Smart Integrated Applications for Post Pandemic in Educational Campuses

Tanvi Desai, Student, Fr.C.R.I.T, Vashi, India, desai20tanvi@gmail.com

Akanksha Chandawar, Student, Fr.C.R.I.T, Vashi, India, akankshachandawar@gmail.com

Emerson Esau, Student, Fr.C.R.I.T, Vashi, India, emersonesau7718@gmail.com

Donbosco Johnson, Student, Fr.C.R.I.T, Vashi, India, donboscojohnson4@gmail.com

Rajan Gosavi, Student, Fr.C.R.I.T, Vashi, India, rajangosavi1141@gmail.com

Yogesh Chandurkar, Asst. Professor, Fr.C.R.I.T, Vashi, India, yogesh.c@fcrit.ac.in

Abstract: In order to improve the pandemic impact of COVID-19 on our educational campus life, there is a need for an hour to provide possible solutions to day-to-day activities in and around campus by integrating innovative applications, review and revise them based on current situations. Fundamental places like colleges are where the spread of germs can be rapid, thus building an intelligent campus is efficacious. As a campus student, we are thinking of providing solutions to all possible areas we come across in a day when we enter and exit the campus. Providing solutions for the post-COVID-19 impact such as Social distancing, sanitization, innovative touch-less systems, authorization and digital documentation. Building an innovative integrated application can apply to classrooms, laboratories, common passages, teacher's cabin, library, washrooms, canteen, hostel and staff quarters, security gate areas. A classroom is a learning space where both students and teachers impart knowledge. With today's technology, we can modernize this space by building an "Automated Classroom." These Integrated innovative applications for educational campuses can be built around using hardware-software approach using microcontrollers and IoT-based devices.

I. INTRODUCTION

Post COVID-19 scenarios would involve a lot of innovation and creativity for a living. Automation feature in and around the college campus activities-mainly in area of Social Distancing, Sanitization, and effective Teaching –learning Classroom environment. The system can provide solutions through, face recognition attendance system, authorization without any touching surface.   Apps were originally intended for productivity assistance, such as email, calendar, and contact databases. However, the public demand for apps caused rapid expansion into other areas such as mobile games, factory automation, GPS and location-based services, order-tracking, and ticket purchases. There are now millions of apps available. Making use of this rapidly growing technology, our project intends to build a mobile app to get done all the documentations digitally along with the provision for attendance entry for convenience. Exploring various ideas on how to minimize germ spread post 'COVID-19' pandemic, the 'Touch-Free Dispensers' using the ' Arduino Uno' is implemented.

II. LITERATURE SURVEY

A. Automatic Hand Sanitizer Dispenser

A wall-mounted housing enclosing a blower, an antiseptic solution holder, an atomizer pump, and a timer switch assembly is built. A front-mounted actuator bar initiates a timer that starts the blower and pump. The atomizer delivers an antiseptic solution into the blower discharge to deliver a vapor mist through the nozzle to the user's hands for a certain period established by the timer. Then the atomizer is shut down by the timer, and the blower continues to operate for another predetermined period to dry the hands. [5]

Face Recognition Based Attendance System

Face recognition system using Eigenfaces from grayscale images is done. Color images are converted to grayscale images, and then Histogram Equalization is applied. OpenCV uses a type of face detector called a Haar Cascade classifier. Given an image that can come from a file or live video, the face detector examines each image location and classifies it as "Face" or "Not Face." The classifier uses data stored in an XML file to decide how to classify each image location. Webcam stream is used as input to the face recognition system. [4]

In this system, attendance is taken by using face recognition and managing the attendance in suitable environments such

as colleges and offices. The system architecture consists of Raspberry Pi Camera Module V2 attached to Raspberry Pi3, and it is placed where the people enter the office. The Camera Module is used to capture video from which images of human faces are extracted. Then face recognition takes place, and it automatically verifies with the existing database through library files present in OpenCV.[2]

Detecting and recognizing the face in real-time using Raspberry Pi is very feasible. It describes an efficient algorithm using an open-source image processing framework known as OpenCV. The face database is collected to recognize the faces of the students. The system is initially trained with the student's faces which are collectively known as the student database. The system uses a user-friendly User interface to maximize user experience while training and testing, collecting student images, and taking attendance with the system. Raspberry Pi usage helps in minimizing the cost of the product and the usability as it can be connected to any device to take attendance. It uses a modified algorithm of Haar's Cascades proposed by Viola-Jones for face detection and uses LBP histograms for face recognition and uses SQLite along with MYSQL to update the database. The system will automatically update the student's presence in the class to the student's database and send message to guardians of absentees and the Head of the department. [3]

