RICE INDUSTRY AUTOMATION TECHNIQUE USING IoT WITH RASPBERRY PI AND PHYTON LANGUAGE

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ABSTRACT

Industrial automation has become very much popular in the past few decades, the main motive is the novelty of its advantages. In urban areas, large industries are following the automation techniques, but in rural areas, medium and small-scale industries are operated only manually because the automation unit is very expensive and complicated for rural people facing investment difficulties, recent days the researchers and engineering people are concentrated into the industrial automation and they give the solutions for common problems faced by the small-scale industries. The small-scale industries like flour mills, jaggery plants, Rice mills, etc. Industrial automation technology has given a great opportunity to take the plant into automatic control and monitoring through respective hardware and software units, and it will give great business opportunities to the rural peoples. This proposed work for small-scale industry automation is achieved by cloud platform Ubidots and automatically or remotely monitoring and controlling device parameters using Raspberry pi. In this work Ubidots, web server, and Raspberry pi module will help to visualize the process and control the appliance. Integration of the software unit will possible to monitor and control the small-scale industry (small scale rice plant automation).

Keywords: Small Scale Industry, Rice Plant Automation, Raspberry pi, Python, Ubidots.

1. INTRODUCTION

To implement automation in large-scale production processes in manufacturing companies to increase the efficiency and high quality of production rate. The actual meaning of industrial automation is reduce to essential production jobs and provide speed and accuracy for the work elements involved. In wide specialized terms, diligence robotization can be stated as a system that consists of relating coordinating and integrating machines, mechanisms, bias, and control to the extent that partial or complete processing of the product is inputs fulfilled automatically without the backing of intervention of mortal being. In general, industrial automation is categorized into full automation and semi-automation. Based on the functionality industrial automation is divided into many such as process automation, building automation, and subdivision automation [6]. In recent years most medium and large-scale industries are turning into automation, industrial automation is very popular and it has more advantages, this automation helps people in different ways such as reducing manpower activities. The engineering people and researchers' approach is based on controllers, robots, and computers, with this the help of IoT (Internet of Things), this approach will help the approach to enhance the industrial automation with affordable approaches and cost-effective to the users [[1],[1]]. This present study is focusing on exploring the level of automation incorporated in the small and medium scale industry such as rice plant automation using IoT with Raspberry pi processor and python language-based automatic valve and motor control.

2. LITERATURE SURVEY

In [[1]] proposed work was done through a multi-user remote system using Raspberry Pi and the Internet of Things (IoT) concept for cloud-based real-time decentralized Photovoltaic plant monitoring. Renewable Energy Monitoring System with IoT helps to monitor the power plant. This work is effective for real-time operation and online consultation, there is no need to unlock ports and/or firewall when using a multi-user cloud service and cost-effectiveness are the main advantages of this proposed work and the wi-fi requirement is one of the drawbacks of this work. In [[2]] authors proposed IoT and Industrial Automation Data and service security, Trust, data integrity, information privacy, scalability, and interoperability

Automation Domain Constraints. This system uses the raspberry pi as controller and server, the programming is done in the python language. And this helps to analyze the overview consumption of power and material requirements. In this system, blade aging of the cutter tool is monitored by observing the energy consumption of cutter tools.

The researchers [[3]] Proposed Industrial automation has become very much popular these days because of its various advantages. This is achieved by using local networking standards and remotely controlling and monitoring industrial devices. By using Raspberry Pi and Embedded web server Technology. Raspberry Pi module consists of ARM11 processor and Real-Time Operating system whereas embedded web server technology is the combination of embedded device and Internet technology. This system can monitor embedded system operation straight through the Internet and achieve network monitoring.

In [[4]] Proposed remote control and monitoring of industrial device parameters by using IoT and Raspberry P. The Raspberry Pi is used as a computer and server, and the coding is done in Python. Raspberry Pi is a portable, reduced computational platform that can handle a wide range of applications. Using this concept to reduce the time, and effort of employees and authorized persons take quick decisions and improve the production. The researchers [[5]] Proposed industrial Remote Terminal Units (RTUs) with the Cloud Collaborative Manufacturing Networks (C2NET) project cloud-based platform for publishing the factory shopfloor data. In this manner, the C2NET platform exploits data that is generated by industrial equipment for further actions, such as the optimization of production plans. This research work resulted in the interconnection of IoT-based devices to a supply chain cloud-based platform within an approach to be exploited by the C2NET project solution.

