Analyze The Floor Tiles Parameters To Select The Suitable Tiles For Buildings Using Plc And Scada

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Abstract— In this project, analyzing the tiles with some parameters, such parameters are designing of tiles, cracking in the tiles. Image processing technology is one of the efficient tools to analyzing the tile's structure. A fully manufactured tile will come on one conveyor with the help of proximity sensor. The conveyor will be stopped when tiles reached a camera unit. During that process, the camera will be ON and suddenly capture the image of current tiles. Then the camera will send the captured image to the MATLAB software. The software will compare the original image (required design and size) and the current image. The original image is previously stored in the software. According to the correct image, a separator will change the direction of tiles. The separator is nothing but one part of hardware hand module which is available in the conveyor mechanical set up. The conveyor control, sensing operations, diversion control and etc. each operation should be controlled by PLC. The PLC is one of the controller modules which can control the output devices with the help of input devices and developed a program. Now-a-days, industrial processes are monitored in a RTU unit. In similar way, this process will be monitored by SCADA (Supervisory Control and Data Acquisitions).

Index Terms— Analyze Tiles parameters, PLC, SCADA, web camera, MATLAB.

1 INTRODUCTION

TILES parameters analyze NORMAL and DEFECTIVE are 2 parts of analyzed. The objective of this project is analyzing the tiles with some parameters based on PLC and SCADA. The PLC is control the entire operation of the tile quality checking, and SCADA for monitoring the operation without the need of manual inspection of quality.When tiles came out from the designing and crack checking section, a person must be needed to monitor the tiles. If suppose any error is occurred in the tiles, need human effort to separating them. In human based inspection system, many defects are missed and the inspection is inconsistent, so that the probability of error occurrence is high which depends on the training and skill level of the human observer. The defect detection rate is low in manual system due to several reasons like fatigue, boredom, or carelessness.Automatic weld defect detection on digital radiography images based on Image classification using PNN and Fuzzy Clustering model for image segmentation with morphological filtering. A fully manufactured tile will come on one conveyor. With the help of proximity sensor, the conveyor will be stopped when tiles reached a camera unit. During that process, the camera will ON and captures the image of current tiles. Then the captured image is sent to the MATLAB software. The software will compare the original image with the captured image. According to the correct image, the separator will change the direction of the tiles. The separator is one part of the PLC module. The programmable logic controller is a digital computer which is used for automating the entire process, and it can be monitored by SCADA tool.

Now we discuss briefly:

- Section [2] Related works
- Section [3] PLC
- Section [4] Experimental result
- Section [5] working of PLC
- Section [6] Project overview
- Section [7] Conclusion.

2 RELATED WORK

A PLC (Programmable Logic Controllers) is an industrial computer used to monitor inputs, and depending upon their state make decisions based on its program or logic, to control (turn on/off) its outputs to automate a machine or a process.

Programmable logic controllers (PLCs) are members of the computer family capable of storing instructions to control functions such as sequencing, timing, and counting, which control a machine or a process. The PLC is composed of two basic sections, the Central Processing Unit (CPU) and the Input/output (I/O) interface system. The PLC measures input signals coming from a machine and through the internal program provides output or control back to the machine.

Ladder logic is the programming language used to represent electrical sequences of operation. In hardwired circuits the electrical wiring is connected from one device to another according to logic of operation. In a PLC the devices are connected to the input interface, the outputs are connected to the output interface and the actual wiring of the components is done electronically inside the PLC using ladder logic. This is known as soft wired.

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2.A. PLC HARDWARE

A programmable logic controller consists of the following components:

- Central Processing Unit (CPU).
- Memory.
- Input modules.
- Output modules and
- Power supply.

CPU : Like other computerized devices, there is a Central Processing Unit (CPU) in a PLC. The CPU, which is the "brain" of a PLC, does the following operations:

- Updating inputs and outputs. This function allows a PLC to read the status of its input terminals and energize or de-energize its output terminals.Performing logic and arithmetic operations.
- A CPU conducts all the mathematic and logic operations involved in a PLC. Communicating with memory.
- The PLC's programs and data are stored in memory. When a PLC is operating, its CPU may read or change the contents of memory locations.Scanning application programs. An application program, which is called a ladder logic program, is a set of instructions written by a PLC programmer.
- The scanning function allows the PLC to execute the application program as specified by the programmer.
- Communicating with a programming terminal. The CPU transfers program and data between itself and the programming terminal.