III. IMPLEMENTATION

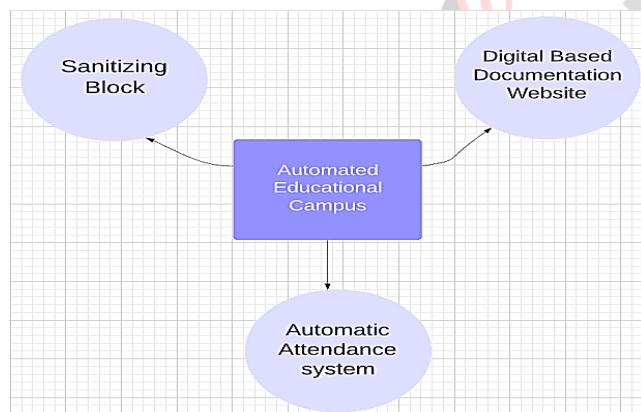Fig 1 is Block diagram of Proposed System. It shows all the blocks implemented.

Fig 1. Block Diagram of Proposed System

A. *Automatic Hand Sanitizer Dispenser*

The model for the project is made using Ultrasonic Sensor and Arduino Uno. Programming of Arduino Uno is done using the Arduino IDE application.[7] We used a mechanism for creating the pressure on the nozzle using copper wire and a piece of glue stick. The ultrasonic sensor is quite accurate in sensing the presence of the hands as the given constraint for distance measurement is less than 5cm. Servo motor gave a torque of about 180° to give a thrust on the nozzle for dispensing some amount of liquid from the sanitizer bottle. Every time person's hand is placed below the nozzle at an appropriate distance, sanitizer is displaced on the person's hand. The response time of this working project was fast and accurate. [1]

B. *Face Recognition Based Attendance System*

The user gives the face image from the webcam as the input to the face recognition system in this module. Then images are normalized to improve the recognition of the system. Then this normalized face image is given as input to the feature extraction module where the key features like eyes nose are extracted that will be used for classification. With the help of a pattern classifier, the extracted features of the face image are compared with the ones stored in the face database. The face image is then classified as either known or unknown. [8] The database where images are stored is used to match the test image with the train images. Then the attendance is recorded in an excel sheet along with time.

C. *Documentation Website*

We are first creating a website on Django. The web pages are designed using CSS and HTML.

Required Setup:
• Text-Editor: Visual Studio is used as text editor here.
• Python 3
• Virtual Environment [6]

Firstly, for authentication signup and login pages are created so that the student can directly login with its credentials. Teacher's login id and password will be directly added to database in order to restrict students from creating teacher's profile. Then two sessions are created one for teacher's login and other for student's login using decorator's function.

IV. RESULTS

A. *Automatic Hand Sanitizer Dispenser*

The model for the project is made as shown in (Fig 2 & 3). The program for the same is executed in the Arduino IDE application. As seen, we used a mechanism for creating the pressure on the nozzle using copper wire and a piece of glue stick. The ultrasonic sensor was quite accurate in sensing the presence of the hands as the given constraint for distance measurement was less than 5cm. We used a 50ml sanitizer bottle for creating this model, but we can also use a large-sized bottle. The servo motor gave a torque of about 180° in order to provide a thrust on the nozzle for dispensing some amount of liquid from the sanitizer bottle. This will happen whenever a person's hands are placed below the nozzle at an appropriate distance.

The response time of this working project was fast and accurate. The hand sanitizer can work well when the hands are at a distance of 7 cm. It dispenses up to few drops of sanitizer in the user's hand with an approximate delay of 3sec after every use. The bottle needs to be refilled when the level of sanitizer reaches 1/4th of the bottle.
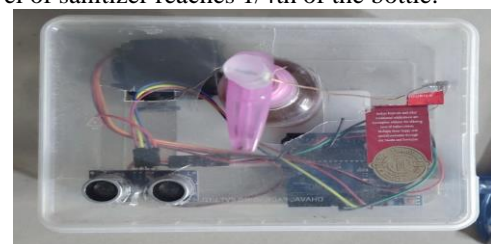

Fig 2. Top View of Model

Fig 3. Front View of Model

B. Face Recognition Based Attendance System

Fig 4 shows the output of the face recognized of one student in live video streaming. Likewise, whenever a face is recognized, it will enter the attendance of that person in the attendance sheet along with time. This is how the system will record attendance. For the face recognition system, the images in the dataset are approximately of dimension 720x1280. Each image occupies a disk size of 90 kb to 130kb on a computer. The response time of the system to detect and recognize a face from the webcam is approximately 5ms.