In [[6]] authors Proposed cloud computing for automation and control applications. It's argued that the open Internet cloud idea has such limitations that it's not appropriate for automation. concept of local automation clouds has been successfully demonstrated in a small closed-loop control example, compartment climate control. Where required automation functionality and related real-time performance have been verified. The implementation was made using the Arrowhead Framework. The researchers [[7]] Proposed in this project, a system is created which will monitor automatically the industrial applications, the temperature, humidity, and gas leakage. The camera is utilized for identifying and alerting undesirable activities or unauthorized persons including those in the surrounded region of industry. In the proposed system raspberry pi is utilized as controller and server, and python language is utilized to run the prototype. The Raspberry pi communicates with the Embedded Web Server. When the information is associated with the webserver, it will store and give the information at the required time. PuTTY software is utilized for checking and controlling the industrial parameters. This system minimizes the energy waste by providing sufficient data to the owner remotely and facilities appropriate decision-making.

The researchers [[8]] Proposed the implementation of Industrial Automation Systems with the help of Raspberry Pi as a Gateway programmed by Python language addition with IoT and FIREBASE Google cloud computing. The raspberry pi is used in the sensor module and they are programmed using python. With the help of FIREBASE cloud computing which use to store data. The proposed system is very useful to any area of industry to control and monitor things and it is low in cost, reliable, easy to operate, and popular in the market.

The researchers [[9]] Proposed Global industrial process monitoring through IoT is a system that uses a computer or mobile devices to monitor functions in the industry. It is intended to spare electric force and human vitality. The sensors that can be checked are temperature, light intensity, water level, current, and voltage. These sensors are associated with at mega and interface with Raspberry pi and observed qualities are put away in the cloud. The client collaborates with the system to send all the commands from various sensors over the internet as shown in the LCD. The outline was tried and actualized and the accuracy and working of the system were verified.

The researchers [[10]] Proposed Using the internet of things (IoT) to connect things, services, and people for intelligent operations has been discussed and deployed in many industry domains such as smart city, smart energy, healthcare, food and water tracking, logistics and retail, and transportation. Finally, we see the remaining challenges within long-lived industrial automation systems with huge complexity and proprietary solutions. By introducing industrial IoT into these systems, connecting different long-lived systems, and creating new services based on fast-paced technologies, additional challenges in integrating these long-lived systems and innovative IoT solutions will arise – this has so far been largely unaddressed by the Industrial IoT community, and remains to be a future research direction.

The researchers [[11]] Proposed sensor-based industrial automation that is a Temperature sensor, gas sensor, and light sensor are used. The system consists of light, gas, and temperature sensors interfaced with Raspberry pi. The sensor data

