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SCIENTIFIC ARTICLE (ENGLISH)

TOPIC:

"**DESIGN AND IMPLEMENTATION OF AN INTERFACE FOR CONTROL AND DATA ACQUISITION OF CONTROLLER (PLC TJ 509) ELECTRIC GENERATOR TECHNICAL UNIVERSITY OF NORTH USING LABVIEW**."

AUTHORS ':

Toapanta Sarzosa Israel Guillermo
Tocagón Tocagón Wilson David

DIRECT:
ING. PABLO MENDEZ

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DESIGN AND IMPLEMENTATION OF AN INTERFACE FOR CONTROL AND DATA ACQUISITION OF CONTROLLER (PLC TJ 509) ELECTRIC GENERATOR TECHNICAL UNIVERSITY OF NORTH USING LABVIEW

Toapanta Israel G.
Tocagón Wilson D.

Engineering in Electrical Maintenance, Technical University Northern, Avenue 17 de Julio 5-21, Ibarra - Ecuador.

guillyboy_657@hotmail.com – david2t@yahoo.com

ABSTRACT: This paper aims to implement the emergency power of the Technical University of the North, the design of an interface data acquisition to monitor the different electrical parameters in real time, which should be helpful for the operator, because it is a practical and able to be understandable for computer users, also an Myrio system for synchronization with the PC is added, and also send data in real time to a tablet. The project is structured as follows: CHAPTER I formulated and defined the research problem, objectives raised; a general and four specific, which were the basis for the course of the investigation. CHAPTER II contains the theoretical basis of the systems of control, SCADA system, LabVIEW software, artificial vision, Myrio, and elements or equipment necessary for the preparation of the project. CHAPTER III research methodology used to prepare the project and the methods and techniques used for execution described. CHAPTER IV contains the development of the proposal for the design of a HMI on the front panel, as well as programming in the block diagram for the creation of the HMI screen and programming LabVIEW 2014 software was used in the packets of vision and motion, for data Acquisition webcam not very high quality is also implemented, and a lamp for proper illumination of the object to focus on camera, in this case installed would be the controller screen. CHAPTER V some recommendations based mainly on the findings for the project is drawn up, bibliographical sources, references, and photographic attachments are also included.

1. Introduction

This work consists of designing a machine vision system for constant monitoring of the controller 509 TJ emergency power generator. This system acquires the electrical parameters displayed on the screen of the controller via a webcam as a digital image, it is processed on a PC, so you can view data obtained by an HMI (human machine interface).

It consists of an embedded data acquisition system Myrio, its main function is to send the processed data from the PC to a tablet, through the WIFI network that is built into the device.

LabVIEW software and platform vision and motion program was used, because it is one of the best methods understood by the user for programming acquisition and image processing. This software was designed HMI for visualization of electrical parameters displayed on the controller screen generator.

To conclude the work, it took different tests to meet the goals, to thereby provide any operator to have a good understanding, at the time of monitoring data obtained.

Rodríguez, P. A. (2007). *Sistemas SCADA*. México, DF: Alfaomega.

1.1 Problem Statement

Because of the drawbacks of the operator of the electric generator of the Technical University of the North, to obtain real-time data from the controller display, it requires the implementation of an artificial vision system for constant monitoring of the system.

Systems interface between user and plant-based panels full control lights, measuring instruments and switches, are being replaced by digital systems, which implement a control panel on the screen of a PC, which enables control and monitor the entire system from a personal computer.

Due to the above drawbacks, it was decided to design and implement a system of artificial vision in the emergency power of the university, to thereby achieve an expansion of knowledge on monitoring and real-time monitoring via a front panel because today it is one of the premier technology.

1.2 Objectives

1.2.1 General Purpose

Design and implement an interface for control and data acquisition controller (PLC TJ 509) of the electric generator Technical University Del Norte using LabVIEW.

1.2.2 Specific objectives

- Conduct a comprehensive study on the types of automatic control systems in generators and real-time monitoring: advantages, disadvantages, limitations and performance.
- Determine the technical designs that justify the use of instruments and equipment required for monitoring signals for monitoring.
- Implement a monitoring screen in which you can monitor in real time all the data showing the controller screen.
- To determine the advantages and disadvantages of using an efficient supervision and easily understood by the user.

