중대사고 조건에서 회로 모델링 모의시험을 통한 새로운 신호분기의 설계

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Design for a New Signals Analyzer through the Circuit Modeling Simulation under Severe Accident Conditions

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Abstract

The circuit simulation analysis and diagnosis methods are used to instruments in detail when they give apparently abnormal readings. In this paper, a new simulator through an analysis of the important circuits modeling under severe accident conditions has been designed, the realization for a body work instead of the two sorts of the Labview & Pspice as an one order command in the Labview program. The program can be shown the output graph form the circuit modeling as an order commend. The procedure for the simulator design was divided into two design steps, of which the first step was the diagnosis methods, the second step was the circuit simulator for the signal processing tool. It has three main functions which are a signal processing tool, an accident management tool, and an additional guide from the initial screen.

I. Introduction

Some abnormal signals diagnostics and analysis through the important circuits modeling including active elements under severe accident conditions have been performed. Unlike the design basis accidents, there are inherently some uncertainties in the instrumentation capabilities under severe accident conditions. Various methods to obtain information during a severe accident have been suggested. The circuit simulation analysis and diagnosis methods are used to assess instruments in detail when they give apparently abnormal readings [1-2]. The simulations can be useful to investigate what the signal and circuit characteristics would be when similar to a variety of symptoms that can result from severe environmental conditions [3-4]. In this paper, a new simulator through an analysis of the important circuits modeling under severe accident conditions has been designed, the realization for a body work instead of the two sorts of the Labview & Pspice as an one order command in the Labview program. The procedure for the simulator design was divided into two design steps, of which the first step was the diagnosis methods, the second step was the circuit simulator for the signal processing tool. It has three main functions which

are a signal processing tool, an accident management tool, and an additional guide from the initial screen. This simulator should be set up in a laboratory and the signals evaluated under various degraded conditions.

II. Design Step of the Circuit Simulation and Diagnosis Methods

2.1 Design Step of the Diagnosis Methods

When an instrument which is providing information for managing a severe accident is apparently malfunctioning, a series of steps can be taken which include a direct diagnosis of the instrument and an indirect method of determining the value of the parameter. These methods are identified by eleven step processes and five of the steps are called operational aids. They are combinations of diagnostic actions and other means of a measurement. These can be applied when instrument readouts are suspectful or faulty. The five types of aids are the diverse indication, parameter inference, portable instrument, circuit diagnosis, and the portable circuit readout.

2.2 Design Step of the Circuit Simulator

Figure 1 shows a flow chart of the design step for the simulator. It has three main functions which are a signal processing tool, an accident management tool, and an additional guide from the initial screen. The signal processing tools have the main positions information obtained from 5 areas in the containment building which include the information needs of the instruments, and the circumstance parameters from the accidents class. As the next step, we need the decision making from some signals which means three kinds of signal patterns, of which the first one is normal condition signals, the second one is abnormal signals, and the third one is out of control signals. In the case of abnormal signals, they have to be processed by five step and finally they can be shown on a CRT screen with enhanced signals. There are two codes to be used, the designed simulator which is composed of the LabVIEW code as a main tool and the PSpice code file as an engine tool which should be exported to the LabVIEW code file. A new simulator through an analysis of the important circuits modeling under severe accident conditions has been designed, the realization for a body work instead of the two sorts of the Labview & Pspice as an one order command in the Labview program.

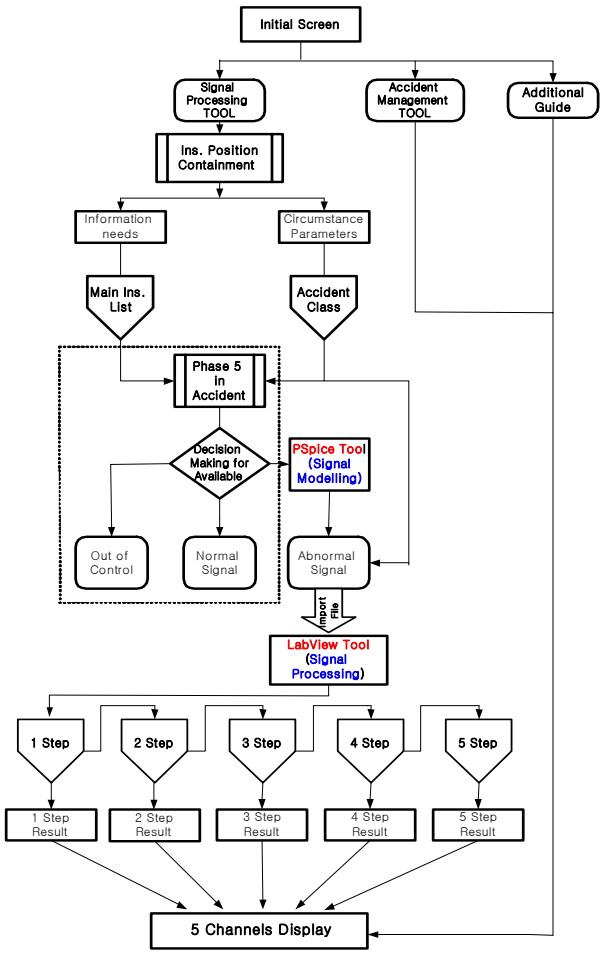

Fig. 1 Flow chart of the design step for the simulator

III. Design Requirements and Functions

3.1 Method of the circuit simulation

A circuit modeling package is required which supports the simulation of the circuit models and degradation mechanisms. This includes the ability to vary the values of the components within the circuit, addition of noise sources and the simulation of temperature and moisture effects, as well as a comparative analysis of the results of these changes to the circuit.

