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Implementation of Colour Mixer using Embedded PLC and Augmented Reality

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Abstract: Automation is basic delegation of control function for human to technical gazettes. It is the use of control systems such as Microcontrollers, PLCs, computers to control machine and processes to reduce the need for human sensory and mental requirements as well. This paper concentrates on an intelligent and innovative control and monitoring system for color combination generation Plant by using "Raspberry Pi" as an effective option to PLCs for the automation of color generation plants. However, we are going to implement the same process for the all type of the industrial process that are going in the automation industries only considering parameter are going to change so we have the mode selection for the different type the process. We have the better result than the ordinary human eye. This work is going to be Product implement for the different Process industries or quality testing department for the manufacturing industry.

Keywords: Augmented reality(AR), Embedded PLC, Raspberry Pi, Colour Mixer, Arduino.

I. INTRODUCTION

Along with the computer technology, integrated circuit technology and the development of the industrial field bus technology, PLC technology to obtain the new development in the field of industrial automation [1]. AR-SCADA permits an operator to observe and management the plant by taking a virtual tour of varied systems and sub systems of the plant through wide 360 degree views of the plant. Conventionally SCADA systems offer a 2nd schematic diagram interface to Associate in nursing operator whereas the increased Reality based mostly virtual tours interface provided by AR-SCADA provides the operator physical identity of the plant, adds training value to plant operators and makes their job more interesting. The Developing industry like textile and industry where color mixing is done, there is color are mixing are manual to user and less interactive till this date and they have inaccessibility to what is going on in the process Etc. so we have to control their quality for the mixing section in according to their color So for that I have developed the embedded solution with the help of image processing and Augmented reality where real-life interaction is possible. Here we can increase their quality using the simultaneously taking frame and Appling the image processing and AR algorithm for that frame and get result as the quality of the mixing process.

II. RELETED WORK

The mixing methodology could be a multivariable and intrinsically non-linear plant. Mathematical modeling of the mixing color methodology has been taken into thought so as to design an adequate control (PI controllers) to assure zero steady state, quick control and disturbance rejection. The comparisons of the nonlinear mathematical model and linear one are done. The control of the process has been enforced by exploitation Programming software system for Siemens SIMATIC Programmable Logic controller (PLC) [1] Model predictive control (MPC) systems for performance optimization of industrial plants and processes are normally implemented on Industrial pc (IPC) platforms. to beat the resulting downsides, caused by additional communication overhead between Programmable Logic Controllers (PLCs) and also the MPC-IPC, lack of IPC hardware reliability and high maintenance effort and prices, a better integration of closed-loop control applications significantly MPC algorithms into PLCs is that the task of the Embedded Energy Efficiency Industrial Controller Platform (E3ICP) project. [2] Embedded PLC need to set up the {requirements the wants the necessities} of various costumers' requirements. in varied field, the requirements of commuters are entirely in various changing. Thus, we want to use the modularization design for the hardware configuration of embedded PLC. [4] However, the embedded soft PLC retains the standard PLC hardware management and also the advantage of application for separation, the upper development system running on computer platform, make full use of the rich development tools and resources provided by the computer, and therefore the underlying package to run on embedded hardware platform, that the development process of the embedded soft PLC has the characteristics of general embedded system development [7]

III. SYSTEM MODEL

The system consists of various Processing block such as Raspberry PI, PI Camera, Open CV, mixing Mechanism, Arduino, motor. Some of them act as input/output Process block and other act as supporting data processing block for the input data. Main Objective of this paper is to give the

new platform for the controlling output device effectively with Comprehensive Algorithm of the expertise quality checking operation and Implementation of Embedded PLC on the Raspberry PI with the help of Open PLC Package. The following diagram shows the block diagram of Raspberry PI Based Embedded PLC for color Mixing and quality assurance check with mixing mechanism Using OpenCL

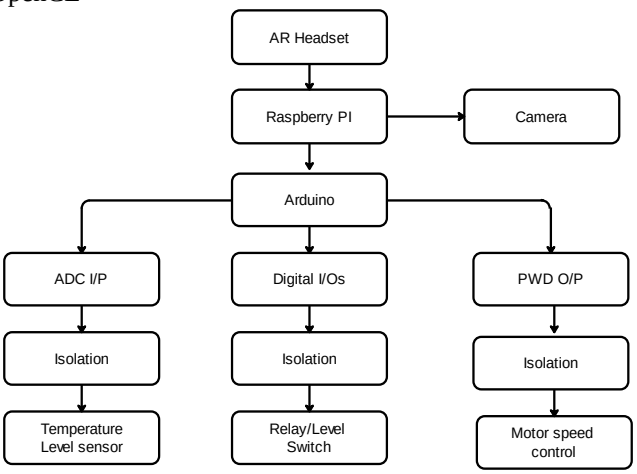


Fig 1. Block diagram of system.

Here we use two unit for the Raspberry PI based operating system with camera and Mechanical Structure interaction using image processing.

