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AUTOMATIC BOTTLE FILLING AND FIRE DETECTION SYSTEM USING RASPBERRY PI

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Abstract---
An innovative preamble design and a related channel estimate approach are proposed in this study to enhance the FBMC/OQAM system. In order to reduce power-related difficulties and error rates, STBC-based Massive MIMO systems are fed the findings of FBMC. The Zadoff chu sequence was used to build a lengthy preamble structure for the frame. Based on the performance results, the proposed method beats the typical preamble structure in terms of spectrum efficiency and lower PAPR values. The proposed method is not only easy to implement, but it also has good BER performance in terms of signal-to-noise ratio and mean squared error for the associated timing offset and frequency offset. Therefore, state-of-the-art mobile networks like 5G can use it right away.

The following words are included in the index: PLC, Raspberry Pi, Python, Internet of Things, LCD, Pi camera, and Haar cascade GUI trainer.

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I. INTRODUCITON

The usage of PLCs to automate processes is widespread across all industries at the moment.Installing and operating power logic controllers (PLCs) may be costly, and they sometimes need licenced software and the services of a PLC maintenance. Therefore, only very big businesses employ PLCs. Many smaller enterprises, whether located in rural or urban locations, simply do not have the capital to invest in the PLCs that are necessary for process automation. The best option, the open-source Raspberry Pi, functions as the little controller here.Using a Raspberry Pi as its central controller, this system can automatically fill bottles and detect fires. An infrared sensor, a DC motor, a pump, an L293D to control the motor, a four-channel 5v relay module to operate the pump, and an LCD display to provide the user visual information are all parts of it. That is why we use all of them to automate the procedure of filling the bottles. The fire detection system is comprised of a Raspberry Pi coupled with a Pi camera.This research set out to document the procedures for building a Raspberry Pi-based system that can autonomously fill bottles and detect fires. The following is the document's structure: Part II focuses on getting the project ready. The project's block diagram and the connections between the different sensors and actuators are then shown in Section III. The automated bottle filling and fire detection system's manner of operation is explained in Section IV. The results of the project are discussed in Section V. The project's future scope, references, and conclusion are all included in Section VI.

In Section II, we will go over the equipment that was used in this implementation. It included a Raspberry Pi 3 model B, an infrared sensor, a four-channel 5v relay module, an immersion pump, a switched-mode power supply, a 16x2 LCD display, an LM317 (positive voltage regulator), an L293D motor driver, and a Pi camera.
The Raspberry Pi is the brains behind the operation. A number of common signals, including as GPIO (general purpose input/output) pins, vcc, and Gnd, are among its forty.Raspberry Pi 3 Model B has a single LAN connection, four USB 2.0 ports, and a robust Broadcom CPU chip.With its integrated Wi-Fi and Bluetooth, the Pi3 is compatible with the Pi camera. A liquid crystal display (LCD) is also included.The reflected infrared (IR) rays from an obstruction, which range from 700 to 800 nanometers in wavelength, are received by the photo diode on the infrared sensor.
nanometers to 1 millimetre. This allows the IR sensor to identify the item.Our 12VDC SMPS takes 230V AC and converts it to a steady DC voltage using a

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converter circuit that operates at 50Hz.A safe way to run a motor is via an L293D board. The submersible relay may be used to operate the pump for liquid filling; its operational voltage is within the range of 3-12v DC.

II. BLOCK DIAGRAM& CIRCUIT DIAGRAM

Raspberry Pi 3 model B has Taken input from the from the sensor that is IR sensor output which is input to the pi will be goes to low when there is a presence of the bottle & goes high when there is no object in front of the IR sensor .once the IR output goes low that is bottle is present so now the bottle has to stop at the filling point and start filling liquid, so in order to stop the motor we are not connected motor directly to theRaspberry pi we should isolate the Pi from the motor Heavy starting currents with the L293D Motor driver. Which could be very useful to control the motor? The 12Vpump is to be activated with Relay which is connected to the Raspberry pi.

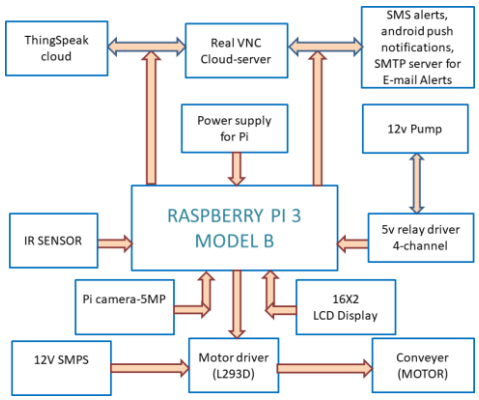

Fig.1.Block Diagram

LCD display will be connected to give the visual display information to the user at the station itself. Power supply of 5v, 2amp that is 10watt adapter is required in order to turn on the Raspberry Pi.Pi camera will be inserted in the camera port which is given with the Raspberry Pi 3 model B board. The details circuit diagram is given below.