3.2 Circuit simulation technique

Circuit simulation models were created for each instrument loop. The simulation included detectors, transmitters, field-end preamplifier or signal conditioners, terminal blocks, splices, cables, penetrations, and other components. Individual circuit board components were not modeled. The simulation consisted of modeling these basic building blocks of an instrument loop as equivalent electrical circuits. Either a partial state of degradation for each environment or complete failure is addressed for each circuit. The general steps in the simulations are the 5 steps mentioned above. Once these models are developed, they can be used to determine if suspected fault conditions really exist. To systematically evaluate each type of circuit, six generic abnormal conditions were defined: upscale, downscale, higher than expected, lower than expected, varying excessively, and unchanging.

3.3 Procedure for an One Body Simulation

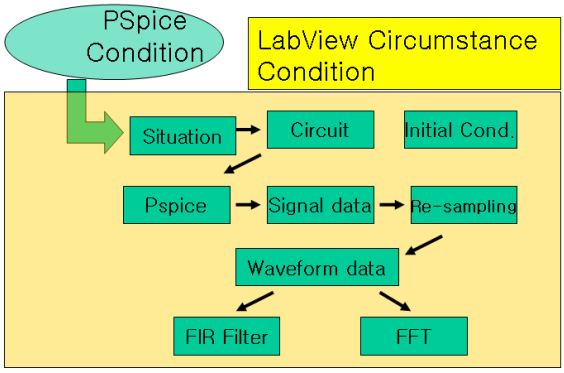

Fig. 2 Procedure for an one body simulation

Figure 2 shows the procedure for an one body simulation. The first time, the establishment for the simulation circuit modeling by the PSpice code, where are the PSpice simulation output file as text file; *.cir, *.sim, *.net file. Next step need to information of the circuit elements from the *.net file, and than the *.net file can be controlled by the element in the circuit, using the Labview *.net file condition, and than take out the csd file from the *.net file in the Labview, and than execute as the *SystemExec.vi* file of the PSpice condition. At last step take out the output results from the csd file, and than the file can be displayed as a graphic.

3.4 Merit for the a body simulation

There is the two sort of the program, PSpice & LabVIEW, which can work as a body in this simulation. The result data can be taken by one operation as an order. So the program can speedy and convenient for us. To change the element value in the circuit, it is available to be wanted the element value as a LabView management, and than we want the graphic which can be shown, specially it is possible to change the output according to the element value. It is also easy and conveniently to the signal analysis for many kind of noise patterns. The output results can be extended to analyze by the tool, because the Labview have the powerful tools

Ⅳ. 4~20mA Loop Circuit Modeling, Simulation, and Evaluation

The loop circuit was composed of three functions which included the pressure transmitter section, the twisted shielded pair connection cable section, and the receiver section. The pressure transmitter has been simplified to obtain an equivalent representation of the resisters, capacitors, and inductors. It also includes voltage or current sources that can be varied through the circuit analysis program to obtain realistic circuit responses from environmental changes in the containment. Figure 3 shows 4~20mA

circuit modeling

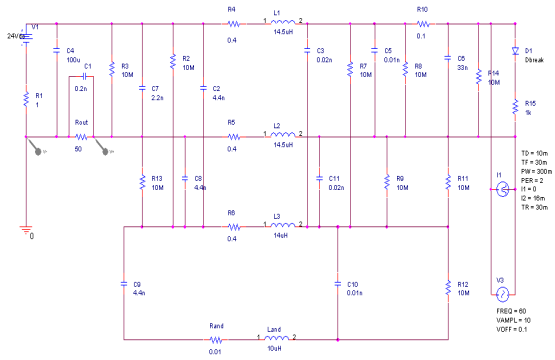

Fig. 3 4~20mA circuit modeling

The specific parameter includes: Input leakage (shunt) resistance that is affected by damages to the interconnecting cable. Input series resistance to represent the spliced connections that might be affected by a corrosion. Input capacitance is easily increased by a water intrusion into the cable or the transmitter housing. Capacitance for the ground is easily increased by the presence of water. A diode and load resistors represent the power supply current. A current generator represents the actual transmitter output signal. A typical cable is represented to describe the wire inductance and resistance and the dielectric capacitance. The shield is represented as a third conductor. It is simplified to eliminate all the resistance and to model only the inductance and capacitance. The voltage source drives a current to a voltage sensing resistor in series with the transmitter. The negative sides of the voltage source and the shields are attempted for the ground in this analysis. Figure 4 shows the result data from an one body simulation

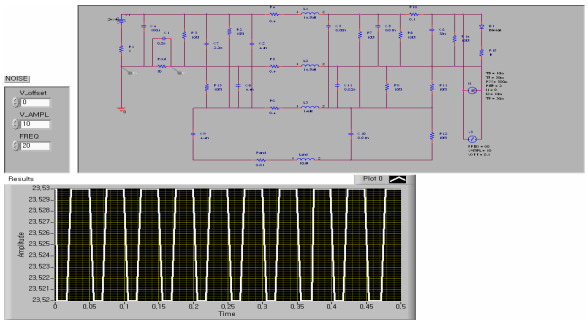

Fig. 4 Result data from an one body simulation

V. Summary and Conclusions

In this paper, a new simulator through an analysis of the important circuits modeling under severe accident conditions has been designed, the realization for a body work instead of the two sorts of the Labview & Pspice as an one order command in the Labview program. The result data can be taken by one operation as an order. So the program can speedy and convenient for us. To change the element value in the circuit, it is available to be wanted the element value, as a result, we want the graphic which can be shown, specially it is possible to change the output according to the element value. It is also easy and conveniently to the signal analysis for the so many kind of noise patterns. The output results can be extended to analyze by the tool, because the Labview have the powerful tools

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