A. Raspberry Camera Section

In this section Camera, Raspberry PI and Monitor are Connected such a way that on the Head mounted displays the application GUI and Camera takes the snapshot of mixing product after process is completed. So, whenever the input is given then output of the process can be seen on the Mechanical side of the Project ass movement of the mixing Mechanism.

B. Image/data processing section

This section consist of various block like OpenCV image processing, Image processors, GPIO services. This section act as the brain of the proposed system. This system process on the input frame data and process and give the output accordingly.

IV. METHODOLOGY AND IMPLEMENTATION

Model of this project are box formed within which all hardware part is fitted rigorously specified we gate high efficient working system. This box doesn't permit enter the external light inside the box. All the system work on the projector light and infrared light that flows through the acrylic glass. Flow chart of projected system is shown in following figure2.

A. System Initialization

At this step, the entire component will be start. System will check the entire component for its status. If any component fails then system corrects that error or notifies the user about component failure. If there is no such failure then system goes online and starts working. Operation like following takes place in this stage

1. Mixing process motor are in halt state.
2. GUI application on HUD
3. Camera takes the number of snapshot per second and send it to system
4. Mixing Mechanism at the initial Position.

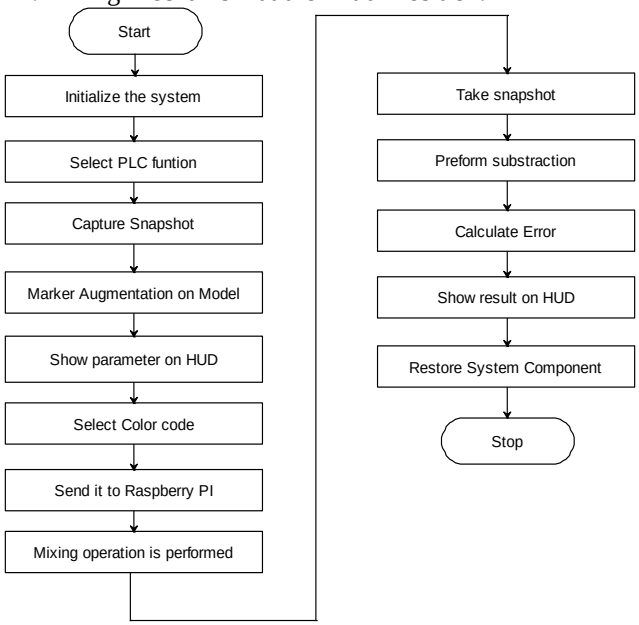


Fig. 2 Flow chart of the process.

B. Capture Frame

At this stage Camera Takes the Snapshot of the Model with the smart phone camera which moving with the HUD. Camera takes the Snapshot and transmit it to the System To process using Smartphone with unity 3D built Software Above VR box acts as the HUD Display for user. For controlling and logging the data about process

C. Perform marker augmentation:

Image we got from the last stage does not have that many details in the captured frame so we have to perform preprocessing operation on the captured frame so that we get some details about the model and user's fingerprint or the voice input. At this stage we perform following operation on the captured frame, to get detail output

1. detecting the fingerprint and their location
2. if the voice command is given detect it
3. model Augmenting

Fig 3. VR Box Unit for Android Mobile.

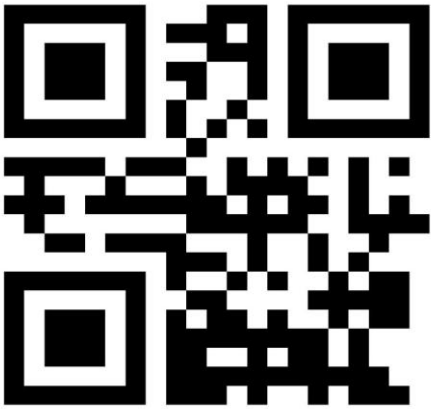


Fig 4. Sample Marker for augmentation.

D. Detect touch

After previous step detail in the frame enhance to the greater extent, no we have to find out if how touch is detected on the real time are detected on frame. For that purpose, we use the High Pass Filtering Method and finger touch detection. It is technique to find out there is touch in the frame or not.

E. After the touch detection

After previous stage if there is no sign of touch detection then camera initialize itself for new frame take the new snapshot from the Model Environment, If We get the sign of touch detection then we proceed to next Stage of finding color value which is detected and send its color code to raspberry PI.

F. Perform color analysis

After getting the Result of detected color we have display information about which color is selected for mixing, then this interrupt should be generated through this swapping of data to the raspberry PI , so raspberry PI get aware of which color it has to generate though the mixing process.

Fig 5. Color Analysis Output.

G. Initialize Sorting Mechanism using the Raspberry PI:

After executing interrupt service routine program as per the user input at HUD side System should give the satisfied output at the mixing Section and So that the interaction of USER should be real time or say fast. It gives the highest interacting System using above proposed Methodology.