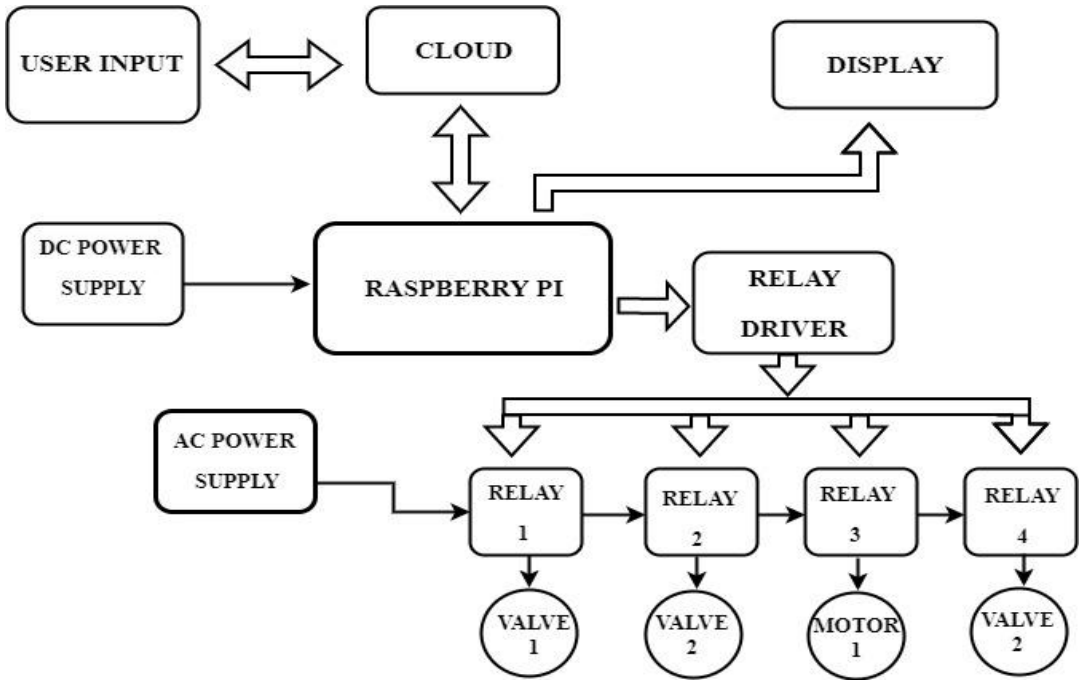
is constantly scanned to record values and check for fire, gas leakage, or low light and then this data is transmitted online. SMS data is analyzed continuously and a level sensor is used to detect the level in the boiler. If any abnormality is detected, a message and email will be sent and a buzzer will make a sound. This system is proposed to prove the various methods. Without using any manual power, we can turn on and off the lights in the industry, and if suddenly a problem occurs in the industry, we get immediately an email and also the message.

The researchers [[12]] Proposed the application of IoT by controlling and monitoring the industrial machine. The system uses the raspberry pi as the main controller, the programming is done in the python language. The webpage is designed using HTML, CSS, JQuery, and JavaScript as a framework for rendering the HTML template in python. All sensor data are collected in raspberry pi and stored at local as well as cloud server storage. This system demonstrates successful measurement of temperature, motor speed, pressure, and location of the machine. The research results can be, Higher customer satisfaction – With the new digital factories, both supply chain and production will become much more agile.

In [[13]] authors Proposed monitoring, controlling, measuring, product counting, and finding updated information of any automatic industry using IoT. This embedded system was designed by Raspberry pi, a cloud server to be more exact. Here Raspberry pi operates the whole system, analyzes performance and machine observation, and makes it unique from other systems. The project that we have designed and developed is such an apparatus or system by considering all previous drawbacks which provide a continuous home monitoring system in a convenient way. The researchers [[14]] Proposed to ensure the chemical solution inside the reactor vessel was maintained based on Raspberry Pi as a temperature controller to monitor and control the temperature reactor. Raspberry Pi simplifies the process of control and increases the efficiency of the Plant. The use of raspberry pi dramatically reduces the price of the system. This application is used for industrial purposes such as process control and monitoring.

The researchers [[15]] Proposed a system automatically monitor industrial applications and generate Alerts/Alarms or take intelligent Decision using the concept of IoT. Control and Monitor circumstances by using concepts of Artificial Intelligence and IoT. Industrial Automation uses IoT with the help of Artificial Intelligence to make systems automated which will take intelligent decisions. The researchers [[16]] Proposed the framework for an Internet of Things (IoT) device as an automated industrial meter reader that uploads the collected numeral data to cloud storage for centralized data processing. The implementation of the device is done using Raspberry Pi as the platform. The total time required by the hardware for the entire process from image acquisition to the uploading of the reading is up to 35 seconds.

2.1 Circuit Diagram:



2.2 Raspberry Pi Processor:

Figure 1: raspberry pi 3b+

We used raspberry pi b 3+ as a core processor which has a faster CPU clock speed (1.4 GHz), and dual-band WiFi hardware and we this processor to perform automation tasks to process the hardware and IoT to communicate. And assign the Tokens previously copied and link with the code to communicate the variables assign in the ubidots dashboard to be linked with the program to receive the commands as per the instructions we programmed in the raspberry pi controller.