1.3 Project Justification

Systems power generation have had a great evolution globally, with the aim of providing continuity to the service users, increased reliability and high efficiency in operation. These changes are primarily focused on obtaining more accurate measurements, reducing the response time in the presence of disturbances and inform the operator through a sound or light alarm detected faults.

A software development, is what allows the operator to more easily act at the time of a failure, such as increased temperature, variation in the electrical quantities, fuel level, depletion of the power supply, among others. It also lets you know how long it stays on, the amount of energy generated in Kw / h, and the moment in which I was in and out of operation.

For these reasons a system of artificial vision is implemented, the same that will monitor the proper functioning of the electrical generator, without the need to be in direct contact with the driver generator.

The implementation of artificial vision system will help everyone, especially students of Engineering in Electrical Maintenance, and it will release the basic operation of one of the newest technology applications in business and industrial fields.

Based on the respective studies, it is found that the present research is feasible in economic and social sphere, as it is an issue that does not require the purchase of high cost devices. It also requires a comprehensive study as regards monitoring systems, using artificial vision. Formed in elementary programming LabVIEW software and virtual instruments used in system development.

2 THEORETICAL FRAMEWORK

2.1 SCADA System

Supervisión de control y adquisición de datos SCADA, proviene de las siglas en inglés (supervisory control and data adquicition), son aplicaciones de software diseñados para funcionar sobre ordenadores, con el objetivo de controlar y monitorear procesos de producción a una determinada distancia, dependiendo de la red de comunicación. Este sistema se basa en la adquisición de datos de los procesos remotos desde la pantalla de un ordenador personal o paneles de control. (Corrales, 2007)

2.2 Interface man - machine interface (HMI)

A man - machine interface called HMI, is an element that allows an operator to interact with a machine or process and determine the operating status and parameters of the devices and the ability to control existing physical variables in a plant or industrial process.

An HMI can be as simple as a switch to turn a motor and an LED that indicates the status thereof, to one or several control panels developed on a computer that come to show schematic representations of the process under supervision, including values real-time variables in the production process

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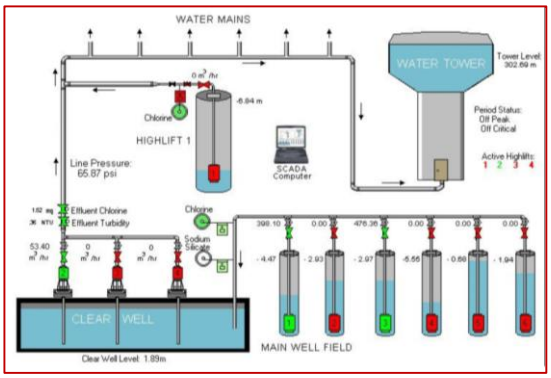


2.2 LabVIEW Software

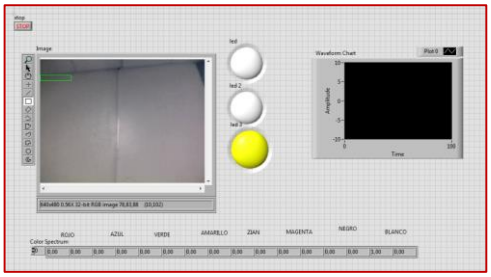
LabVIEW software is the platform on which the machine vision system was developed. LabVIEW The word comes

from the acronym in English Laboratory Virtual Instrument Engineering Workbench is a graphical development environment with integrated data acquisition, control equipment and measurement analysis functions. LabVIEW presents a graphical programming environment in which you can create applications much faster and easier way than other similar programs. (Bathrobe & Lagos, 2008)

LabVIEW offers all kinds of powerful tools to create applications for control and monitoring of industrial processes. For programming tools and devices placed already built in this way to quickly create human machine interfaces. (Bathrobe & Lagos, 2008)

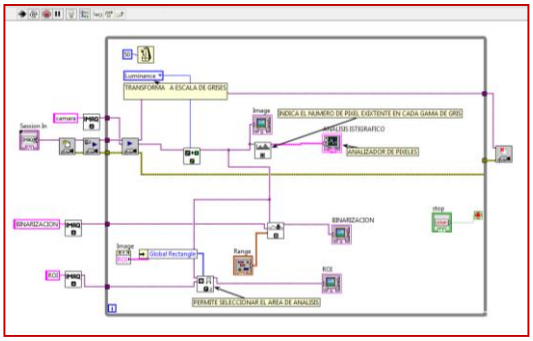
2.2.1 Front Panel

A real instrument has a front panel where the buttons are, screens, switches, controllers, etc. and an internal circuitry. The interactive user interface of a VI is called a front panel, because it simulates the panel of a physical instrument.



