ISSN : 0974 - 7435 Volume 10 Issue 11

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(11), 2014 [5298-5305]

On generation algorithm of prefix code-based postorder traversal tree and its application

Meixia Tang[1]*, Yu Liu[2]

[1]School of Information Engineering, Nanning College for Vocational Technology, Nanning 530008, Guangxi, (CHINA)

[2]Modern Education Technology Center, Nanning College for Vocational Technology, Nanning, 530008, Guangxi, (CHINA)

ABSTRACT

The paper strives to solve nodes structural relationship, and can effective produce traverse tree's subtree and so on, therefore the paper proposes a kind of unified nodes and data structure prefix coding heel traverse tree generative algorithm, the algorithm is helpful for fuzzy searching and systematic analysis seeking, in addition, the algorithm doesn't need any special requirements in running period, each node branch can be different, so the algorithm is a kind of general algorithm, it can construct subtree in case don't increase complicated extents, by experiment, it can get the algorithm is obviously superior to traditional algorithm, so verify it by concrete experiments, and get the algorithm is convenient and effective.

KEYWORDS

Prefix code; Heel traverse tree; Tree generation algorithm; Mathematic model.

INTRODUCTION

With development of science and technology, each kind of information management gets more and more complicated, no matter in post, department or administrative region, all universally have hierarchical relations, currently such aspect research is mainly expressed by tree, and correlates each node, the research plays certain driving roles in future information system development.

Regarding researches on tree structure application into information management, formers have got many achievements, such as Kuang Li-Qun and others made researches on prefix code tree generation aspect algorithm, and proposed a kind of fast generative tree algorithm in the paper, constructed subtree in case without increasing any complicated extent, which no doubt shortened running time, and promoted efficiency; in relative literatures, it adopted genericity correlation techniques to improve TGSBG algorithm, so the algorithm was beneficial to promote generative tree running time.

The paper just on the basis of above formers researches, makes further analysis and researches on prefix code heel traverse tree generation algorithm, and by applying documents literature, mathematical statistics, numeric analysis and other methods to verify it, finally obtained result conforms to practice, it proves the algorithm operation is effective.

PREFIX CODE HEEL TRAVERSE TREE GENERATION ALGORITHM

According to formers research information, it can make classification of codes, classification design aspects mainly divide into three types that are respectively :

(1) Range coding :In several and entity, every one corresponds to an entity coding range, and give it same group entity in the range, such as postal coding and accounting subject coding as well as other correlation examples.

(2) Linear coding :Rank according to one performance, successively express its numbers into sequence number, then it can implement sequence numbers and easy to find, but it has no practical significance, so only can be used as substitute coding.

(3) Hybrid coding:The coding is the combination of above two kinds of coding, currently most applied is prefix coding, the coding has many advanataged, every element coding is descendent element prefix coding, so that can series connect it to make comprehensive judgment, and save its path in whole process. Every figure represents certain significance, to save nodes' individual information and increase its nodes storage contents, finally obtained result is also not convenient to explain.

To solve above difficulties, the paper proposes a kind of new algorithm, the algorithm design is as following shows.

One kind of new prefix coding method

In management system, sequence code can be two digits, every digit can be English or Arabic mathematics, then the two codes corresponding node number is $(26+10)^2$, but in real life, maximal fan cannot surpass the node number, on this basis, take Shanxi province administrative planning region as an example to illustrate, as following Figure 1 shows:

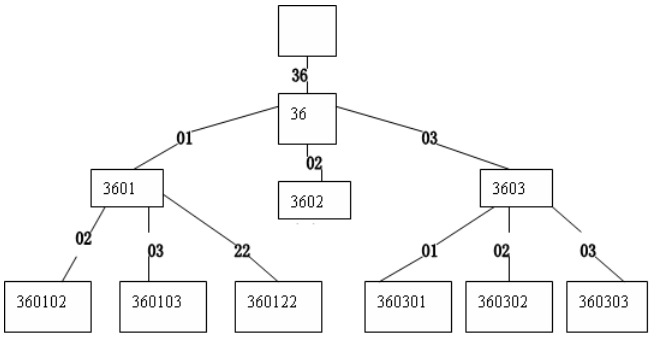

Figure 1 : Shanxi Province administrative divisions prefix tree

By above figure, we can see that any one node is jointly composed of nodes prefix and nodes order, from which root node coding cannot have number that must be vacant.