3.3 Power Supply

Mostly all digital circuits require a regulated power supply. In this project we used the 220V AC supply as a 5V DC supply, a voltage step down transformer and a rectifier circuit are used for rectifying AC into DC. Capacitor 1000 µf & 1 µf is used as a filter. And the next stage 7805 IC is used as the regulator IC to convert rectified 9v into regulated +5V DC.

3.4 Relay driver:

Figure 2: 5v four-channel relay module.

In this project we are using 4 Channel Relay Module used to control high voltage, high current load such as motor, solenoid valves, lamp, and AC loads. It is specially designed to interface with microcontrollers such as Raspberry Pi, Arduino, PIC and etc. The relay terminal (COM, NO, and NC) is being brought out with a screw terminal.

3.5 Display:

Raspberry pi has an HDMI output port output which is compatible with the all HDMI port in the most the mordent computer monitors and HDMI supported displays, which are used to display raspberry pi files and used in while programming the raspberry pi processor.

3.5 Cloud (ubidots):

Ubidots is an Internet of Things (IoT) application builder with data analytics and visualization. where use the Ubidots platform to send data from any Internet-enabled device to the cloud, triggering actions and alerts based on that data, and visualizing it.

3. WORKING PRINCIPLE

STEP 1

Go to the web browser and Sign Up for an Account for Ubidots in the Browser.

STEP 2

Go to Devices and add a new device, or automatically create new devices using the libraries and documentation. Then a new Device is automatically created in the Devices section. And add the required devices needed for example in our project raspberry pi was added.

STEP 3

And Setup Variables Assigned in the Device previously added Raspberry pi device then add required variable required for hardware interfacing at the output devices and label the variables as per the requirement.

STEP 4

In Ubidots Dashboard add the new widget from the list as per our requirement, in that widget creation, select the required variable device and select the variables and select ok to create control switches.

STEP 5

Go-to dashboard on the top right, select the setting, and select the AIP credentials in that API credentials select the Default Tokens and Authentication Token from Assigning Devices. And save a copy of the link displayed in the check box for the linking in the python code for communicating with the server and the hardware.

STEP 6

Setup Up the Raspberry Pi processor for the hardware interfacing as depends on the task and the output required and write python code to process the hardware and IoT to communicate the task. And assign the Tokens previously copied and link with the code to communicate the variables assign in the ubidots dashboard to be linked with the program to receive the commands as per the instructions we programmed.

STEP 7

Reading Data Used to Get Requests to Specific URLs in the ubidots, and a program to function the code and configure the hardware GPIO's as per our requirement output as per our task required.

STEP 8

And Connect the Relay driver circuit with Raspberry pi as per the block diagram above mentioned and set up the relay circuit to be used to control high voltage, a high current load such as motor, solenoid valves, lamp, and AC loads as per the application used.

STEP 9

Then test the Program by Running Python Code and other hardware connections and check Ubidots Dashboard to make control to test the toggling of the assigned devices in the ubidots dashboard.

