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IOT Temperature & Mask Scan Entry System for COVID Prevention

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ABSTRACT: The first step to detect COVID is by scanning for fever. Also, we need to monitor every person for a mask. That I have temperature checking systems for every entrance for scanning but manual temperature scanning has a lot of disadvantages. To solve this problem, propose a fully automated temperature scanner and entry provider system. It is a multipurpose system that has a wide range of applications. The system makes use of a contactless temperature scanner and a mask monitor. The scanner is connected directly with a human barrier to bar entry if high temperature or no mask is detected. Any person will not be provided entry without temperature and mask scan. Only person having both conditions is instantly allowed inside. The system uses temperature sensor and camera connected with a raspberry pi system to control the entire operation. The camera is used to scan for mask and temperature sensor for forehead temperature. The raspberry processes the sensor inputs and decides whether the person is to be allowed.

KEYWORDS: IOT, Thermal Scanning, ASP.NET, MySQL, Raspberry Pi

I. INTRODUCTION

In order to prevent the spread of corona virus (COVID-19), the World Health Organization (WHO) advises all governments to mandate its citizens to wear masks in public. As majority of positive cases are found in busy and over-packed regions, scientists recommend wearing a face mask in public places to prevent disease transmission. To prevent the spread of virus, it is also necessary to sanitize hands periodically. The system can detect the presence or absence of a face mask in videos using a camera. COVID-19 infected more than five million people in 188 countries in less than six months. The virus spreads through intimate contact, as well as in congested and overcrowded environments. With the aid of emerging technologies such as artificial intelligence, the Internet of Things, and machine learning, we can combat and anticipate new illnesses. To gain a better understanding of how infection rates may be reduced using our method. Many nations have regulations requiring people to wear face masks in public. These guidelines and legislation were created in response to the rapid increase in cases and deaths in several locations.

A. System References

Corona virus disease 2019 has affected the world seriously. One major protection method for people is to wear masks in public areas. Furthermore, many public service providers require customers to use the service only if they wear masks correctly. On national level, temperature screening by employers is not mandatory. However, it is strongly recommended for businesses with more than 50 employees and businesses where maintaining social distance may not be realistic. Also government decided to reopen all religious places in this case temperature screening and mask plays crucial role hence we proposed system which automatically detects mask and screen temperature and allows only those who are wearing mask and has body temperature within range.

B. Overall Description

Now that many shops, offices and institutions are re-opening again after the Corona lockdown, many businesses are faced with the need to provide the best possible protection for their staff and customers. Face masks and body temperature checks play an important part in the protection effort. While this is already done routinely and at a large scale at airports or railway stations, many businesses and institutions are struggling to meet the challenge. Face mask monitoring often requires additional staff resources. At the same time, body temperature checks by staff come with certain risks in terms of hygiene and data privacy.

C. Motivation

However, it is becoming more difficult to monitor large groups of people when they are congregated in public places. As a consequence of this, we are going to suggest a temperature scanner and entry provider system that is totally automated. It is a versatile system that may be used for a variety of things in a variety of settings. A contactless temperature scanner and a mask monitor are used by the system. If a high temperature or the absence of a mask is detected by the scanner, admission will be denied by a human barrier that is directly linked to the scanner. Anyone who attempts to enter without first undergoing a temperature and mask screening will be denied access. Only those people who meet both requirements will be permitted immediate entry. The temperature sensor and camera are both linked to a Raspberry Pi system, which serves as the primary controller for the whole system. The temperature sensor is used to measure the temperature of the forehead, while the camera is used to scan for masks. The raspberry analyses the data received from the sensors and determines whether or not the individual should be permitted access.

II. SYSTEM ANALYSIS

The main objective of this project is to build a system that will help the people from corona virus by using suitable precaution measurements such as Temperature scanning and Mask Detection.

A. Operating Systems Support

There must be used are system type is 64 bit operating system x64-based processor which will support our functions that we are going to built in our project.

B. Programming Language

This project is based on web, so we choose ASP.NET using C# Programming.

C. Constraints

The main constraints of our project is that proper set hardware for thermal scanning and mask detection is required in crowded places such Railway station, malls, Restaurant etc is required.