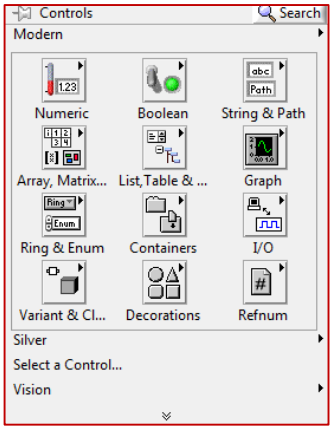
2.2.2 Block Diagram

The block diagram is the source code of the VI and its complementary part, where the front panel objects appear as terminals. Contains functions and built-in libraries LabVIEW, which through specific cables for each function can connect all nodes in a virtual instrument structures, controls, indicators terminal, functions and structures have a block diagram.



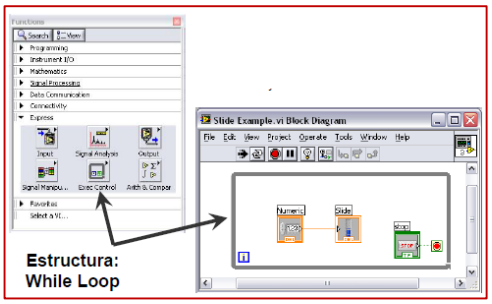
2.2.3 Control palette

The Control palette is used to select and place the drivers and indicators in the front panel. These tools can only be found on the front panel to access must make a right click on the area of the front panel and displays a palette with different functions. (Lojan & Iñiguez, 2009)



2.2.4 Function Palette

This tool is used to build on the block diagram, which is only available to work on the programming part, the only is found in the block diagram to access this tool must be done right click on the work area. (Lojan & Iñiguez, 2009)

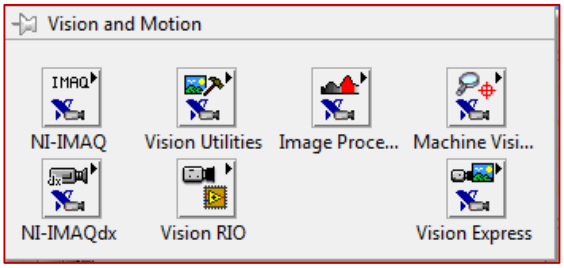


2.3 NI Vision

Most modern industrial field, require a development vision for the analysis of their tasks, allowing the acquisition of moving images and use robotic vision for the analysis of measurements taken from each of the processes (Tello & Salcán , 2009)

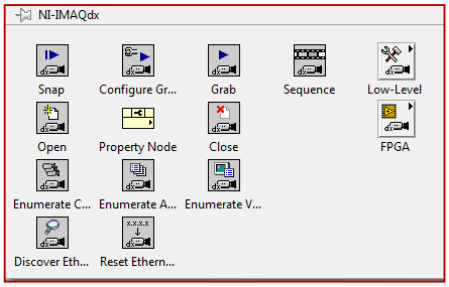
2.3.1 Vision and Motion.

It contains a number of vision-related packages that facilitate the design and implementation of machine vision systems and their adaptation to moving technologies. It incorporates multiple functions that can acquire images from multiple cameras and process improvement way as to improve the image, identify edges of objects, identify color, check for any object, measuring parts, among other functions. 2.17 image packages incorporating vision and motion shown.



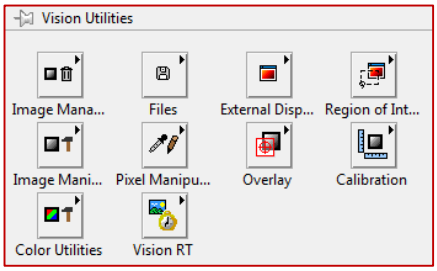
2.3.2 NI IMAQdx

This package is required to start acquiring an image from the outside by means of a camera and allow open and close an interface.



