

DEVELOPMENT OF A MULTI AGENT SYSTEM FOR VOLTAGE AND OUTAGE MONITORING

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Declaration

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Abstract

This thesis presents a research work which is carried out to implement a multi agent system for voltage and outage monitoring system for Sri Lankan electricity distribution network. In Sri Lankan distribution network most of the new technological features can be seen in the different part such as automated meter reading, remote breaker operations. But distribution system fault identifications, voltage monitoring and network reconfiguration are carried out using basic technologies.

Automated Meter Reading (AMR) system is introduced to read analogue energy meters remotely. Research on agent based AMR system is established with four major projects. Those are Agent based meter reading system, network resource planning of the agent based system, agent network reconfiguration and restoration project and Agent based voltage and outage monitoring system

This particular research is on a development of Agent based voltage and outage monitoring system formulated for power distribution network using Multi Agent System. Establishment of agent based monitoring system is developed with the defined model in a part of the area network. The model is established to represent the distribution network and to collect voltage and interruption data to the server. Five major agents namely, Database Agent, Meter Agent, Breaker Agent, Area network Agent and Reporting Agent are defined.

Voltage data collected from GPRS meter reading technique in Maharagama area is selected for the case study. Six different data sets are considered under the case study. There are four different types of voltage failures are identified as High voltage, low voltage, Branch failures and individual meter faults. These four scenarios are compared with conventional method and agent based system.

Agent based monitoring system is continuously updated through GUI and it would visualise the voltage level of the network. It would enhance the functions of the control room operator. Transformer setting changes can be changed while monitoring high voltage and low voltage areas. Distribution network augmentation can be done with monitoring system by increasing transformer capacity or introducing new transformer in identified areas.

Different types of GUIs are established to maintain easy monitoring system and reporting system. The reporting system is included the agent based report generation for power quality measurement indexes. Individual index vales of each consumers and the whole area network index can be monitored through this system. Scalability and the flexibility of the monitoring system increased with defined Multi Agents.

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List of Abbreviations

Abbreviation	Description
CEB	Ceylon Electricity Board
LECO	Lanka Electricity Company
MAS	Multi Agent System
AMR	Automatic Meter Reading
GUI	Graphic User Interface
IEEE	Institute of Electrical and Electronics Engineers
USB	Universal Serial Bus
SCADA	Supervisory Control and Data Acquisition
CAIDI	Customer Average Interruption Duration Index
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
FIPA	Foundation for Intelligent Physical Agents
ACL	Agent Communication Language
JADE	Java Agent Development Environment
AMS	Agent Management System
DF	Directory Facilitator
MTS	Message Transport System
AP	Agent Platform



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