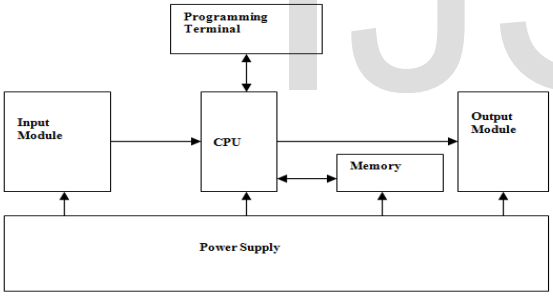

Fig. 1. PLC Hardware Block Diagram

Memory : Memory is the component that stores information, programs, and data in a PLC. The process of putting new information into a memory location is called writing. The process of retrieving information from a memory location is called reading.

The common types of memory used in PLCs are Read Only Memory (ROM) and Random Access Memory (RAM). A ROM location can be read, but not written. ROM is used to store programs and data that should not be altered. For example, the PLC's operating programs are stored in ROM.

A RAM location can be read or written. This means the information stored in a RAM location can be retrieved and/or altered. Ladder logic programs are stored in RAM. When a new ladder logic program is loaded into a PLC's memory, the old program that was stored in the same locations is overwritten and essentially erased.

The memory capacities of PLCs vary. Memory capacities are often expressed in terms of kilo-bytes (K). One byte is a group of 8 bits. One bit is a memory location that may store one binary number that has the value of either 1 or 0. (Binary numbers are addressed in Module 2). 1K memory means that there are 1024 bytes of RAM. 16K memory means there are 16 x 1024 =16384 bytes of RAM.

Input modules and output modules:

A PLC is a control device. It takes information from inputs and makes decisions to energize or de-energize outputs. The decisions are made based on the statuses of inputs and outputs and the ladder logic program that is being executed.

The input devices used with a PLC include pushbuttons, limit switches, relay contacts, photo sensors, proximity switches, temperature sensors, and the like. These input devices can be AC (alternating current) or DC (direct current). The input voltages can be high or low. The input signals can be digital or analog. Differing inputs require different input modules. An input module provides an interface between input devices and a PLC's CPU, which uses only a low DC voltage. The input module's function is to convert the input signals to DC voltages that are acceptable to the CPU. Standard discrete input modules include 24 V AC, 48 V AC, 120 V AC, 220 V AC, 24 V DC, 48 V DC, 120 V DC, 220 V DC, and transistor-transistor logic (TTL) level.

The devices controlled by a PLC include relays, alarms, solenoids, fans, lights, and motor starters. These devices may require different levels of AC or DC voltages. Since the signals processed in a PL are low DC voltages, it is the function of the output module to convert PLC control signals to the voltages required by the controlled circuits or devices. Standard discrete output modules include 24 V AC, 48 V AC, 120 V AC, 220 V AC, 24 V DC, 48 V DC, 120 V DC, 220 V DC, and TTL level.

Power Supply : PLCs are powered by standard commercial AC power lines. However, many PLC components, such as the CPU and memory, utilize 5 volts or another level of DC power. The PLC power supply converts AC power into DC power to support those components of the PLC.

Programming Terminal : A PLC requires a programming terminal and programming software for operation. The programming terminal can be a dedicated terminal or a generic computer purchased anywhere. The programming terminal is used for programming the PLC and monitoring the PLC's operation. It may also download a ladder logic program (the sending of a program from the programming terminal to the PLC) or upload a ladder logic program (the sending of a program from the PLC to the programming terminal). The terminal uses programming software for programming and "talking" to a PLC.

3 PLC:

Bringing input signal status to the internal memory of CPU:

1) The field signals are connected to the I/P module. At the output of I/P module the field status converted into the voltage level required by the CPU is always available. 2) At the beginning of each cycle the CPU brings in all the field I/P signals from I/P module & stores into its internal memory called

as "PII", meaning process image input. 3) The programmable controller operates cyclically meaning when complete program has been scanned; it starts again at the beginning of the program.