2.3.3 Vision Utilities

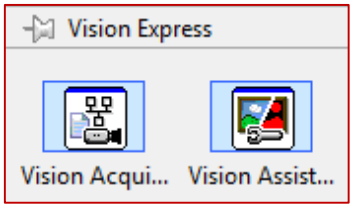
This palette of functions allows you to process images acquired by the camera, or extracted from a file. Here the region of interest is set to analyze an image, convert to grayscale, analyze colors and functions for image processing.



2.3.4 Vision Express

Allows image acquisition of a fast, also allows image processing using two applications are: vision acquisition and vision assistant.

- Vision acquisition: set in an easy acquisition of analog cameras, digital cameras, camera link, etc.
- Vision assistant: performs tasks common image processing.



2.4 Machine Vision

You can define machine vision as a field of artificial intelligence, the same as using the right techniques, allows the collection, processing and analysis of any information obtained through digital images (Minesterio of Education, 2012)

2.4.1 Image acquisition

It is one of the most important processes, the objective of this process is to acquire the image for further processing, here the success or failure of the system is determined, so it is essential to acquire an image of good quality, to thereby use the least amount of algorithms for improvement. (Cardenas & Llerena, 2012)

2.4.2 Digital Imaging

The image in computer vision is defined as the spatial distribution of light intensity in a scene and mathematically plotted coordinates f (x, y). While the digital image is defined as the discrete spatial distribution of light energy in a scene nxm pixels formed by.

2.4.3 Region of interest ROI

This tool is one of the first steps to perform almost all operations quantization of images, which is necessary to delineate the region of interest, that is just what we need in order to rule out the trivial data, the best way to use ROI it is plotting or framing that area of interest to select all, considering that should only select data useful.

2.5 NI MyRIO

The Myrio device (Reconficugareble Input Output) is an embedded device design, mainly used in data acquisition, created to help students develop real systems engineering and complex, faster and more easily.

3 Proposal

"DESIGN AND IMPLEMENTATION OF A CONTROL AND INTERFACE FOR OBTAINING

THE DATA CONTROLLER (PLC TJ 509) ELECTRIC GENERATOR TECHNICAL UNIVERSITY OF NORTH using LabVIEW"

3.1 Purpose

Implement an interface for data acquisition controller (TJ 509) electric generator Technical University North using LabVIEW.

3.2 Introduction

This paper aims to design an interface for data acquisition controller (PLC TJ 509) electric generator Technical University North based on their respective study.

By referring to the form to be used, you must have the capacity and sufficient solidity to the development of the project, which will be to obtain data using a web camera and to transfer to a computer where an HMI is built and installed in this case the front panel where you can see all parameters, such as voltage line 1, line 2, line 3, frequency, temperature and DC voltage.

In addition, it was necessary to design a metal stand for holding the camera, which should remain still and keep up screen controller, which is to display the data, also it was implemented, tape leds white light for better illumination.

This system is controlled by LabVIEW software, which features the toolkit vision and motion, which is critical for image acquisition, also works with the Myrio, which has the same software LabView.

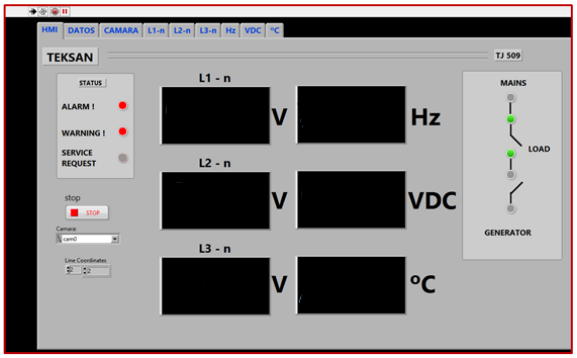
3.3 Design Analysis

The design of artificial vision system in this work was performed according to basic electrical parameters displayed on the controller display, which serve as a reference for monitoring by the operator.

