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## The Study for Workflow Analysis Method for Time Interval and Frequency Measuring based on Petri-net

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### Abstract

**Aim:** Study formal methods on workflow analysis for time interval and frequency measuring, which can provide quantitative assessment and be automatically implemented on computer; **Methods:** Capitalize the basic theory of Petri-net to extract workflow model, illustrate the process of time interval and frequency measuring, assert whether the result is right or not, provide optimal path selection, record the numerical value of testing result until the end of the test; **Results:** Relying on workflow analysis, not only automatic measuring is implemented, also the validation of the process is offered; exemplify the practical situation and summarize the key points of practical experiments. **Conclusion:** The presented Petri-net based method, in principle, can be applied to key equipments, such as equipments in the fields of spaceflight, nuclear security control, and testing meters in massive scale projects, builds the basic theoretical foundation for automatic test.

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*Keywords:* Petri-net ; Time interval and frequency measuring; Workflow ; Automatic test.

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## 1. Introduction

With the significant development of information and digital technology, the requirement of test on massive scale systematic equipments, such as those crucial devices used on airplanes, space shuttles and nuclear projects, is growing rapidly, so the authentication of the testing process is extremely required besides the accuracy and reliability of testing results, under which situation the traditional hand-programmed planning has been out of date. It is reported that due to the misuse of a single programming statement in the testing stage before launching, American space shuttle Columbia crashed, leading onboard crew killed, and loss of billions of dollars. Accidents like this are certain to raise the care of implementing automatic test on key equipments to avoid accidents and sequent huge loss.

This paper proposes a Petri-net based analysis method for time interval and frequency measuring, which aims to provide verbose and exact steps and scientific benchmark for automatic implementation. In the remainder, this paper firstly introduces the application background and manual operation procedure of time-interval and frequency meter, and analyzes the application configuration. Secondly, introduces the Petri-net theory and key points of workflow analysis, mainly focus on the process of time interval and frequency measuring method using Petri-net model. At last, the paper concludes with the summary of the presented method.

## 2. Introduction Description and remarks on application background and manual operation of time-interval and frequency meter

### 2.1. Application background

Today, there are many types of the already wildly used intelligent time interval and frequency meters available. The basic design spirit is, with the support of embedded processors and corresponding software, to automatically implement auto-test, system incorporation, issue the initial pulse, and divide frequency, then drive the counter to work, at last proceed validation and verification, finish with frequency count and time calculation. The main steps are listed as follow:

Step1 Device starts; check currency and voltage, if normal, move to next step;

Step2 Proceed self-test, input pre-set check pulse count, if right, forward to next step;

Step3 Wait for key-press, press function key, function key show FUC, wait for key-press, show state FA, wait for key-press, press measuring key, send time scales to channel B.

Step4 Check if been self-triggered, if so, take pre-set UA , move to next step, or tune AUTOL, take UA and return, move to next step;

Step5 Send UA via D/A, clear counter A and B, start CTC1\2, call gate procedure, wait for gate to close, close the gate, read numerical value, process and show the data;

Step6 Check the result of count, if has been steady, press record key, store the result on screen, or move to step4.

Explanations:

- Step1-Step3 are actions for preparation, in Step3 after each manual key-press, when ready state is shown, press once again, until time scale state is shown, Step6 is manually operational procedure;
- In step4 and step5, CPU runs automatically;
- Gate procedure belongs to associate software model, which would be extracted as interface event.

### 2.2. Problems of man-machine mixed operation

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