In above figure, each branch node path coding as :03, 03, 01, 36, 14 all these numbers represent each node sequence coding ;and each character string node coding is expressed by above figure 36102, 3602, 36 and other numbers;Each node prefix coding is as above figure's 360122 node corresponding prefix coding is 3601.

Prefix coding algorithm design

Different from traditional researches' prefix coding algorithm, the paper's prefix coding traverse tree generation algorithm uses judgment statements and circular ways to implement tree, its ideas are:

I, Establish tree nodes on the premise establishing parent nodes, therefore complete its construction and adding process;

II, In case subtree nodes corresponding set, it defines one node subtree, and after that traverse subtree, so that can get sequential traversal table ;

III, Targeted at every layer latest generative superior node, use it as the layer node representative, integrate each layer such node and then can get each layer node element.

According to above ideas, the paper designs the algorithm implementation process, as following Figure 2 shows:

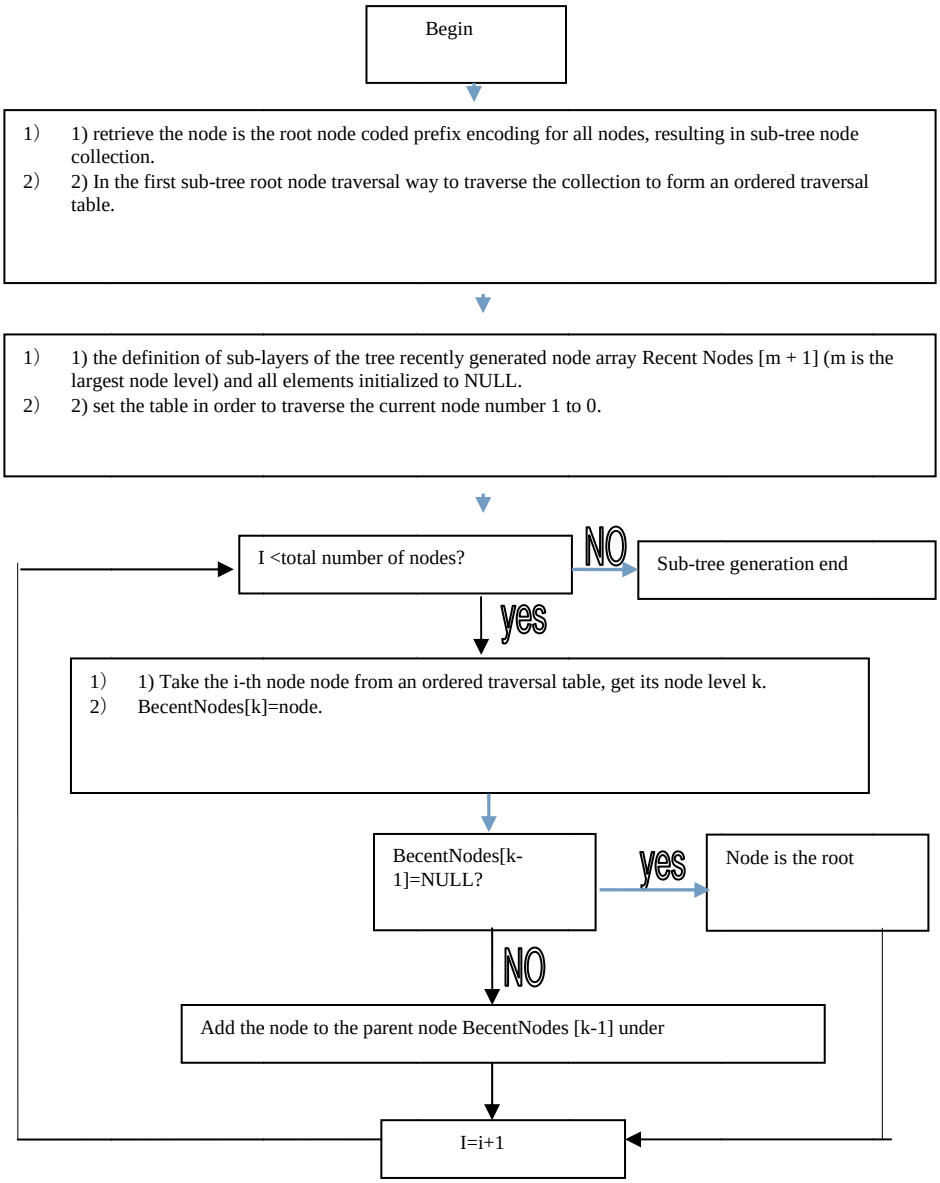

Figure 2 : Algorithm flowchart

According to above process, targeted at one place administrative region planning, it designs prefix tree, from which sub node coding number is represented by 03, 02, 01, 36, 14 and others relative character strings, from which length is fixed as two, corresponding Figure 3 is as following :

