Traversal Tree Implementation in Chart of Account Design

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Abstract—**This study aims to create a control of account (CoA) with the tree preorder traverser method with the development of the MPTT (Modified preorder tree traversal) method to facilitate the recording of financial information systems. The way that is now used to create an account is the manual way to analyze the creation of a structured account, so the computing process takes a long time for each transaction process. To provide solutions to these problems, the researchers used the tree traversal algorithm method. The results of this study are the chart of accounts (CoA). CoA is very important by using the MPTT method because it can complete the computational process in a shorter time compared to the manual way especially if the CoA data is used in large numbers by determining the relationship of each account with CoA.**

Keywords: control of account (CoA), modified preorder tree traversal

I. Introduction

Changes in the economic globalization, impact on financial information based on information technology (IT) is a new challenge in financial information systems [1]. The more advanced IT development, the more access to various types of financial information systems [2]. The role of IT in the field of financial information can help managers and finance in making decisions related to the provision of information and financial transactions that are supported and translated [3].

Financial information system is also responsible for maintaining or recording all financial transactions that occur in the company, including the movement of assets in and out, such as preparation, operating costs, reporting sales and purchases [4]. A complete financial information system every financial transaction and cash flow in the company [5]. Financial information systems need to pay attention to processes such as creating accounts, regulating accounting periods, keeping journals in order to produce systematic financial reports [6]. Financial statements are considered systematic if they have a good chart of account (CoA) so as to facilitate the search for financial statement transactions. CoA is a process for classifying transaction accounts so that they are easy to understand and remember, and control journals and financial reports [7].

Previous research has made a CoA with enterprise requirements planning (ERP) system with the aim of making transaction account charts from manual to automatic [8]. However, this research does not analyze the structure of each code in the financial transaction account and ERP implementation is only suitable for medium and large companies. The existence of an account structure or account control (CoA) can help computing processes carried out by computers run quickly. This can provide information to companies quickly and accurately. Enterprise resource planning in the field of accounting is the process of determining the provision of information in accordance with accurate financial transactions in corporate financial reporting. Financial statements that contain every transaction that occurs in the company by creating a different account for each financial transaction such as asset transactions in and out, such as payments, operating costs, sales and purchase reporting.

II. Literature Review

Literature review related to implementation of control of account (CoA) with the traversal tree algorithm needs to be done to determine the extent of previous studies have been carried out or published.

A. Control of Account (CoA)

Control of account (CoA) is the process of classifying transaction accounts so they are easy to understand and remember, and control journals and financial statements [7]. In general, CoA is the basis for making accounting modules and contains general ledger account summaries [9]. CoA also becomes the main base in the accounting module besides the period, because it controls journals and financial reports [7]. There are several ways to create a CoA such as adding an account combination submodule.

B. Traversal Tree Preorder

Traversal tree preorder is the process of visiting the nodes of a tree that starts from visiting the root by completing the left subtree. After all the left subtree has been visited, the node will move to the right subtree and recursively run so that all nodes have been visited [10].
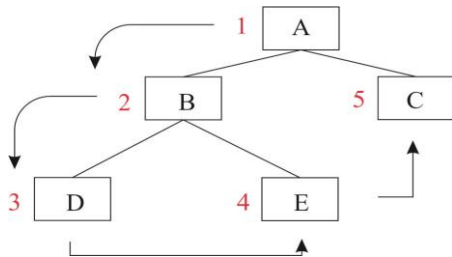

Fig. 1. Preorder traversal tree.

The picture above the first visited root is A then followed by the left subtree B and D. After the left subtree has been visited, it will move to the right subtree, E and C. Then the output of this preorder traversal tree method is as follows A → B → D → E ⇒ C.

C. Modified Preorder Tree Traversal (MPTT)

MPTT (Modified preorder tree traversal) is an efficient method for storing hierarchical data in a data tree structure. The MPTT approach adds the left and right attributes in the preorder traversal tree model so that it easily determines the parent-child relationship. The implementation of MPTT algorithm can speed up storing hierarchical data (such as categories and subcategories) in a relational database. The purpose of the modified preorder tree traversal algorithm is to make the retrieval operation very efficient.
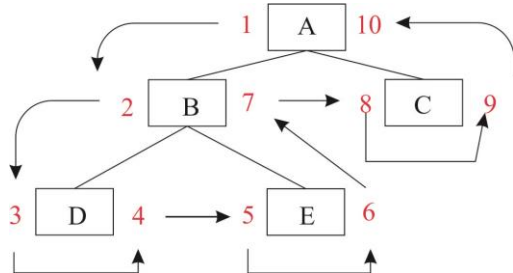

Fig. 2. Modified preorder traversal tree.