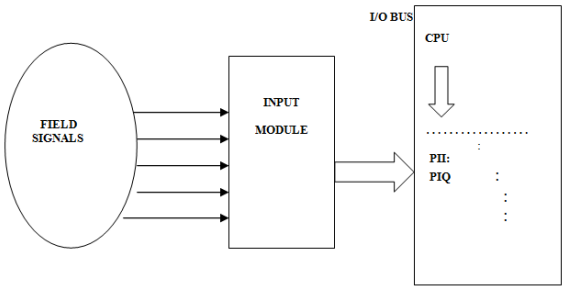

Fig. 2. Flow diagram

4 EXPERIMENTAL RESULT

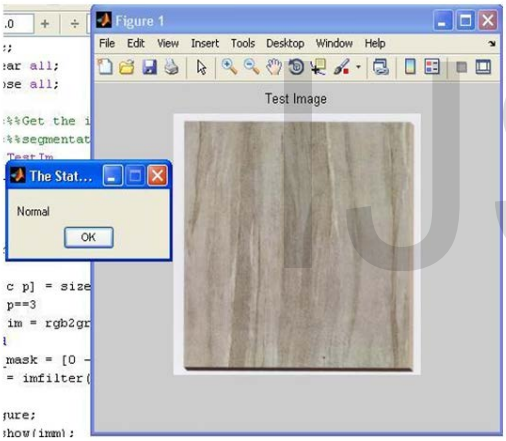

Fig. 3 IMAGE MATCHED TILES NORMAL

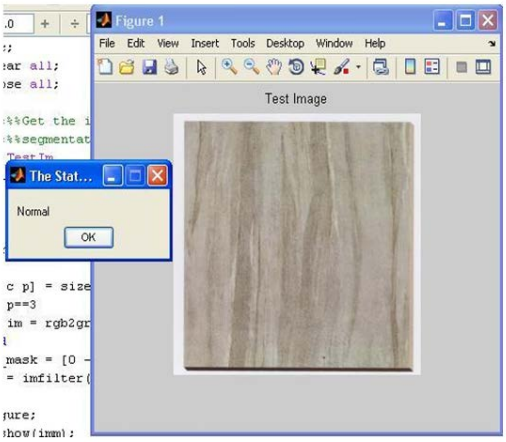

Fig.4 IMAGE MATCHED TILES DEFECTIVE

5 WORKING OF PLC

A PLC works by continually scanning a program. We can think of this scan cycle as consisting of 3 important steps. There are typically more than 3 but we can focus on the important parts and not worry about the others.

Step 1-Check Input Status-First the PLC takes a look at each input to determine if it is on or off. In other words, is the sensor connected to the first input on? How about the second input? How about the third... It records this data into its memory to be used during the next step.

Step 2-Execute Program-Next the PLC executes your program one instruction at a time. Maybe your program said that if the first input was on then it should turn on the first output. Since it already knows which inputs are on/off from the previous step it will be able to decide whether the first output should be turned on based on the state of the first input. It will store the execution results for use later during the next step.

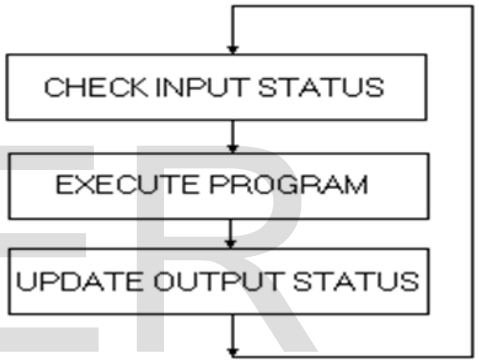

Fig.5 Scan cycle of a program

Step 3-Update Output Status-Finally the PLC updates the status of the outputs. It updates the outputs based on which inputs were on during the first step and the results of executing your program during the second step. Based on the example in step 2 it would now turn on the first output because the first input was on and your program said to turn on the first output when this condition is true.

Process Control:

"The process of recognizing the state of the process at all times, analyze the information according to the set rules and guidelines and accordingly actuate the control elements is referred to as process control."

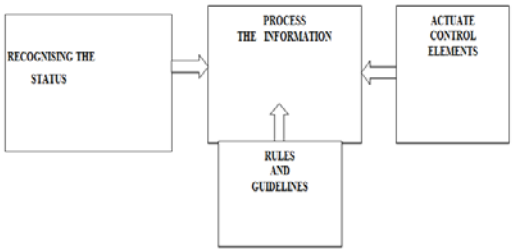

Fig.6 Process control block diagram

In control of process all these actions can be taken manually with human involvement or in a semiautomatic or fully automatic manner.