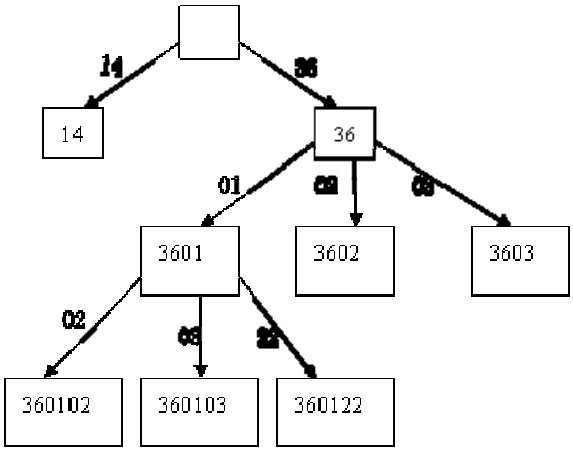

Figure 3 : An administrative division of the prefix tree

Algorithm superiority analysis

During traditional algorithm and new algorithm comparison, firstly it should assume tree's nodes total amount as m pieces, and maximum number of each node branch is n.

In traditional algorithm, every node similarly contains two basic adding and seeking node sub trees. But for the algorithm, its leaves node number is foreseen in advance that doesn't need to continue to search sub nodes, node number in crossover tree is m/n, so the kind of method time calculation extent is : $o(\mathrm{m}+\mathrm{m}/\mathrm{n}\times\log\mathrm{m})$, it is clear the calculation is relative complex.

And for the paper's new algorithm, its database traverse tree node number and record set successive orders are the same, traverse database for one time can increase step-by-step. Every node can directly position and doesn't need to search, in the whole procedure, only one circulation can implement, the algorithm time complex extent is $o(\mathrm{m})$.

The algorithm superiority analysis is even when node stores in database, it needs to define a node whether is node number of leaves or not, once generative tree only has a part, then now the marking process will not have effects, in order to more clearly present the method superiority performances, the paper takes one region administrative tree as an example to illustrate, as following Figure 4 shows :

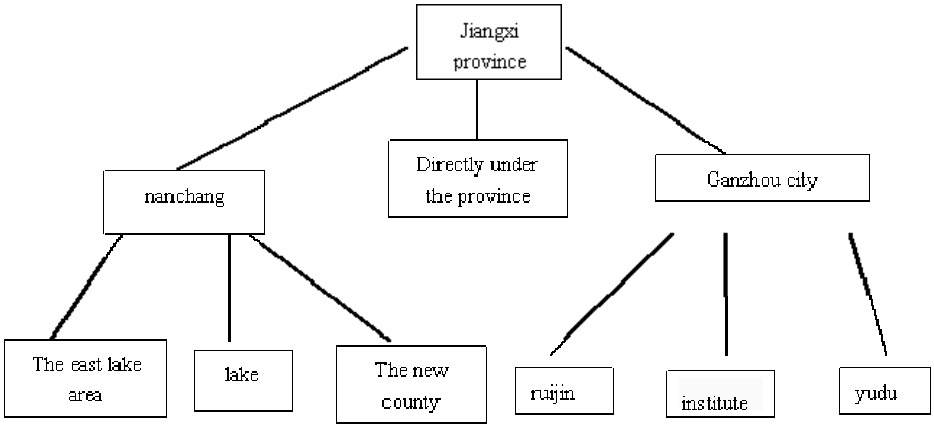

Figure 4 : Administrative divisions' tree

According to above Figure 4, it can set figure's seven cities, towns, regions as node's leaves number, if system needs to construct them into partial tree, it is as following Figure 5 shows:

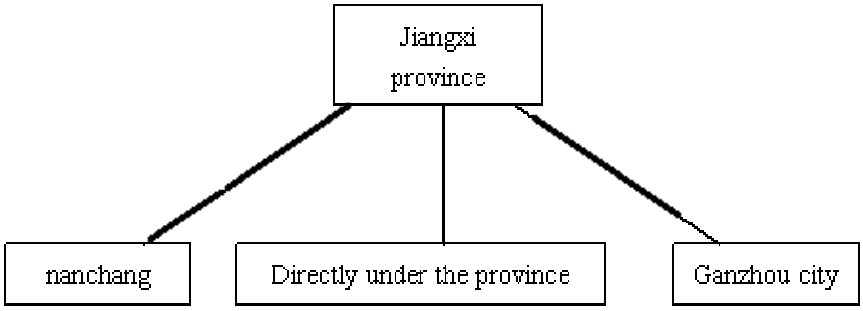

Figure 5 : Administrative divisions subtree

By above Figure 5, we can know previous defined leaves node number has no effects, so the algorithm is fit for constructing the whole tree, if construct sub tree, then it needs to add leaves' node numbers to add their judgment, but from which it will not add its algorithm complex extent.

To further explain above thoughts, the paper selects one school organizational institution to explain, as following Figure 6 shows:

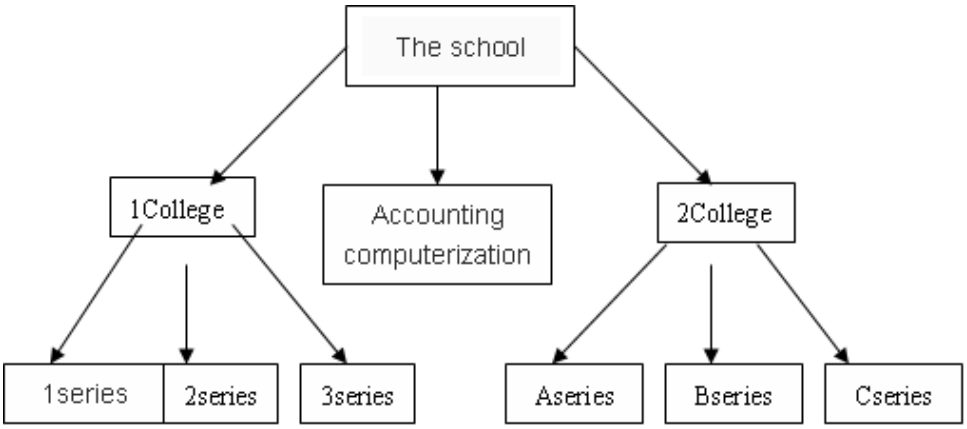

Figure 6 : University organization tree

In above Figure 6, it can define six departments and one party committee office as node leaves, add them and only construct partial trees, as following Figure 7:

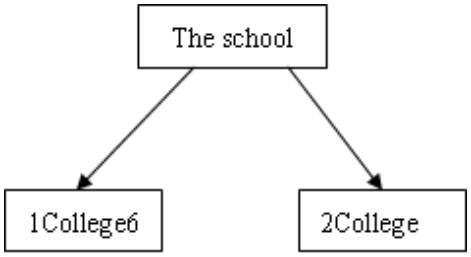

Figure 7 : A subtree of university organization tree

By above figure, we easily find previous introduced leaves node number has no effect. So it proves the new type algorithm is not fit for the whole tree construction.

Algorithm application

Regarding prefix coding aspect application, it has already played roles in rescue aspect as earlier as year 2008, targeted at different administrative regions, it can establish different sub trees, and the paper uses administrative regions to classify sub trees to illustrate.

DATABASE DESIGN

By above, we can establish a corresponding database, corresponding two-dimensional relationship table is as following TABLE 1 shows:

TABLE 1 : Administrative region classification table

Name	Type	Significance
Node-code	Char (12)	Node coding (district division coding), major key
Node-name	Varchar (20)	Node name (district division name)
Order-code	Char (2)	Sequence codes (district division serial number)
Trie-code	Char (12)	Prefix coding (Superior district division coding)
Node-depth	Tinyint	Node grade (District division grade)

…	…	…

Rank above TABLE 1 all information, it can get corresponding traverse tree, combine with above figure, we can get sequential traverse tree table, as following TABLE 2 shows:

TABLE 2 : Ordered list

Sequence codes	Prefix coding	Node coding	Node name	Node grade
	NULL		China	1
01	36	3602	Nanchang province	3
36		36	Jiangxi province	2
02	3601	360102	East Lake District	4
02	36	3602	Directly subordinate to Jiangxi province	3
22	3601	360123	Sinkiang region	4
03	3601	360103	West Lake District	4
03	36	3603	Gan Zhou City	3
03	3603	360302	Yudu country	4
02	3603	360303	Xingguo country	4
01	3603	360302	Ruijin city	4

According to above ways, we can get traverse tree presents a kind of non-linear structure, but it can be stored by linear way; such way is convenient for tree generating. And before calculation, it adopts prefix to code that is beneficial to descendant node seeking.