From Figure 2 above each node visits the left subtree, after the subtree is visited it moves to the right subtree by adding left and right to each node.

TABLE I.   OUTPUT FROM MPTT

Parent	Title	Left	Right
A	B	2	7
B	D	3	4
B	E	5	6
A	C	8	9

III. METHODS

This section will explain how to create an account chart and read financial statement accounts based on the tree algorithm. The steps will be explained below:

A. Breaking Down the Account on the CoA to be Used as a Sample A

The account code numbering on an account by using numbers or letters on those accounts is a step that can be considered very important, because it can make it easier for accountants when compiling and sorting accounts into financial statements and accounting ledgers. The usefulness of the account number code is that we can easily identify its location when we look for the account number in the ledger

B. Determine Linkages between Accounts

All accounts have been registered, the next step is to determine which account is the parent and which account is the child. To determine this, each account is set with an account code and given an account code that has been assigned a numeric number.

C. Implement CoA with the MPTT Method

IV. RESULTS AND DISCUSSION

A. Register for a CoA Account

This study uses an example of a COA hierarchy in Kimia Farma companies. Data was obtained from 2018 Financial Statements that were published online. The following is a list of CoA accounts used in this study.

Fig. 3. List of CoA accounts.

B. Linkages between CoA Parent and Child Accounts in MPTT

The account is already registered, then determine which parent and child. To do this, each account is given a code with a numeric number that has become a condition in making CoA. After all CoA accounts are known which are parent and child, the CoA account is then applied to the MPTT method to determine the left and right of each CoA account. The following is a list of CoA accounts that have been determined parent and child.

TABLE II.   RELATIONSHIP OF CoA WITH MPTT

Parent	Child
Assets	Current assets
	Non-current Assets
Capital	Capital stock
	Retain earning
Debt	Short-term liabilities
	Long-term liabilities

TABLE III.   LINKAGES OF ASSET ACCOUNTS WITH MPTT

Parent	Child
Current Assets	Assets and Cash Equivalents
	Account Receivables
	Other receivables
Non-current Assets	Fixed assets
	Investment Property Assets
	Non-current Assets
	Deferred charges
	Intangible Assets
	Other Assets
	Deferred tax assets

TABLE IV.   LINKAGES OF CAPITAL ACCOUNTS WITH MPTT

Parent	Child
Capital Stock	-
Retain earning	User Defined
	Not yet determined by the user

TABLE V.   LINKAGES OF LIABILITY WITH MPTT

Parent	Child
Short-term liabilities	Middle Term Loans
	Accounts payable
	Bank Debt
	Tax debt
	Advances From Customers
	Accrued cost
	Debt to Purchase Installments
	Other Current Liabilities
Long-term liabilities	Post-employment Benefits Liabilities
	Deferred Tax Liabilities
	Debt to Purchase Installments
	Medium Term Loans
	Long-term Bank Loans

C. Implement CoA for MPTT

CoA Accounts for Parent and Child have been completed, the next step is to approve the CoA model in the MPTT method. For CoA implementation in MPTT the model can be seen in figure below.
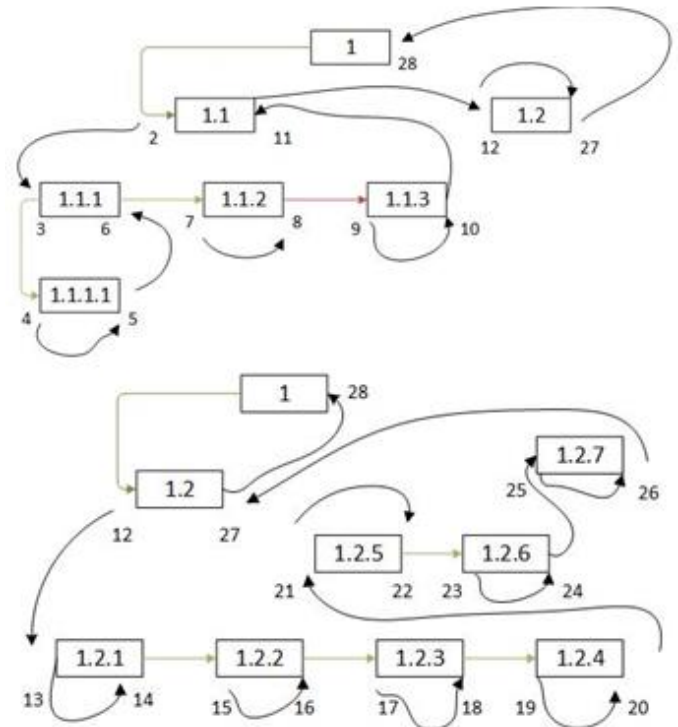

Fig. 4.   Applying CoA in the MPTT method.