Fig 4. Live Face Detected from Webcam
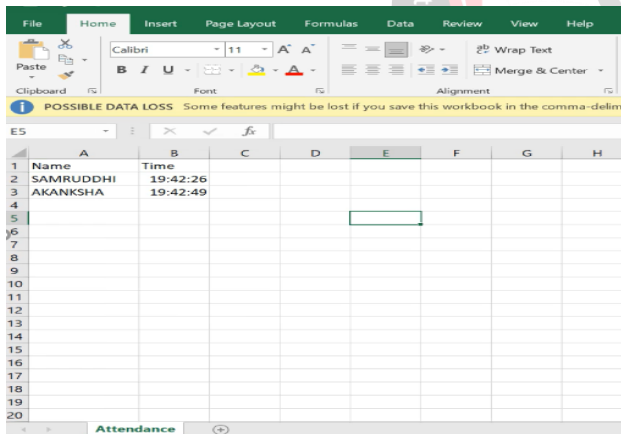
Fig 5. Snapshot of Excel Sheet

Fig 5 is snapshot of excel sheet where attendance of student will be recorded with time.

C. Documentation Website

Fig 6. To Fig 14 are screenshots of developed website using Django.

Fig 6. Signup Page of Website

Fig 6 shows the signup page for the students where they can enter their basic details and the student gets registered into the database.

Fig 7. Login Page of website

Fig 7 shows the login page where the student logs into the website using username and password.
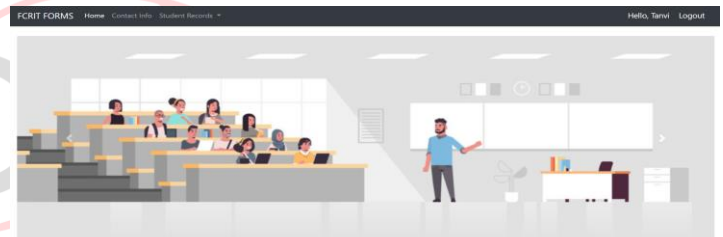

Fig 8. Home Page of Teacher's Profile

Fig 8 shows the home page for a teacher where there they can check for the uploaded files by the students. Also queries from the students can be seen in the Contact Us tab.

Fig 9. Student's Record Page (Teacher's Profile)

Fig 9 shows the individual student's submitted forms.

Fig 10. Student's Contact Info Page (Teacher's Profile)

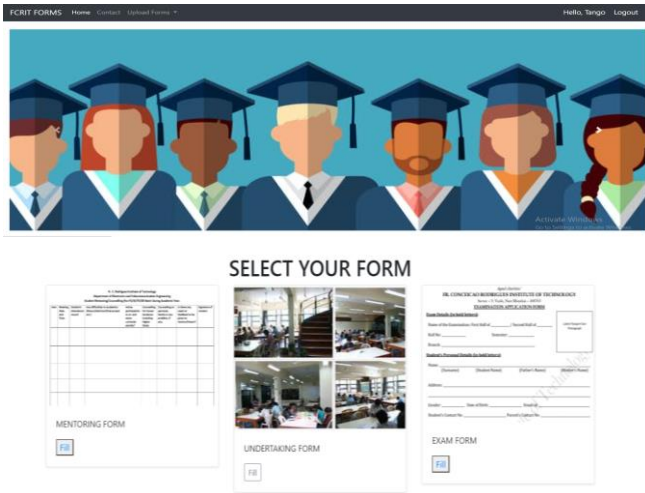Fig 10 shows contact info page with queries from the students.

Fig 11. Home Page (Student's profile)

Fig 11 shows the home page side of a student where they can fill the different forms provided such as mentoring form, undertaking form, exam form, etc.
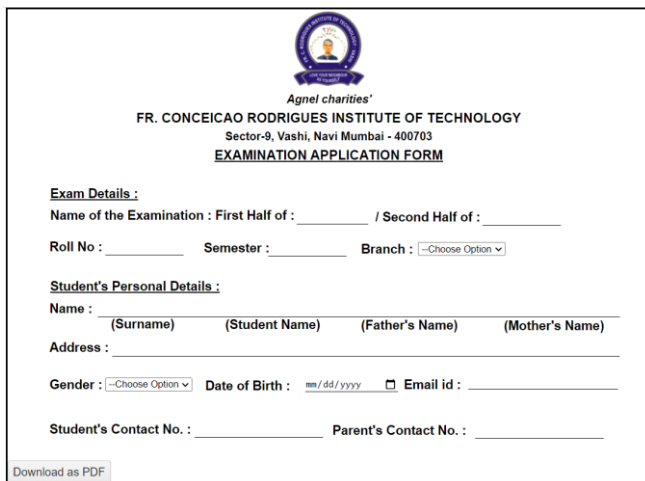

