Automatic Food Particle Sensing Water Tap Control System

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Abstract— This project is to build and to test a smart tap system. It senses the waste particles on food plate(when we go for washing the plate in which we have eaten) and gives a buzz sound when there is any wastage on the plate.If there is no wastage the tap is automatically turned on. This avoids stagnation of water at sinks because food wastage especially is found at hostels in schools, colleges. Since this project lies with improvement in technology. If we replace all the manual taps with a smart one that opens and closes on its own automatically not only we can save water but also have a healthier lifestyle since we don't have to operate the tap with our dirty hands. Therefore, this system will be cost-effective, compact and easily maintainable system that solves the problem.

Indexed Terms-- Clean Plate, Dirty Plate, IOT, Image Processing, Machine Learning

I. INTRODUCTION

Every meal generates dirty plates which need to be cleaned quickly and efficiently. Being organized can save you a lot of time and trouble. So there is a need for developing a new method or process for effective manufacturing. Those processor methods should fulfill the requirement about accuracy productivity etc. When problem is increased and it becomes more difficult to meet demand for energy and power needs. The aim is to intend and expand a manage organization base a clever by electronic means forbidden automotive tap calculating arrangement is call "automatic food particle sensing water tap controlling system"..

Drinking water plays an important role in human metabolism and helps in making the skin healthier, refreshed. It also makes us stay alert of many diseases. The automated. The smart tap system is used to turn over water from source point to usage point in an efficient way and avoids human error. Automated water supply can be done through embedded system in cost effective way.

The smart tap system is actually a smart system as the people who wish to wash his/her hand or drink water don't need to tum on the water tap.

Many people face a lot of challenges or problems due to the diseases related to inadequate water, and hygiene which is a huge burden in developing countries. It is estimated that 88% of diarrheal disease is caused by unsafe water supply.

Schools, particularly those in rural areas, often completely lack drinking-water and hand washing facilities; alternatively, where such facilities do exist they are often inadequate in both quality and quantity. Schools, Colleges, Hostels, Canteens with poor water, sanitation and hygiene conditions, and intense levels of person-to-person contact, are high risk environments for students and staff, and exacerbate student's particular susceptibility to environmental health hazards.

"Automatic food particle sensing water tap controlling system", which is prepared by esp32 camera, ultrasonic sensor, water motor and irrigate tap scheming system. It is a authentic scheme which is completely prepared and intended for hostels, canteens, Function halls.… The procedure remainder an important part of the arrangement even though with altering anxiety on bodily contribution as the quantity of automation is greater than before.

This project titled automatic food particle sensing water tap control system will help to avoid stagnation of water at sinks, wash a person's hand, plate and in addition would save water.

II. SYSTEM ARCHITECTURE

The first step is to set up the esp32 AI Thinker board and ultrasonic sensor to upload the images to google drive.

The step is completed in four major steps:
Writing code for ESP cam and uploading
Installing Python and all required libraries
Setting up the google drive API
Writing python code to upload the images
Then in the second step of the project a machine learning algorithm is developed using TorchVision a python library.

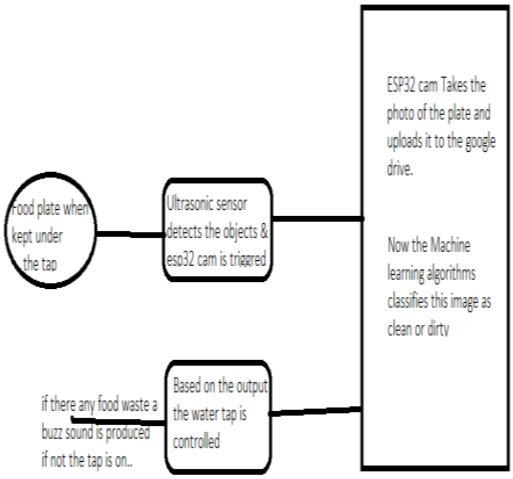

Figure 1. Block Diagram

After the new image is uploaded to google drive the algorithm classifies this image as a clean or dirty plate. If the food plate contains wastage than the accepted level then the plate is considered as dirty and a buzz sound is produced. And if it is a clean plate then the tap is turned on. When the plate is removed tap automatically turns off.

III. METHODOLOGY

3.1 Plates
The plates that will be used in this research were from the hostel students of an engineering college. Sample images of the food plates were also acquired. The images were captured using a ESP32 camera and were uploaded to the google drive.

3.2 Image Analysis
A image processing machine learning algorithm is used in google colab. Using Torch Vision from python library to classify the images. Initially the machine is made to learn from the images in the database and analyze the patterns. And when the new image is uploaded the it gives output as whether a cleaned or dirty plate

3.3 Tap
The output of the machine learning algorithm is now sent back to the device. Here the water motor is automatically turned on if there is no wastage on the food plate which will result in strucking of the sink. If there is any wastage then the accepted level a buzz sound is produced.