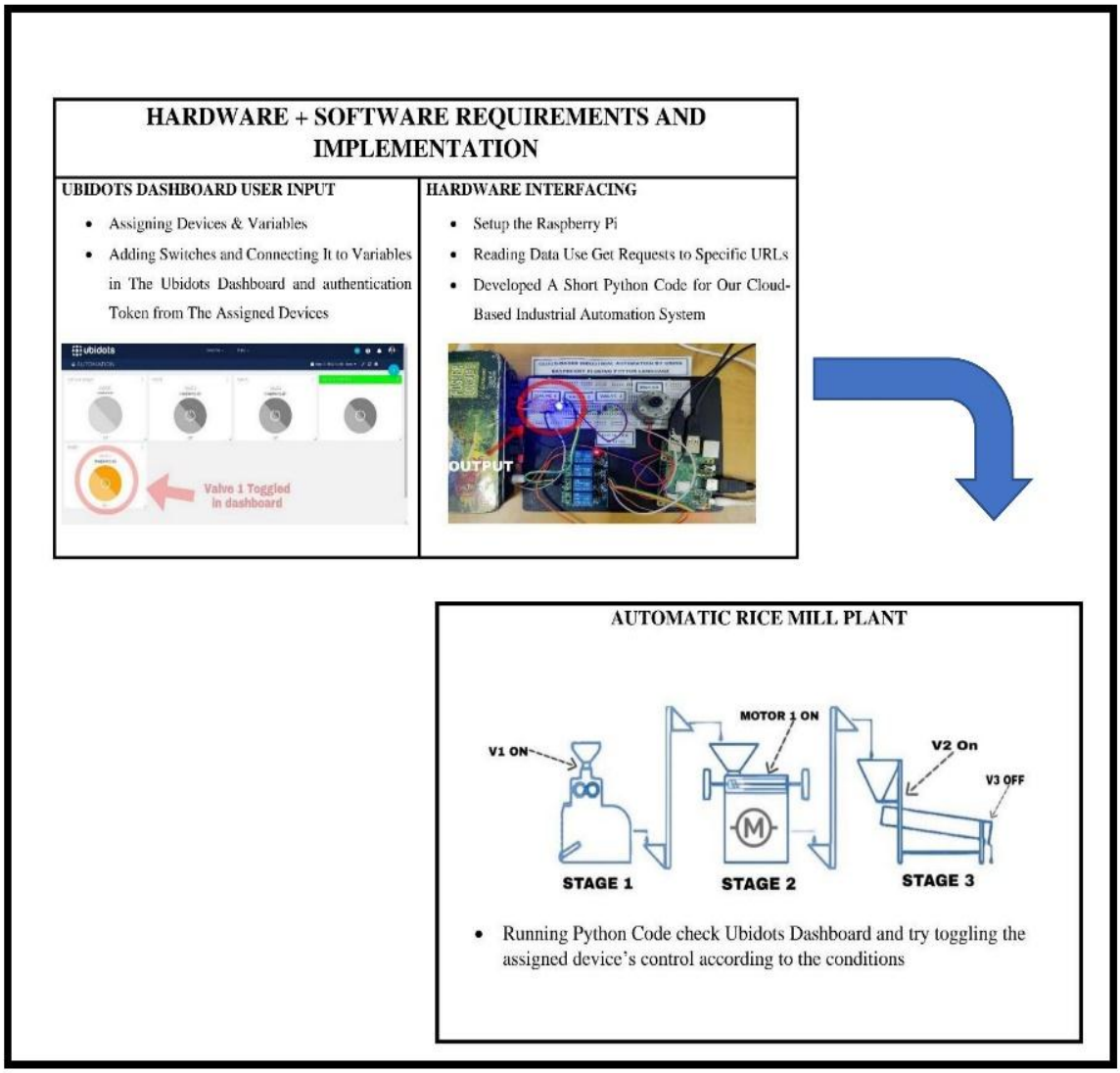


Figure 2: A working process of rice plant automation.

4. RESULTS AND DISCUSSION

The main motive of this present work is to implement the automation techniques in the Rice mill plant. This proposed method will help to minimize the manpower and cost-effectiveness with simple algorithms including ubidots flatform and Raspberry pi 3 B+ processor. In this work we used open-source software named as Ubidots and comparatively low-price processor named as raspberry pi for controlling the valve and motor units. We hop this work will help the man power handled rice plant industry turn into automation-based industry.

5. CONCLUSION

This proposed work gives an overview of the main needs for small-scale industrial automation, and how to interface the IoT and Raspberry pi B+ processor and python to that domain. The authors implement the IoT concept in the field of small-scale rice plant automation for the purpose of automatic valve open/close, and motor on/off purpose. This proposed work used a raspberry pi B+ processor and Ubidots (online software) with a python programming language for automatic valve open/close purposes. Since this work is expected to improve productivity and this work offers to reduce the manpower with a cost-effective automation system. Same this approach offers many appealing opportunities it also introduces many new challenges facing real-time properties and high availability.

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