Design and Implementation of Financial Workflow Model Based on the Petri Net

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Abstract. In order to ensure the reasonableness, accuracy and reliability of financial workflow nets, this paper analyzes the financial workflow features, and points out the mapping relationship between financial workflow diagram and Petri network. Then, it proposes one modeling method of financial workflow based on the Petri nets. In this paper, the FWF-net model is set up for a financial reimbursement workflow instance and analysis of that shows that the model is correct and reasonable. The model provides a theoretical basis for financial workflow modeling.

Keywords: Petri net, workflow, modeling, financial workflow net.

1 Introduction

Financial workflow is one of the most commonly used workflows in various enterprises and institutions. It is related closely to the economic interests of enterprises and institutions. With the rapid development of enterprises informationization, the diversification of participants and processing mode appears in financial workflow management [1]. The requirements of reliability of financial workflow improve continuously and a modeling method to be represented as a theoretical support is important. Distinguishing strictly the function and execution of activities, the Petri net is the first choice for financial workflow as a modeling tool.

Researchers have made some very meaningful work about financial workflow and Petri nets modeling. Na LiChun and Chen Qingkui [2] came up with financial regulatory data collection model based on concurrent workflow. According to the characteristics of the workflow of medical information system Yan Chungang [3] etc. constructed Petri nets models of medical information system in accord with the standard of IHE and provided theory for medical information system designing and modeling. However, there is still rare research to put financial workflow chart into Petri net model according to the characteristics of financial workflow. After analyzing the characteristics of financial workflow, this paper uses Petri nets modeling method to finance the workflow and comes up with the mapping relationship between the workflow chart and Petri nets. It puts forward the modeling method of the financial workflow net (FWF-net), and constructs the FWF-net model of the financial workflow and analyzes the rationality and validity of the model in the end.
2 Petri Nets

2.1 Definition of Petri Nets

Definition 1. A Petri net is composed by the four-tuple, namely $PN = (P, T; F, M_0)$, and: (1) Let $P$ be the set of the place node and $T$ be the set of the transition node. (2) Let $P \cap T = \emptyset$, $P \cup T \neq \emptyset$. (3) Let $F \subseteq (P \times T) \cup (T \times P)$ be the set of the directed arcs between the place nodes and transition nodes. (4) Let $M_0 : P \rightarrow N$ be the initial marking, where $N$ is the natural number set.

Definition 2. Petri nets are strongly connected graphs if and only if there exits one route from $x$ to $y$, which are any two nodes in the Petri net.

Definition 3. A Petri net $PN = (P, T, F, M_0)$ modeling is reasonable if and only if [4]: (1) There exits a route from node $M$, whichever can be reached from the initial node $I$, to termination node $O$, namely $\forall M \left( i \xrightarrow{*} M \right) \Rightarrow \left( M \xrightarrow{*} o \right)$. (2) The termination node $O$ is the only final node that the initial node $I$ reaches, and contains at least one token in the end, namely $\forall M \left( i \xrightarrow{*} M \wedge M \geq O \right) \Rightarrow (M = O)$. (3) There is no dead transition in $PN$, namely $\forall n \in T \exists \text{ } M_1, M_2 \left( i \xrightarrow{*} M_1 \xrightarrow{t} M_2 \right)$.

2.2 Graphic Representation of the Petri Net Basic Structure

Five basic structures in Petri nets are shown in Figure 1: (1) Sequence structure, (2) Parallel split structure, (3) Parallel synchronous structure, (4) Mutex choice structure (5) Simple rendezvous structure.

![Fig. 1. Five basic structures.](image)

3 Financial Workflow Nets Model

3.1 Financial Workflow Characteristics

As one kind of workflows, financial workflow has its own characteristics: (1) Definiteness. As financial workflow standard is unified, workflow net model have to be unambiguous and definite to ensure that every node is reachable. (2) Flexibility. Routing in the financial workflow is flexible such as jumping and backing in the financial workflow. For example, there is necessity to back to the workflow node already dealt with or jump some nodes for some reasons. (3) Extensibility. To get more information or ensure the financial work is reliable, the current checker can ask