IV. RESULTS AND DISCUSSIONS

cleaner area : the self-closing mechanism will not lead to sink overflow and users' dirty hands would not be touching the tap.

In sanitary facilities with touch free taps, one does not have to get dirty again reusing the same lever or handle and there will not be cross-contamination between users through the tap.

Water conservation
cost saver in the long term, with constant flow and accessible to all users.

Since smart taps require power, There are different battery options, but they will last for at least 1 year.

4.1 Image Processing Results

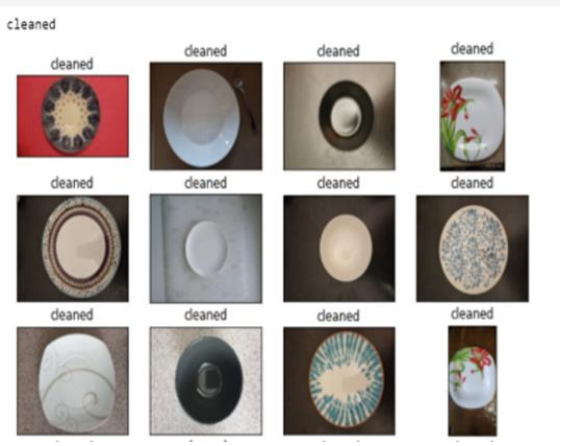

Figure 2. An example of images of the clean plates that were used in Image Processing

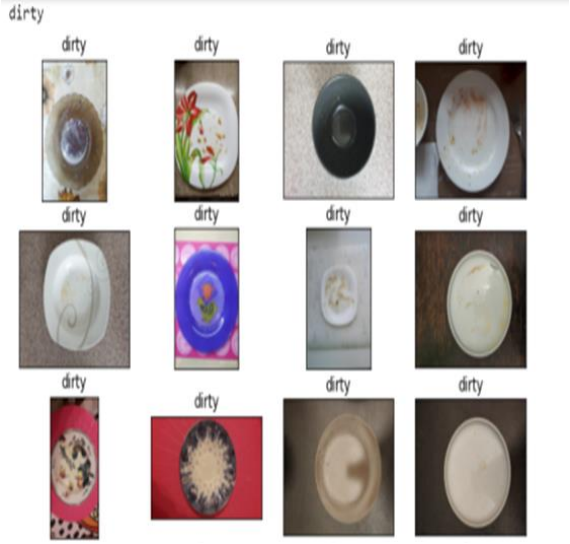

Figure 3. An example of images of the dirty plates that were used in Image Processing

A separate folder is taken which consists of 20 dirty plate images

Figure 4. An example of images of the clean and dirty plates that were used in Image Processing for testing

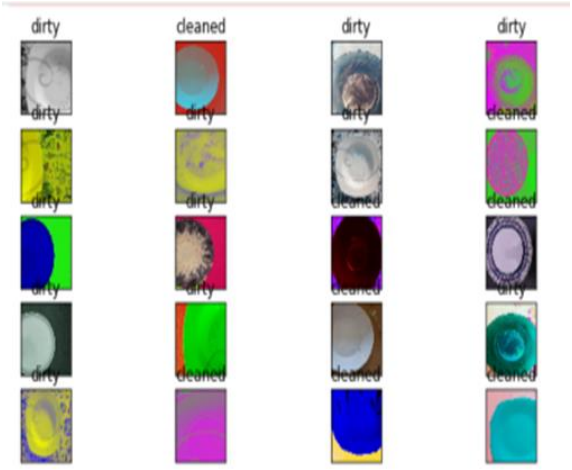

Figure 5. An example of images as cleaned or dirty as output of the image processing

Figure 6. The tap is getting is not turned on when there food waste on the plate

V. CONCLUSION

"Automatic food particle sensing water tap controlling system", which is prepared by esp32 camera, ultrasonic sensor,water motor and irrigate tap scheming system. It is a authentic scheme which is completely prepared and intended for hostels ,canteens, Function halls....Schools, Colleges, Hostels, Canteens with poor water, sanitation and hygiene conditions, and intense levels of person-to-person contact, are high risk environments for students and staff, and exacerbate student's particular susceptibility to environmental health hazards. The procedure remainder an important part of the arrangement even though with altering anxiety on bodily contribution as the quantity of automation is greater than before. sThe output of the project is as follows. Here the water motor is automatically turned on if there is no wastage on the food plate which will result in stucking of the sink. If there is any wastage than the accepted level a buzz sound is produced.

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