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Research Paper

System for Safe Smart Lab Administration and Control

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Abstract: In today's age of digitization and automation, the life of humans is increasingly easier because virtually everything has been reprogrammed and replaces old manually generated procedures. Today's people make use of the Internet to this day in their everyday lives, and that leaves them unable to function without it. The Internet of Things offers a platform that allows devices to connect, detect and remote control objects on the network infrastructure. Lab automation is a major focus of our project. Currently, none of the colleges' and schools' labs are automated. Wireless systems, can be a great asset for automation systems. The presence of students in the lab, the lab's temperature, and its humidity can be checked automatically. Automated labs means monitoring entry of students and person's entering in the labs and providing security to labs when there is off period of institute it helps to security when anyone trying to enter in the labs. Software provides platform to students and teacher to meet online at one place. The system extends the home robotization technology to the council laboratories, and hence to produce a smart laboratory.

Keywords: Face Recognition; Temperature sensor; Thief surveillance, Submission portal, ESP32 webcam.

1. Introduction

In this   ultramodern world technological advancement is adding   extensively and to manage with it we constantly need to modernize ourselves. We've heard of Smart TV, Smart Kitchen, Smart Car also why not produce a smart lab for scholars in seminaries and sodalities which super optimized to reduce mortal trouble. principally, we're going to produce an terrain where we fete the face of pupil of the person who wants to enter the lab, and if valid pupil is there then only the door will automatically open. Also, in the lab we've handed temperature detector and we've set a threshold value, when the temperature of lab is higher than this threshold also addict will automatically start moving. We've handed security to lab using ray and LDR detector, To manage data of lab and scholars, we also have created a web gate. The system extends the home robotization technology to the council laboratories, and hence to produce a smart laboratory. The smart laboratory reduces the quantum of power consumed throughout the day. therefore, the system helps in managing energy efficiently. Also, the robotization of the laboratory leads to its advanced association and reduces staff involvement in simple administration tasks.

1.1 Objective
The main objective of this project is to provide security for labs by using face recognition and thief surveillance systems and to give automated features to manual labs by using a web gate and an automated fan on or off system.

2. Literature Survey

Making things simple and intelligent is the main goal of the automated system. Internet of Things (IoT) projects that the majority of sectors have been working on over the past several years[1]. These became necessary for digitizing with several security tools, which led to the introduction of smart locks and the ability to move them in our daily lives. Therefore, it is imperative that everyone maintain high-security passwords that are well-programmed Passwords were employed as an authentication method by the next level of security. For the purpose of validation, this system keeps track of authenticated users' passwords. As a secret of authorized users, the password authentication system offers users a high level of protection. Another flaw in this method is the password.

3. System Design

A formal description and representation of a system that's set up to grease analysis of its structures and behaviours is called an armature description.Figure 1. Shows the architecture / design of the system.

Proposed system includes both internal as well as external intrusion discovery mechanisms which includes total four modules:

1. Thief Surveillance System
2. Face recognition system
3. Student assignment submission portal
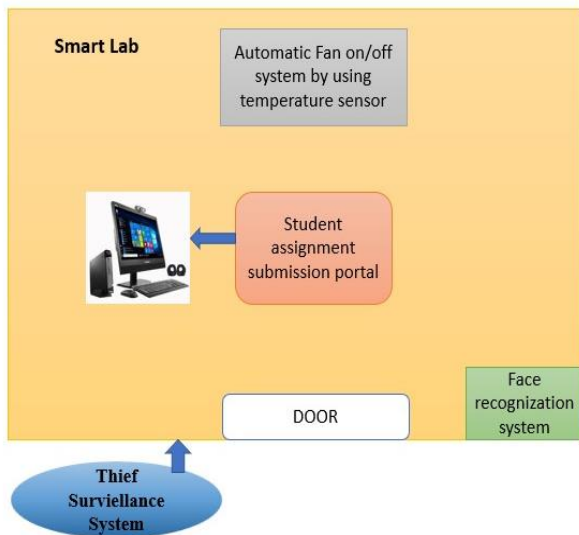4. Automatic fan on/ off system by using temperature detector

Figure.1

3.1 Thief Surveillance System

The main purpose of the thief surveillance system is to provide security to labs when there is a holiday for labs or institutes. This system can help security guards because, by making a buzzer sound, it can easily tell if someone is trying to enter the lab on the holiday. For making these systems, we used an LDR (light-dependent resistor), a red LED, a 4V battery, a 2,2 K ohm resistor, a BC547 transistor, a buzzer, a SPST switch, and a red ray light or laser.