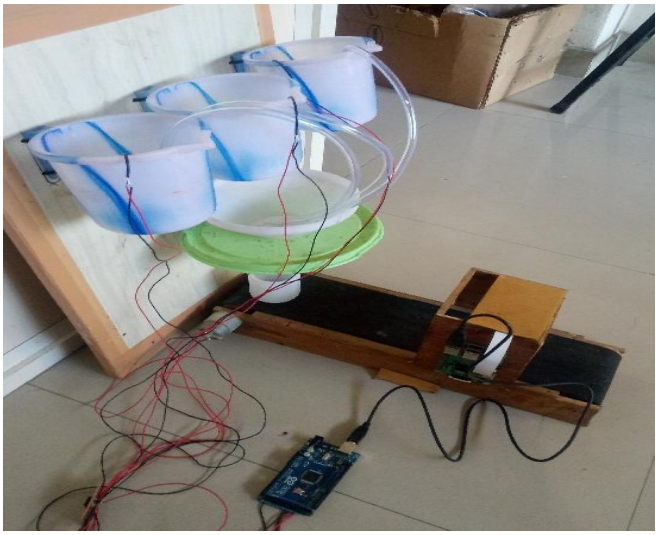


Fig 6. Set up.

V. RESULTS AND DISCUSSION

Fig 7 shows 3D model created using Unity 3D software can be implemented in Smartphone as android application. This app detects the marker in real time place that implement the model on the marker and other parameter from process.

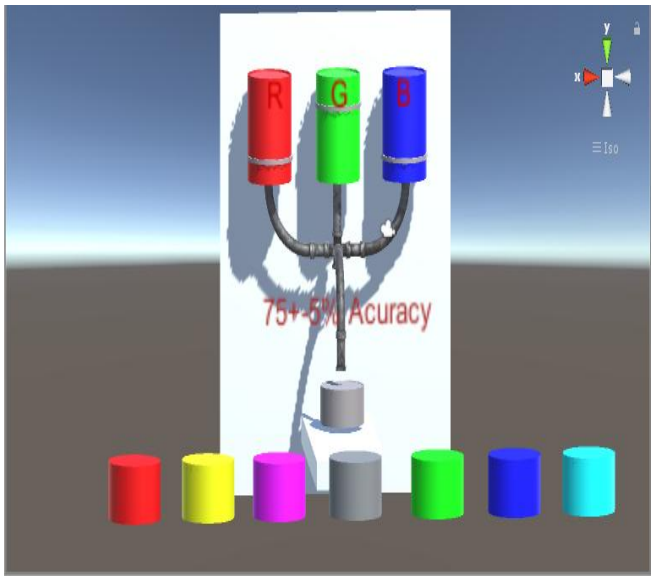
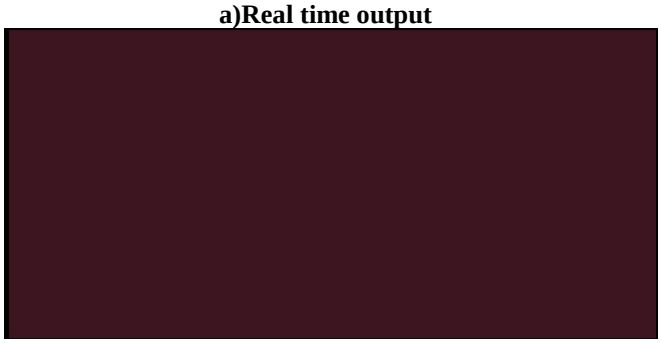


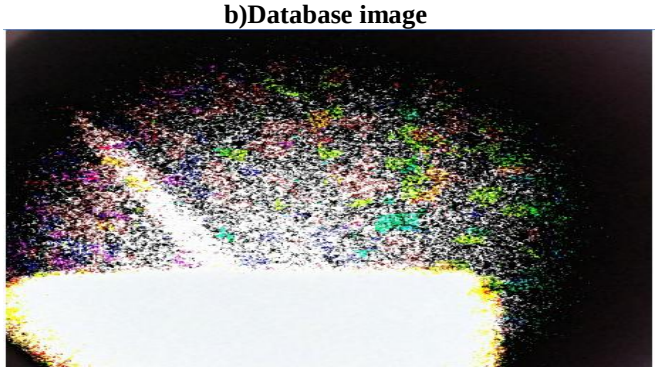
Fig 7. AR 3D Model on Marker.

Fig. 8 shows the output we got from image processing of color detection this show the theoretical and practical match with color palette of the standard color chart. We calculated the deviation of real time output from database image that shows the 75% matching for given images.

a)Real time output



b)Database image



c) Deviation

Fig 8. Comparison of Real and Database Image.

VI. CONCLUSION

We developed a system model for grain condition monitoring and controlling based on 3 parameters size, defects, and chalkiness by using Raspberry Pi development board and Python platform using open CV image processing package. For better quality analysis of grains more parameters are to be considered. Application of the same algorithm for different types of grains.

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