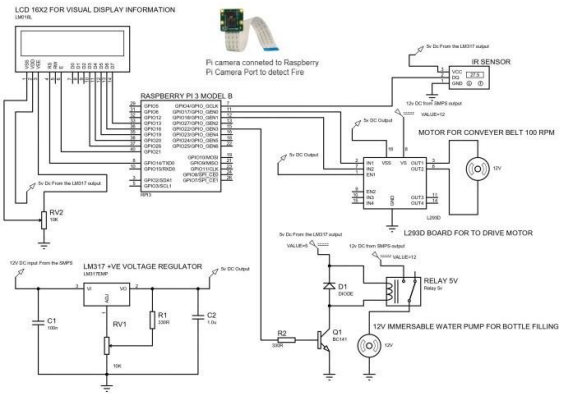

Fig.2.Circuit Diagram (designed in proteus 8.12 software)

III. DESIGN FLOW AND METHODOLOGY

we are developed the entire software code is in python only, here the IR sensor will plays a key role in the bottle filling When the Program execution begins Pi will continuously monitoring its IR sensor which is connected to the one of the GPIO pin of the Pi. If IR sensor detects the object-Bottle then pump will turned on with the help of the Relay module which is connected to the Raspberry pi and liquid is filled to sufficient level and the bottle is move

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forward, Now one count with in the program is incremented and this data is sent to the Thingspeak cloud and plotting of data at the channel in Thingspeak is done. And if sensor not detects any object-bottle, conveyer kept on until next object is detected .the LCD display is used to give the visual information to the user. Once the process is starts it is initialized and displays "Process is initialized" and "Automatic bottle filling system". And it will displays "Place a bottle" when there is no object with in the conveyer, displays "Bottle is filled" when the bottle is filled.

Pi camera is used to monitor the station if Fire is detected Pi will send alerts to the user and further actions has to be taken. In order to detect the fire we are used a Haar cascade Gui trainer software where we are given some images of fire to the gui trainer as positive images and the some of the background images as negative images for the Haar cascade GUI trainer software .the positive images contains the object which is used to detect with the help of the Pi camera. After starting the train a model after processing the GUI trainer will generates an .xml file which could be used to give as an input the fire detection python program.so with this .xml file the fire is detected.So once the fire is detected the alerts will be sent to the user's as SMS alert,E-mail(Electronic mail) alert and Push notifications to the Push Bullet Application of the registered users android mobile.

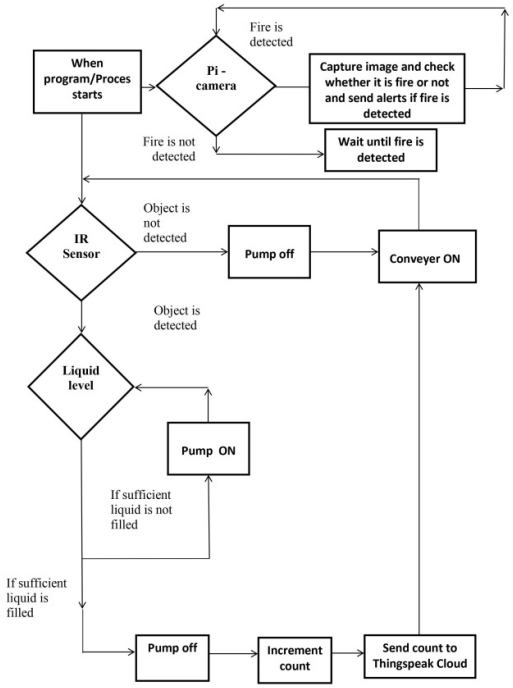

Fig.3.Design Flow

Project Development Steps:

Initially we are Setup the Raspberry Pi with stable Rasbian Os From the official website. And flashed the installing the OS using the free and open-source Balena image-editing software; learning how to link the Raspberry Pi to a laptop using tools like Putty, Realvnc Cloud Account enabled VNC Viewer, and Advance IP Scanner.Next, we set up Python 3 on a Raspberry Pi 3 B.After that, I installed a few essential modules, packages, and libraries, such as "pip" (the most recent version), "twilio" (for SMS alerts), "smtplib" (for email alerts), "Pushbullet" (for Android push alerts), "Adafruit_CharLCD" (for visual display information with a 16x2 LCD display), and "Open CV" (for object detection). Finally, to activate the Picamera for fire detection, go to the "pi configuration—interfacing—camera" section of the graphical user interface (GUI) of the Raspberry Pi. Last but not least, we have software and hardware co-design.

