UNIVERSITI TEKNIKAL MALAYSIA MELAKA

APPS BASED SAG AND TRANSIENT IDENTIFICATION FOR POWER QUALITY MONITORING

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology with Honours.

by

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I hereby, declared this report entitled Apps Based Sag And Transient Identification for Power Quality Monitoring is the results of my own research except as cited in references.

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Date: 19 January 2021

APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology with Honours. The member of the supervisory is as follow:

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Co-supervisor: JOHAR AKBAR BIN MOHAMMAT GANI

ABSTRAK

Projek ini memperkenalkan reka bentuk dan pengembangan sistem pemantauan kualiti kuasa berasaskan aplikasi untuk meningkatkan kebolehpercayaan kuasa di kalangan pengguna. Aplikasi ini memainkan peranan penting dalam mengesan kesalahan dan menetapkannya dengan menghantar mesej ke bilik kawalan. Aplikasi ini menyediakan operasi pemantauan kesalahan dan pengumpulan data untuk analisis. Reka bentuk projek ini akan bertujuan untuk mengembangkan sekumpulan model asas untuk mensimulasikan voltan lendur dan voltan sementara menggunakan MATLAB / Simulink. Microchip akan diprogramkan ke jenis kesalahan tertentu untuk voltan kendur atau voltan sementara ketika menerima data dari MATLAB / Simulink. Selepas itu, status akan muncul di paparan telefon dan Modul Wi-Fi akan menghantar maklumat secara langsung ke bilik kawalan sebagai memberi amaran kepada operator mengenai keadaan semasa melalui Antaramuka Pengguna Grafik (GUI). Akhirnya, sistem ini dapat mengesan voltan kendur atau voltan sementara dan waktu permulaan dan akhir gangguan berlaku, sehingga siap untuk dihubungkan dengan Aplikasi yang lengkap.

ABSTRACT

This project introduces the design and development of an App-based for power quality monitoring system to increase the reliability of power among the consumers. The App plays an important role in detecting faults and assigned it by sending message to control room instead. The App provides monitoring fault operation and data collection for analysis. The design of this project will be aimed on developing a set of basic models to simulate a voltage sag and voltage transient using MATLAB/Simulink. The microchip will be programmed to a specific type of fault for voltage sag or voltage transient condition when it receives data from the MATLAB/Simulink. After that, the status will be appeared on the phone display and Wi-Fi Module will send the information directly to control room as warning the operators on the current situation via Graphical User Interface (GUI). Finally, the system can detect the voltage sag or voltage transient and the starting and ending time of the disturbances occurred, thus ready to be interfaced with the complete App.

DEDICATION

To my beloved parents

Mohd Naseri Bin Che Ahamad

Norizam Binti Mat Daud

Siblings

Mohd Rifqi Bin Mohd Naseri

Mohd Rifa'ie Bin Mohd Naseri

Nurul Izzati Binti Mohd Naseri

Nurul Izyani Binti Mohd Naseri

Nurul Najwa Binti Mohd Naseri

Nurul Najihah Syamimi Binti Mohd Naseri

Nur Fatin Firzanah Binti Mohd Naseri

Nur Afiqah Faqihah Binti Mohd Naseri

Supervisor

Mr. Ahmad Idil Bin Abdul Rahman

Co-Supervisor

Mr. Johar Akhbar Bin Mohamat Gani

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LIST OF SYMBOLS

I/O	-	Input/output
Kv	-	kilovolt
Pu	-	Per Unit
ψ(t)	-	Continuous Function in Both Time Domain
W	-	Angular velocity
X	-	Displacement
Z	-	Height
Q	-	Angle
ms	-	milisecond
ns	-	nanosecond
µs	-	microsecond
mV	-	millivolt
V	-	Volt
I/O	-	Input/output
Kv	-	kilovolt
Hz	-	Hertz

LIST OF ABBREVIATIONS

GUI	Graphical User Interface
EPS	Electrical Power System
IEEE	Institute of Electrical and Electronics Engineers
PQ	Power Quality
IPDQA	Intelligence Power Quality Data Analysis
RMS	Root Mean Square
ESD	Electrostatic Discharge
L-G	Line-to-Ground
L-L-G	Line-Line-to-Ground
L-L-L-G/L-L-L	Line-Line-Line-to-Ground
EMI	Electromagnetic Interference
RFI	Radiofrequency Interference
CWT	Continuous Wavelet Transform
DWT	Discrete Wavelet Transform
IDE	Integrated Development Environment
PWM	Pulse Width Modulation
GPIOs	General Purposes Input Output

CHAPTER 1

INTRODUCTION

1.0 Introduction

This primary chapter will clarify the project background, problem statement, scope, expected outcomes and objectives of this project.

1.1 Background

In an electrical power system, power quality monitoring is an important service offered to their industrial and main commercial customers by electrical utilities companies. There are many kinds of faults, the complex of power supply operation and the increased use of nonlinear loads also cause disturbance in power quality. Software technology advancement have made the monitoring very effective. The power quality (PQ) analysis is mostly based on off-line analysis while monitoring the data instead of the captured data being processed in real-time. A real-time processing means completing the processing between samples within the time allowed or available.

The PQ disturbances cause enormous financial losses to electricity companies, their customers, and electrical suppliers (especially industrial customers). Most consumers of electricity do not know how the PQ disturbances effect the power system. The cause of damaging effect that occurred from PQ problems lead to load maloperations, instabilities and short usage of lifetime. A real-time analysis is one of the important

considerations to implement the steps to avoid PQ disturbance for the power utilities and customers. It is significant to know the types of PQ disturbances and ways to mitigate them so that the accident in power system can be avoided. A powerful software tools are needed to perform automatic, efficient, and accurate analysis of PQ disturbance.

There are of various techniques to process the signal for automated detection of PQ disturbance analysis such as speech recognition, wavelets, RMS, and time-frequency. Some PQ disturbance analysis software tools have based on these techniques developed such as the Intelligence Power Quality Data Analysis (IPDQA) and smart harmonic disturbance analysis. One of the most used methods in research is designing a model and simulation to analyze the PQ disturbance in power system. Various waveforms and data of PQ disturbance are generated by using a simulation that can be beneficial for the disturbance identification.

In this project, a new PQ disturbance analysis and identification software tool has been developed to build an App based monitoring system. The App is created using the wavelet transform, MATLAB software with Graphical User Interface (GUI) and the Arduino UNO.

1.2 Problem Statement

Traditionally, disturbances were analyzed by visual inspection of the signals, so that the knowledge of the engineers played a critical role in the monitoring process of Electrical Power System (EPS). Engineers were overwhelmed with a huge amount of information that what made this methodology was inefficient and ineffective. This was evident that, to determine the causes and sources of disturbances, an application should