Figure 4 above the output of CoA that has been applied in the MPTT model and can be seen in table 6 below:

TABLE VI.   MPTT METHOD CoA OUTPUT

Parent	Title	Left	Right
1	1.1	2	11
1.1	1.1.1	3	6
1.1.1	1.1.1.1	4	5
1.1.2	1.1	7	8
1.1.3	1.1	9	10
1	1.2	12	27
1.2	1.2.1	13	14
1.2	1.2.2	15	16
1.2	1.2.3	17	18
1.2	1.2.4	19	20
1.2	1.2.5	21	22
1.2	1.2.6	23	24
1.2	1.2.7	25	26

D. Implementation of Database Design

RDBMS (relational database management system) used by MySQL because it is an open source DBMS relational product that is stable, reliable and reliable in handling multi-user connections. This database is able to handle applications that use connectivity in a large number of users. Besides that, MySQL also has a transaction feature, especially when implementing the InnoDB engine. Transaction features in accounting are important so that data consistency occurs if the

storage process is carried out involving many tables. The following basic table designs are designed for the application of the MPTT method.

TABLE VII.   MPTT DATABASE DESIGN

#	Name	Datatype	Length/
1	id	INT	11
2	Account	VARCHAR	50
3	Code	VARCHAR	50
4	Lft	INT	11
5	Rgt	INT	11
6	parent	INT	11

This table is a basic table that can be developed further, for example, branch office codes, asset locations and so on can be added.

E. The Display Design Used for Data Charging

Display in data storage using html and css which is the basic language in web layouts. Basic display design:

Fig. 5.   CoA system user interface design.

F. Syntax Coding for Storing Data from the html Form to the Database.

The programming language that we use in this study is PHP. PHP is a language used for web-based applications, is open source and reliable on applications used in the scope of network applications. In implementing MPTT we use the Zebra MPTT library. Besides using zebra MPTT we also use the Idiorm library. Idiorm is a library that can be used for database storage with protection features against SQL injection and with the paradigm of a simple and easy database modification process.

The application of hierarical data to the chart of accounts, management and data acquisition is very easy. The MPTT library also applies a table lock mechanism to ensure that data integrity is maintained. This will certainly reduce costs in the process of developing a computerized accounting information system both in the form of time, costs, and in the form of code inefficiencies, thereby reducing the bugs that may occur because COA is the root of transaction processing in accounting. Besides that, using the MPTT method makes account storage unlimited and more flexible in contrast to COA design techniques with methods that have been ascertained against the number of children on a COA account.

G. CoA Implementation Output Results in the MPTT Method

The next ways after the system is finished, it then tests whether the output of the MPTT method matches the registered CoA data such as account, parent, child, left and right code. The output of the CoA implementation results in the MPTT method can be seen in table 8 below.

TABLE VIII.   OUTPUT OF CoA IMPLEMENTATION OF MPTT METHOD

id	account	code	lft	rgt	Parent
1	Asset	1	1	28	0
2	Equity	2	29	38	0
3	Liabilities	3	39	74	0
4	Current Assets	1.1	2	11	1
5	Non Current Assest	1.2	12	27	1
6	Cash and Cash Equivalent	1.1.1	3	6	4
7	Trade Receivables	1.1.2	7	8	4
8	Other Receivables	1.1.3	9	10	4
9	Fix Assests	1.2.1	13	14	5
10	Current Liabilities	3.1	40	61	3
11	Non Current Liabilites	3.1.1	41	42	10
12	Trade Payable	3.1.2	43	48	10
13	Thirs Parties	3.1.1.1	44	45	12
14	Related Parties	3.1.1.2	46	47	12

V. CONCLUSION

CoA are a fundamental part of accounting information systems. One method in designing a COA is to use MPTT. MPTT is a method of algorithm that is very fast in facilitating the creation of a framework of linkages between categories which in this case can be applied for COA design. besides in the context of COA MPTT also in accounting information systems can be applied in making hierarchical systems between branch offices. The MPTT method also facilitates management in making financial statements systematically so that it can facilitate the search for financial statement transactions.

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