When laser light falls on LDR, it creates a beam. When someone breaks that beam of light, a buzzer will make a sound.

Figure.2

3.2 Face Recognition System

Facial recognition technology is a popular technology that's used in numerous operations, similar as door cinch unleashing systems. In utmost cases, facial recognition simply identifies a person's face rather than counting on a large database of images to determine an existent's identification. This module will fete the faces of scholars and preceptors and allow them entry if they've a valid ID.

The library that we've used for facial recognition performs the following way

Step 1: Face detection

The camera detects and locates the image of a face, either alone or in a crowd. The image may show the person looking straight ahead or by profile

Step 2: Face analysis

The software reads the figure of the face and converts the analog information(a face) into a set of digital information(data) grounded on the person's facial features. This data is called a faceprint.

Step 3: Converting the image to data

Converting the image to data The faceprint is also compared against a database of other givenfaces.However, also a determination is made, If the faceprint matches an image in the database. The use of facial recognition technology has raised some sequestration enterprises. For illustration, some people are concerned that facial recognition technology could be used to track people's movements or to identify people without their concurrence. still, facial recognition technology also has numerous implicit benefits, similar as perfecting security and making it easier for people to pierce services.

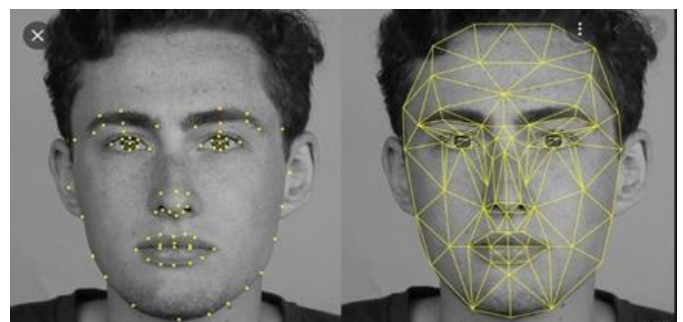For this module, we use the ESP32CAM board.

Figure.3

3.3 Student Assignment Submission Portal

The student assignment submission portal provides the facility for students and teachers to meet online and access data online instead of manual accessing.This portal has some features that are the same as Google Classroom, and we try to add some extra features that are different from Google Classroom.

In this portal, students are automatically added to the subject class based on the class they selected while registering. Teachers can easily add assignments and quizzes on the same platform; there is no need to create separate any

form.Teachers can view the student details for the students who submitted the assignment and quiz. There is another feature of the portal, which is the notification tab. Students get notified when teachers upload any material and add a quiz or assignment. Teachers get notified when students submit an assignment or quiz.

For this portal, we have used PHP to establish the connection between the frontend and database. We use a structured database, which is MySQL, and for the frontend, HTML and CSS.
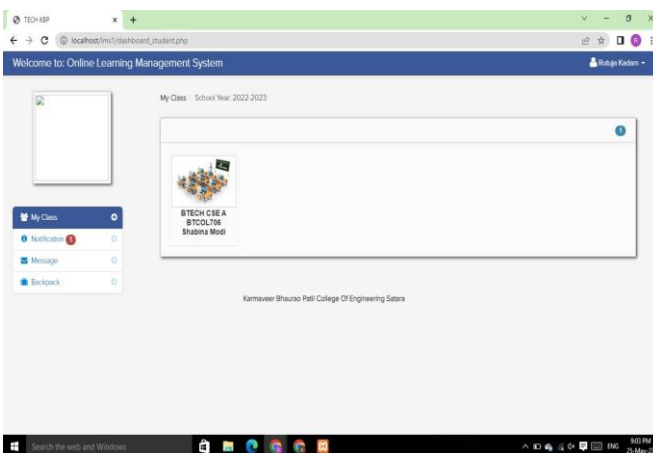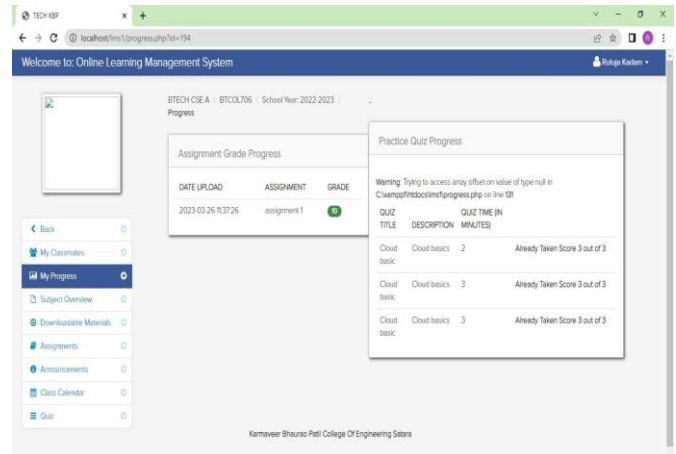