PLC consists of input modules or points, a central processing unit (CPU) and output points. The operation of PLC is in the following:

Step 1: Read the external input signal, such as the status of keypad, sensor, switch and pulse.

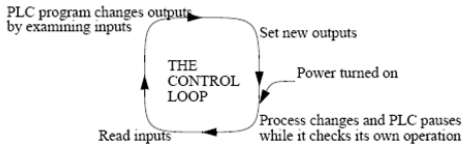

Fig.7 The Scan Cycle of a PLC

Step 2: Using microprocessor to execute the calculations of logic, sequence, timer, counter and formula according to the status and the value of the input signal read in the step 1 and pre-write programs saved inner to get the Corresponding output signal, such as open or close of relay, operation of controlled machine or procedure to control automatic machine or procedure of manufacture. PLC also can be used to maintain and adjust of production program by editing or modifying the peripheral equipments (personal Computer/handheld programming panel). The common program language of PLC is ladder diagram.

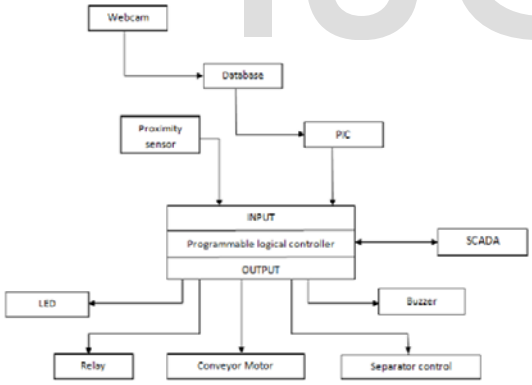

Fig.8 PLC ladder diagram

There are stronger functions in PLC with the development and application requirements of electronic technology, such as position control, network and etc. Output/Input signals are DI (Digital Input), AI (Analog Input), PI (Pulse Input), DO (Digital Output), AO (Analog Output) and PO (Pulse Output). Thus PLC plays an important role in the feature industry.

6 PROJECT OVERVIEW

FUNCTIONAL REQUIREMENTS

This project uses PLC to control the entire operation of tile quality checking and SCADA for monitoring the operation without the need of manual inspection of quality. The capacitive proximity sensor of PNP configuration is used for detecting the tile on the conveyor which turns off as soon as the target (tile) is sensed. Webcam is used for capturing the image of the target (tile).

SOFTWARE REQUIREMENTS

The system specification is a technical specification of requirements of software products. It is the first step in requirements analysis process. MATLAB software is used for analyzing of tile quality using two functions namely DWT and Haralick features. It defines the functionality of the project.

WPL Soft V2.30 software is used for designing the ladder logic program which is downloaded to PLC for controlling purpose. This language allows the programmers to design a complex process efficiently and skilled knowledge is not required.

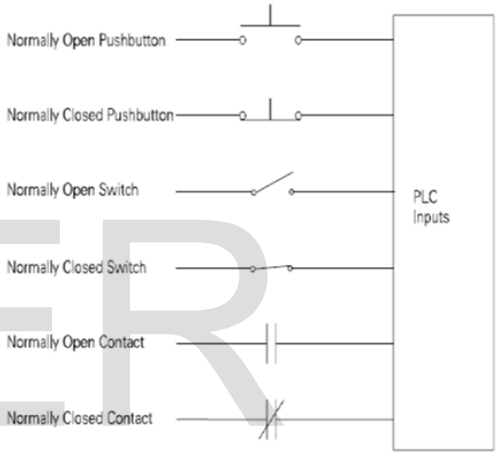

Fig.9 Traditional diagram

7 CONCLUSION

Thus an automated tile analyzer using PLC and SCADA proves to be an effective method for analyzing the design parameters of the tile by increasing the rate of defect detection. Thereby reducing the probability of errors encountered in manual inspection. The operation was viewed in SCADA where the data from PLC in which the data is sent for observation purpose. The real time image and standard image are compared in the MATLAB software installed in PC. When there is any abnormalities in the system, the LED and buzzer are triggered.

This project can be implemented in industry to detect the tile design parameters effectively and enhance the product quality. Further development can be done in the area of neural networks and fuzzy logic.

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