3.4 Design of HMI

The man -machine interface is designed according to the specifications and system requirements, so you can visualize it all the processed data on a single screen presentation. LabVIEW software allows you to design a recreational HMI according to the needs and tastes of each user.

HMI design was created to work on a new VI. On the front panel, the tool was used tab control, found in containers palette controls to access this palette right click is performed on the front panel and can be viewed tab control among a group of tools.

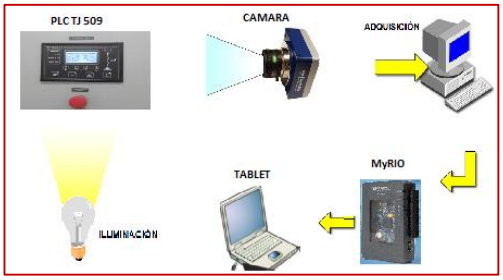


3.5 Programming LabVIEW Software

For correct programming must take into account the operation of each of the tools, drivers and indicators which will be very useful basis for the project's progress. To distinguish the operation form the front panel and the block diagram, since both must be synchronized for proper programming and visualization.

3.6 Acquisition System Architecture

The system consists of a webcam, adequate lighting, a PC, MyRIO embedded system and a tablet. The system architecture consists of communication protocols to acquire data from the HMI PLC Machine Vision screen is used, and communication of the tablet PC is used MyRIO through WIFI and its respective software LabVIEW.



3.7 Programming block diagram

The programming of the different components and elements used for designing artificial vision , are basically the elements contained in the package vision and motion , for image acquisition and processing thereof.

3.8 Simulation Control

For the simulation control, ignition internally integrated into the MyRIO leds took place, the same as pressing a switch comprises an LED MyRIO, as well as be known what type of LED is lit, it will agree to conditions set by the user.

For simulation he created a VI within the MyRIO, so that the simulation program created control is synchronized with the image of acquisition.

4.1 Conclusions

At the conclusion of this thesis work could learn roads which serious topics SCADA programming, LabVIEW and Machine Vision system:

- It came to conclude that the analysis of the different types of existing automated systems in the industrial market, could not be carried over, because they have drawbacks and limitations of access, so we decided to make the acquisition of electrical parameters by means of artificial vision.
- To implement a system of artificial vision relevant studies were conducted, including equipment selection, the was based in relation to cost, as the price of these devices is very high compared to those used in the project.
- One of the main drawbacks of artificial vision is due to the variation of illumination during the day and night. The installed lighting should skip these variations for a smooth operation.
- With LabView can be developed vision systems in a fast, intuitive, highly adaptable and low cost material and temporal manner.

4.2 Recommendations

In making this thesis can recommend the following:

- It is very important to note the location of the elements to be used, for easy access and manipulation when performing a job.
- For proper image acquisition, the camera must be in a total state of inertia, completely static because any small movement can descalibrar the system.
- It is a primary requirement to provide a source of quality lighting for optimal image detection, as poor lighting brightness and images cause would not be readable by the program.
- For visualization of data obtained should have a front panel easy to understand for the operator and people who have access to the system.
- For such projects must take into account the availability of materials and equipment used to conclude with the objectives.

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6 Gratitude

Our special recognition to the Technical University of the North, to fulfill its mission of training high-level professionals.

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Israel Guillermo
and
Wilson David

7 About the Authors

Israel Guillermo TOAPANTA SARZOSA, I was born on November 9, 1988 in the parish of San Rafael lagoon located in the city of Otavalo. My primary instruction made it in the Fiscal School José Martí city of Otavalo, at the end entered the school Experimental Jacinto Collahuazo city of Otavalo, where I got the title of Mathematician Physicist degree. Finally I entered the race Electrical Maintenance Engineering Technical University of North for the title of Electrical Maintenance Engineer.

Wilson David TOCAGÓN TOCAGÓN, I was born on December 22, 1989 in the parish of Gonzalez Suarez Otavalo city. My instruction conducted in the school Parish Farm Atahualpa Gonzalez Suarez, at the end enter the school Experimental Jacinto Collahuazo city of Otavalo, where I obtained a bachelor's degree in the specialty of Mathematical Physics. Finally enter the race Electrical Maintenance Engineering Technical University of North for the title of Electrical Maintenance Engineer.