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DEVELOPMENT OF AN INTELLIGENT SYSTEM FOR OPERATOR
SUPPORT DURING WIRELESS INFRASTRUCTURE SYSTEM TESTING

CRANFIELD DEFENCE AND SECURITY

PhD THESIS

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Abstract

Intense competition and the requirement to continually drive down costs within a mature mobile telephone infrastructure market calls for new and innovative solutions to process improvement. One particular challenge is to improve the quality and reliability of the diagnostic process for systems testing of GSM and UMTS products. In this thesis, we concentrate on a particularly important equipment type – the Base Transceiver Station (BTS). The BTS manages the radio channels and transfers signalling information to and from mobile stations (i.e. mobile phones). Most of the diagnostic processes are manually operated and rely heavily on individual operators and technicians' knowledge for their performance. Hence, there is a high cost associated with trouble-shooting in terms of time and manpower. To address this issue, we employ Bayesian networks (BNs) to model the domain knowledge that comprises the operations of the System Under Test (SUT), Automated Test Equipment (ATE) and the diagnostic skill of experienced engineers, in an attempt to enhance the efficiency and reliability of the diagnostic process. The proposed automated diagnostic tool (known as Wisdom) consists of several modules.

An intelligent user interface will provide possible solutions to test operators / technicians; to capture their responses, and to activate the automated test programme. Server and client software architecture will be used to integrate Wisdom with the ATE seamlessly and to maintain Wisdom as an independent module. A local area network will provide the infrastructure for managing and deploying the multimedia and text information in real time. We describe how a diagnostic model can be developed and implemented using a Bayesian network approach. We also describe how the resulting process of diagnosis following failure, advice generation and subsequent actions by the operator are handled interactively by the prototype system.

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