III. OUTCOME

The configuration of the system's hardware and

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software components are separate processes. Part one explains the function of the different parts, including the LM317, infrared sensor, 12v pump, four-channel 5v relay, and 100 Rpm DC motor. The next step is to create python programmes for all of the hardware components. Last but not least, we integrate the hardware and software to build the system that can detect fires and automatically fill bottles. After the software and hardware have been properly installed, we will proceed to establish the foundation for this project. So, the whole automated bottle filling and fire alarm system worked well. We have successfully automated the process of filling bottles, and in order to predict future output, we have logged the total number of bottles made in Thingspeak. Thingspeak allows us to obtain data in a CSV file format. In order to fine-tune output, this file records the data provided by the Pi together with timestamps. The Pi camera, together with the OpenCV library for open source computer vision and some Python code, could detect the fire and immediately trigger the alarms. These are only a few of the numerous outcomes of our effort.

Fig.4.1.Automatic Bottle Filling System Basic Setup Front View

Fig.4.2.Automatic Bottle Filling System Basic Setup left side View

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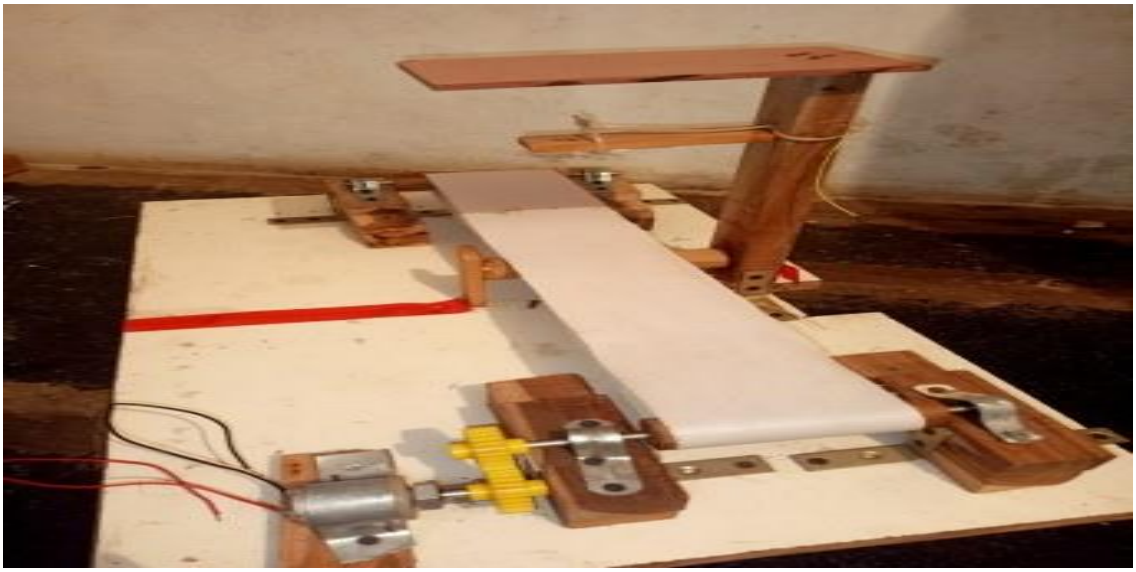