EXPERIMENTAL VERIFICATION

The paper adopts Windows XP system, and takes paper's traditional method and new method the two as its objects to generate 20000, 10000, 8000, 5000, 2000, 1000 pieces of nodes trees, by such experiments for ten times, it can solve time average value, corresponding result is as following TABLE 3 shows :

TABLE 3: Algorithm executing time result comparison table

Number of node	Traditional algorithm executing time	New type algorithm executing time	T1/T2
1000	294	274	1.07
2000	565	308	1.81
5000	1436	452	3.19
8000	2417	553	4.38
10000	3212	632	5.06
20000	8244	1067	7.71

By above TABLE 3, we can get traditional and new algorithms two running time comparative relations, from which traditional algorithm running time is obviously longer than new type algorithm running time, and time will extent with nodes amount increases, it proves running efficiency mainly suffers its recursive function influences.

In addition, the paper also test tree branches numbers influence extent on the new algorithm, when number of nodes is 5000 pieces, its corresponding branches number is 20, 15, 10, 8, 6, 4, 2, corresponding result is as following Figure 8 shows:

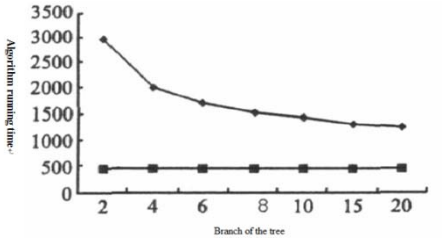

Figure 8 : Different branches of time Comparison Chart

In above Figure 8, above broken line represents new algorithm running time on the condition of different branches, and following straight line represents traditional algorithm running time on the condition of different branches, by comparing, we can find that traditional algorithm has nothing to do with branches amount, and new algorithm is closely linked to branches amount that non leaves node amount proportion in whole traverse tree gets smaller, then corresponding branches amount will be fewer, and now system execution speed on the contrary will be faster.

CONCLUSION

The paper proposes a kind of prefix coding heel traverse tree generation algorithm that applies each node into prefix coding data structure, such new type algorithm is beneficial to fuzzy searching and systematic analysis seeking, in addition, the algorithm doesn't need any special requirements during running period, each node branch can be different, so the algorithm is a kind of general algorithm, it can construct subtree in case without adding complex extent, by experiment, it can get the algorithm is obviously superior to traditional algorithm, and apply it into Shanxi administrative institution, it arrives at ideal effect by analyzing.

REFERENCES

[1] Zhang Yu-Fang, Hu Xiang-Qian, Xiong Zhong-Yang; Use Recursive Algorithm to Generate Directory Trees in the JSP [J], Computer Engineering and Design, **26(1)**, 44-49 **(2005)**.

[2] Zhang Hao, Wang Kui-Sheng, Fang Ming; Navigation Tree Generation Strategy Based on Genericity Technology [J], Computer Engineering, **35(9)**, 55 -59 **(2009)**.

[3] Zhu Chang-Cheng, Liang Ping-Yuan; A Kind of Updating Supported Ordered s XML Document Coding Method [J], Computer I: Process and Application, **25**, 145-149 **(2012)**.

[4] Fan Ce; A kind of Coding Without Prefix (UPC)[J], Journal of Computers, **25(2)**, 217- 222 **(2002)**.

[5] Wan Chang-Xuan, Liu Yun-Sheng, Xu Sheng-Hua; Range Coding XML Index Structural Effective Structural Connection [J], Journal of Computer, **1**, 113-128 **(2005)**.

[6] Yan Wei-Min, Wu Wei-Min; Data Structure (C Programming Language Version) [M], Beijing: Tsinghua University Press, **(1997)**.

[7] Zhang Yu-Fang, Hu Xiang-Qian, Xiong Zhong-Yang; Use Recursive Algorithm to Generate Directory Trees in the JSP [J], Computer Engineering and Design, **26(1)**, 44 -47 **(2005)**.

[8] Wang Ning, Dong Guo-Qin; Using a Prefix Encoding Efficient XML Query Strategies [J], Journal of Shandong University (Science Edition), **42(11)**, 45-49 **(2007)**.