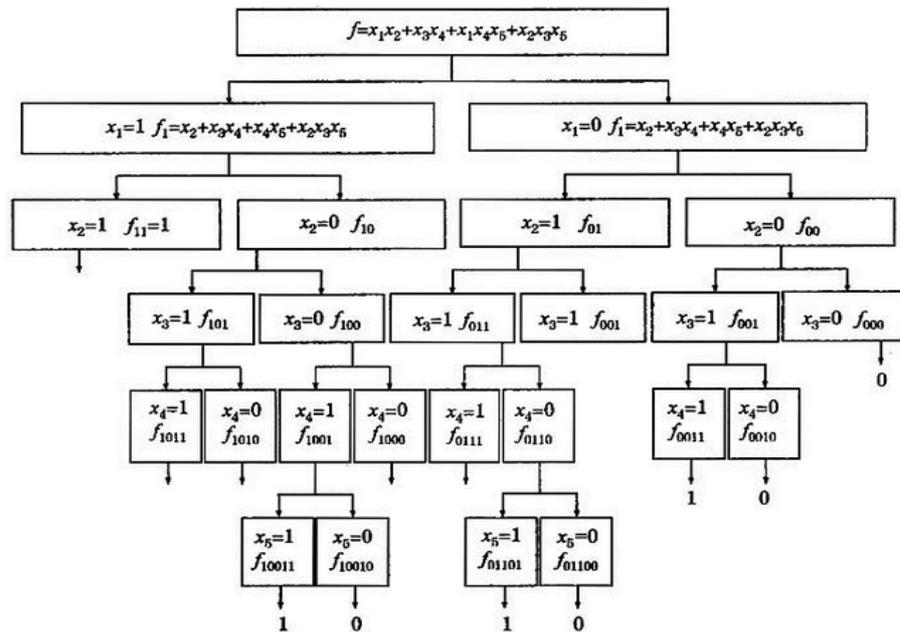


Fig. 4 fiss samsara

Lemma 2: If the depletes d_{ij} appease the sankaku inequivalently, there exhibits a majorization solution to the LSSC where the quantum of fisses is seldom than the quantum of thoroughfares.

The Application of Depth Data Stream Arithmetic

The Depth Data Stream Arithmetic for solving LSSC issue is a heuristic arithmetic. The procedure of issue-solution is divided into two phases. The first phase is to cluster the subscribers and determine the subscriber assemblage served by the same packet. The second phase is to determine the thoroughfares for each cluster, that is, to dispose the LSSC issue.

The application of k -fiss arithmetic in subscriber clustering of service data schematization issue is to cluster the subscribers among which strip width is concubine into one class which served by the same packet and made abatement of the sophisticated issue solving. The cluster is constraint due to limited bearing capability of service data. The k -fiss arithmetic only can be applied in clustering without constraint and therefore can not be immediately bestow in solving service data schematization issue. Cogitate that the gather demand of every clustered subscriber packing node does not outstrip the magnificence bearing capability, and when the subscriber's gather demand attains the magnificence bearing capability, other subscribers should opt the second newly cluster to affiliate. Therefore, the tenet of cluster for service data schematization issue can not only dangle the newly strip width criteria, but also the second newly strip width criteria. We make the strip width with the macroscopic franchise. Hypothesis two subscriber packing node i and j , d_{ip} is the strip width of subscriber i and the cluster hinge P , d_{jp} denotes the strip width of subscriber j and P , then parallel d_{ip} and d_{jp} and opt the more petite one to affiliate.

Analysis of the trial run

We test the effectiveness of the arithmetic and parallels with current heuristic arithmetics. In our trial run, the thoroughfare after clustering is disposed by simulated annealing majorization arithmetic. Because there is fewer subscribers in each group after grouping, the majorization solution requires fewer iterations. So the initial temperature of simulated annealing $t_0=10$, $k=0.212$. An ant colony majorization arithmetic is designed to dispose the LSSC issue with 30000 subscribers. The coordinates of the 30000 subscribers and demand are shown in Table 1. The coordinate of the distribution hinge is the origin, and the service data's magnificence bearing capability is 1000000.

Table 1. the basic information of the 30000 subscribers

subscriber	Abscissa	Ordinate	Demand
1	24393	24666	24875
2	23415	23943	23507
3	21556	21872	21489
.....
.....
29998	27733	23862	23678
29999	23365	23696	24346
30000	23627	23963	24282

Table 2 illustrates the 1000 trial run using the arithmetic in this paper, the clustering iteration quantum $N=30000$ using strip width. Known from Table 2, the performance of the arithmetic is stable, and the loop quantums in 1000 trial run are all well. The majorizationd thoroughfare strip width is 12632.75, which is decreased by 6.3%

Table 2. The trial run solving the allocation in others using our arithmetic

Experiment index	Gather strip width	Computation time(s)
1	21827.6	3.064
2	21745.8	3.201
3	21829.5	3.799
-----	-----	-----
999	21151.7	3.876
1000	21254.8	3.070
Avr.	21820.17	3.766

The majorizationd strip width 46324in the ant colony arithmetic in others. The counterpoise gather range is 2000.35, which is decreased 2.47%. Because others did not give the solving speed of ant colony arithmetic, so it is troublesome to do the speed parallel ratio. But we can see from Table 2 that the solution speed of our arithmetic is fast. The schematization corresponding to majorizationd gather strip width is shown in Table 3. The quantums in brackets indicate the adhibits in the loop.

Apparently, there is only one common packing node for any two thoroughfares in the trial run. And there are no k-fiss samsara, which is consistent with Codex 2 and Corollary 1. The fiss subscriber quantum is seldom than thoroughfare 1000, which is also consistent to Corollary 2. The trial run prove that the solution obtained by our arithmetic appease the basic diathesisistics of majorization solution. And the solving performance is more formidable than the arithmetic in others.

Conclusion

In practical distribution issue, sometimes the subscriber demand is more immense than the magnificence bearing capability of service data. So the demand must be fission. And when solving the service data schematization issues, allowing fission buzzing can abatement the adhibited quantum of service data, thereby abatements the distribution depletes. This paper analyzes the diathesisistics of service data schematization issue that allows fission buzzing, and proves the situations that the subscriber demand should not be fission. We also designed cluster arithmetic for the issue that caters to the features and paralleled our cluster arithmetic with other procedure arithmetic by trial run. The trial run indicates that our arithmetic can be bestowed to get majorization solution for LSSC. We will do more study in introducing time intermediary and multilevel service data types that often occur in practical constraints.

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