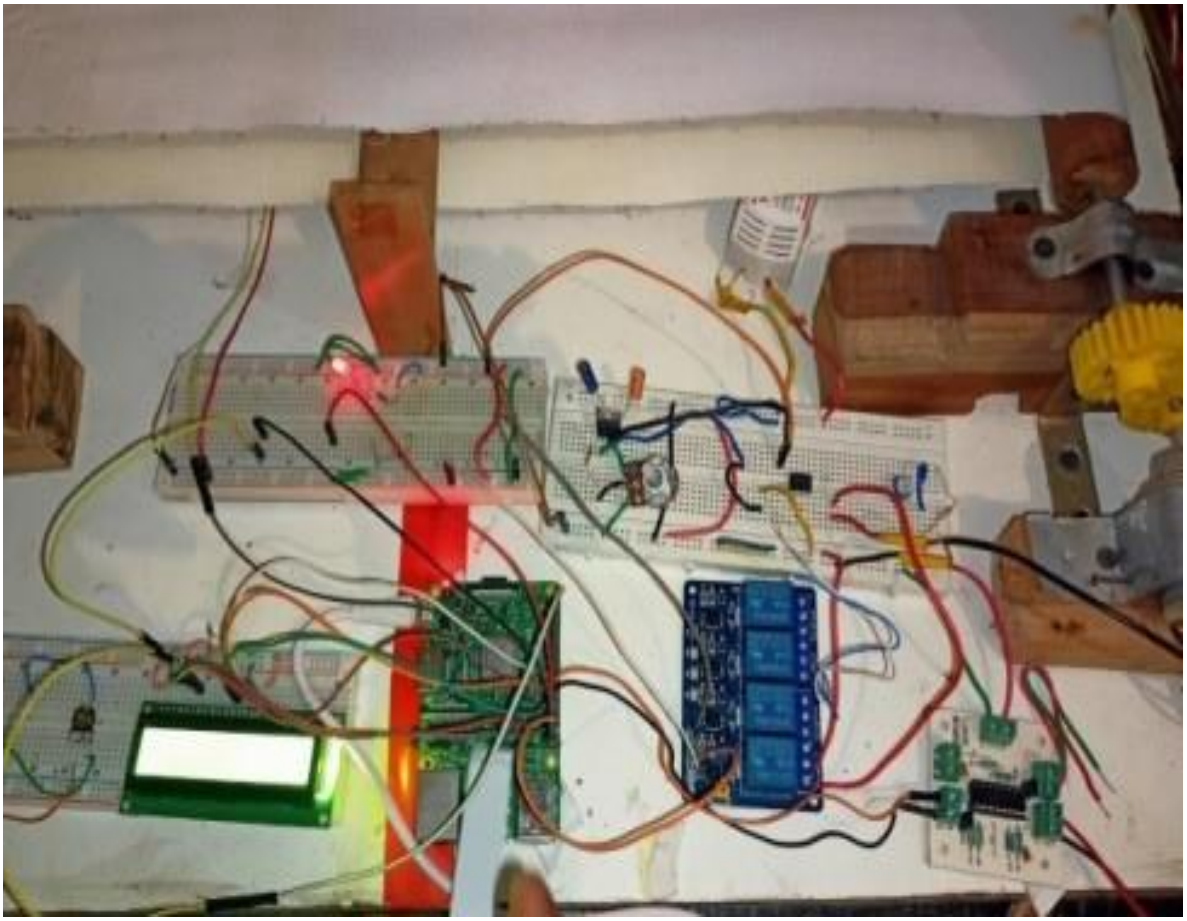

Fig.4.3.Automatic Bottle Filling System Basic Setup Right Side View

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Fig.4.4.Hardware setup

Fig.4.5.Bottle is filling with the help of pump when IR sensor detects it

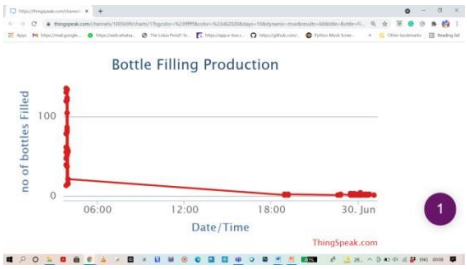

Fig.4.6.No of bottles filled data sent to Thingspeak cloud

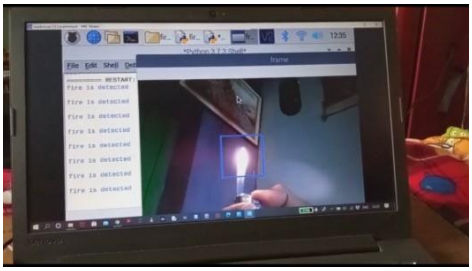

Fig.4.7.Fire is detected and prompting fire is detected on the shell

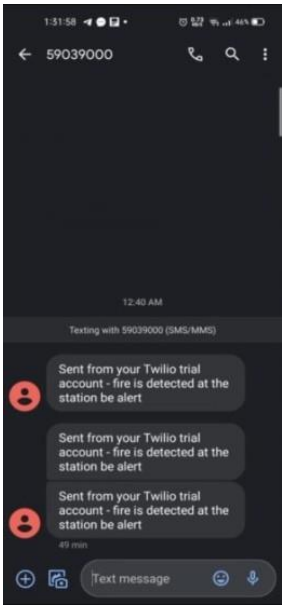

fig.4.9.Email alert along with image captureis sent to the user mail if the fire is deteced

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CONCLUSION

There are two main points to the suggested study. 1) to design a mechanism that facilitates investments in small and medium-sized businesses by residents of metropolitan areas. So, such businesses need a cheap and automated water bottle filling machine.Using the Pi camera and object detection with OpenCV, we can catch industrial fires early and save property damage. To complete the product as a bottle, it is possible to expand the current work to include automated filling of customised bottles (based on bottle size), automatic capping of bottles, and automatic labelling of bottles. Additionally, automatic extinguishing must be activated in the event that a fire is detected and confirmed to be genuine.

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