Fig 12. Exam Form Page (Student's Profile)

Fig 12 shows the exam form page for the students where they have to fill in the details and download it as a pdf which then can be submitted in the respective tab.
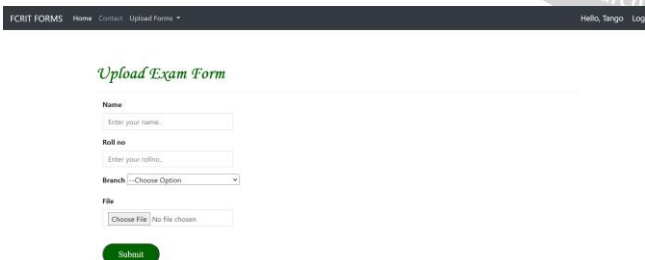

Fig 13. Uploading Page (Student's Profile)

Fig 13 shows uploading page for the students where they have to submit their downloaded form with their credentials.
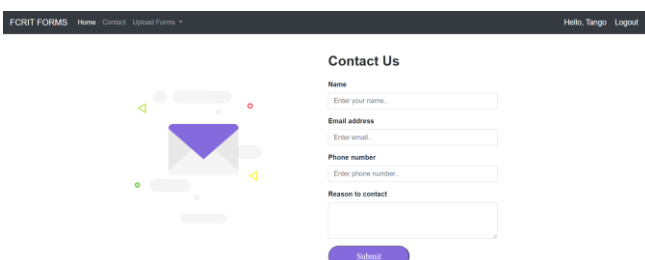

Fig 14. Contact Us Page (Student's Profile)

Fig 14 shows Contact Us page, the students can send any query related to the form or any doubt they have directly to the teachers.

V. FUTURE SCOPE

The Automatic Hand Sanitizer could be improved by implying different design style by using a PIR sensor instead of an ultrasonic sensor. This would enhance the system as in the current prototype model if the user places its hands above the nozzle still it pumps sanitizer which can be solved by using PIR sensor which has a lower range of detection.

The same face recognition system can be implemented using Raspberry Pi converting it into a complete system, by making minor changes in the code so as to detect multiple persons at a time.

VI. CONCLUSION

Implemented Contactless Automatic Hand Wash Dispenser for Sanitation is efficient, and the cost price is minimized. The person gets the limited sanitizer liquid for sanitation on hand and protects themselves from corona disease. Based on the research results on the design of the automatic hand sanitizer that the researchers did, we can conclude that the hand sanitizer can work well when the hands are at a distance of 7 cm with an approximate delay of 3sec after every use. This system can be utilized in malls, high populated areas.

Student attendance is usually achieved by the classical way. This means record papers or more novel approaches by hardware tools such as radiofrequency identification (RFID), biometric identification, or a combination of just presented. In our proposed system, an effortless way is used for marking attendance where the camera identifies a student, where the faces are matched to the one stored in the database after comparing the trained images. Results are pretty accurate in detecting the faces, automatically storing the attendance record with date and time in an excel sheet.

In this COVID-19 crisis, our website will be a boon to college students as it cuts down any possible human contact. The website is built on the Django platform with proper authentication. All the templates for the website are designed using CSS and HTML. On this website, we have included two sessions separate for teachers and students for easy submission and checking of forms. The students have the provision of entering the details in the forms followed by downloading & uploading the same from the student's side to the teacher's side.

REFERENCES

[1] Akshay Sharma A S,"Review on Automatic Sanitizer Dispensing Machine", International Journal of Engineering Research & Technology, Vol. 9 Issue 07, July-2020.

[2] Kiran Kumar.R, Mekala.S," Face Recognition Attendance System using Raspberry Pi", International Journal of Pure and Applied Mathematics, Volume 118 No. 20, pp.3061-3065, 2018.

[3] Priya Pasumarti, P. Purna Sekhar," Classroom Attendance Using Face Detection and Raspberry-Pi", International Research Journal of Engineering and Technology, Volume: 05 Issue: 03, pp. 167-171, Mar-2018.

[4] Shervin Emami and Valentin Petruț Suciu,"Facial Recognition using OpenCV", Journal of Mobile, Embedded and Distributed Systems,2012.

[5] Virgil R. Dutton, Chandler, Ariz," Automatic Hand sanitizing System", U.S Patent 4999929, Mar 19,1991.

[6] http://www.yournxt.com/blog/2019/04/15/steps-create-basic-website-django/ - Steps to create website using Django

[7] https://en.wikipedia.org/wiki/Arduino_UNO/ - Arduino Uno

[8] https://www.eff.org/pages/face-recognition - Face Recognition Process