Figure.4

Figure.5

Figure.6

Figure.7

3.4 Automatic Fan On/Off System By Using Temperature Detector

Automatic Fan On/Off System: This system is based on the temperature of the surrounding area or room. First, we set a threshold value; if the temperature rises beyond that threshold, the fan will automatically turn on.

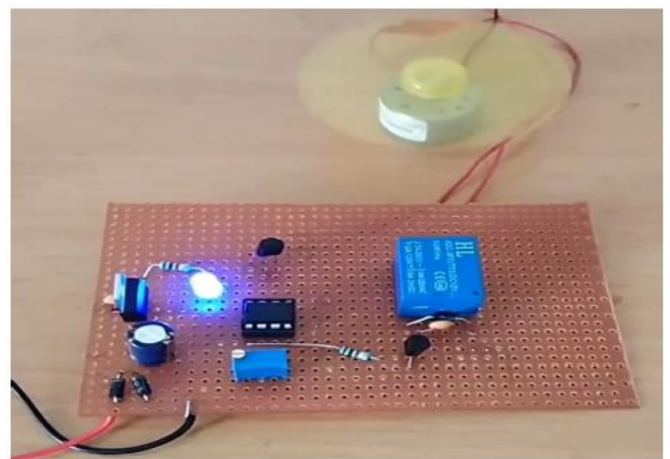For this system, we use a temperature sensor, relay, resistor, and transistor.

Figure.8

4. Requirements

For implementing this project, we need some hardware components and some technology for implementing software or web parts.
Hardware and software requirements are as below:

4.1 Hardware Requirement

As we know, IoT projects consist of different types of hardware components, like sensors and actuators. For this project, we use different hardware components, some of which act as sensors and some as actuators.
Below is a list of hardware components:
1.Hardware Components:
1. ESP32 CAM Board
2. Relay
3. Motor

4. Buzzer
5. LED
6. LDR
7. Laser
8. Resistor
9. Transistor
10. SPST Switch
11. FTDI Programmer
12. Jumper Wires
13. Solenoid Lock

Below is a list of software components:
2. Software Components:
   1. PHP (Visual studio)
   2. HTML & CSS
   3. MySQL Database
   4. C++
   5. Arduino IDE

5. Advantages and Disadvantages

5.1. Advantages
1. Valid Entry
2. Security
3. Power Consumption

5.2 Disadvantages
1. Cost

Future Scope

1. We can use this model anywhere, i.e., in companies and other types of laboratories.
2. In the future, we can add as many sensors as needed according to the environment or requirement.
3. Maintenance system: if there is any issue with a particular PC, Then it will automatically notify the lab in charge.
4. In the future, we can add login based on face recognition..

6. Conclusion

Things are becoming more automated today. The need for automation is growing every day. Flexible control is made possible by including some "smarter" components. A smart lab that uses internet-connected gadgets to allow for remote monitoring and control of systems and appliances, like a fan on/off system. Our project automates the laboratory events by taking this necessity into account. As long as the components are turned off when no one is in the lab, our project will conserve energy. Cost reduction directly relates to energy conservation. Our system's primary goal is to minimise human effort. In order to preserve security, we are able to authenticate users using face recognition. Every instructor can benefit from Portal, as can students.

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