DISSERTATION

Binary Series Analysis in Application to Alarm Correlation Methods in Mobile Telecommunication Networks

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Abstract:

Today-present, advanced systems such as mobile telecommunication networks characterized by increased complexity make maintenance routines difficult. Amount of data to be analyzed in a short time during fault diagnosis of mobile telecommunication networks strongly justifies the need to automate the alarms correlation and root cause analysis. A major challenge in the alarms correlation process is to determine how to reflect on the alarm flow inertia. Thus, the alarm pattern discovery with a dynamic correlation window should be used in fault diagnosis for alarms correlation purposes.

The automatic alarm pattern discovery allows fast generation of root cause analysis hypotheses and supports effective troubleshooting of network problems. The propagation process of alarms related to the faults throughout the network is manifested by the time lag between the fault accident occurrence and potentially linked symptoms which are observed. In most of the cases the correlation strength is weakening with the time.

The dissertation presents an overview of mobile telecommunication networks management aspects, with particular emphasis on the alarms correlation methods. A novel approach for alarms correlation in mobile telecommunication networks based on analysis of binary series representing alarms generation time attributes has been presented. The method allows detection of a causal relationship between alarms with a dynamic estimation of the alarm correlation window size. In addition, the technique for alarms correlation based on cluster analysis using the k-means method with a topological filtering was proposed.

Keywords: mobile telecommunication networks diagnosis, alarm correlation, cluster analysis, binary series, (Dice, Dice1, Dice2) similarity coefficients, Hamming distance

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