D. Performance Analysis

This system will help us to reduce the spread of corona virus to some extend by properly using thermal scanning and Mask Detection.

E. Technical Analysis

For developing the software we have used ASP.NET as programming language because the functionalities for developing the modules of requirement as it can be done easily using it.

III. PROPOSED METHODOLOGY

This model consists of raspberry pi and temperature sensor, interfacing circuit, camera, buzzer, LCD display, driver circuit, Door access and a sanitizer motor. In the existing model there is only mask detection which detects the face of the person wearing mask or not on this proposed model we have used the Existing model Temperature sensor and the automatic Sanitization the model. All To solve these problems, working on that automates the process of Temperature Check-ups by using Facial Land marking & Contactless IR Temperature Sensor and Mask Detection using Deep Learning Neural Network by using, This system not only detects human temperature but also scans persons

wearing face mask or not. When a passer without wearing face mask is approaching to the camera sensor, display shows the body temperature and sounds "ATTENTION, MASK NOT DETECTED" warning to remind the person detected at the same time. Of course the setting of "Wearing mask or not" can be based on officer's preference to make an adjustment. If a potential person is close to fever temperature and exceeds the specific temperature is detected, camera will make a quick response and will sound "WARNING, TEMPERATURE OUT OF RANGE" to inform officer by alarm message.

Advantages

- Full and partial facial recognition with the capability to detect a user while wearing a face mask
- Fast and accurate, non-contact forehead temperature scanning with high-temperature alarms
- Connects to secure gate entry systems
- Multiple devices can be used at one location
- Various modes of operation for use in a wide range of settings

PROJECT DESCRIPTION

Face Detection

Face detection applications use algorithms and ML to find human faces within larger images, which often incorporate other non-face objects such as landscapes, buildings and other human body parts like feet or hands. Face detection algorithms typically start by searching for human eyes -- one of the easiest features to detect. The algorithm might then attempt to detect eyebrows, the mouth, nose, nostrils and the iris. Once the algorithm concludes that it has found a facial region, it applies additional tests to confirm that it has, in fact, detected a face.

Mask Detection

Face Mask Detection uses existing CCTV cameras to look for the faces and detect people without masks. Using an AI network, it can recognize if the person is not wearing a mask. The Face Mask Detection System can be used at office premises to detect if employees are maintaining safety standards at work. It monitors employees without masks and sends them a reminder to wear a mask.

IR Temperature Sensor:

Thermopile IR Temperature Sensors Thermopile sensors are designed to measure temperature from a distance by detecting an object's infrared (IR) energy. The higher the temperature, the more IR energy is emitted. The thermopile sensing element, composed of small thermocouples on a silicon chip, absorb the energy and produce an output signal.

The LM35 does not require any external calibration or trimming and maintains an accuracy of +/- 0.4°C at room temperature and +/- 0.8°C over a range of 0°C to +100°C. Another important characteristic of the LM35DZ is that it draws only 60 microamps from its supply and possesses a low self-heating capability. The sensor self-heating causes less than 0.1°C temperature.

An amplifier can either be a separate piece of equipment or an electrical circuit contained within another device. Amplification is fundamental to modern electronics, and amplifiers are widely used in almost all electronic equipment. Amplifiers can be categorized in different ways. One is by the frequency of the electronic signal being amplified.

For example, audio amplifiers amplify signals in the audio (sound) Range of less than 20 kHz, RF amplifiers amplify frequencies in the radio frequency range between 20 kHz and 300 GHz, and servo amplifiers and instrumentation amplifiers may work with very low frequencies down to direct current. Amplifiers can also be categorized by their physical placement in the signal chain; a preamplifier may precede other signal processing stages.

IV. RESULTS AND DISCUSSION

Hardware Requirement

- System : Inter i3
- Hard Disk : 500 GB.
- Monitor : LED
- Mouse : Logitech.
- Ram : 4 GB.

Sensor

- * DS18B20
- * Camera
- * Temperature Sensor
- * LCD Display

Software Requirement:

- Operating System : Microsoft Windows Ultimate
- Front End : Microsoft Visual Studio, Python
- Back End : **Sql** Server

FRONT END

Features OF .Net

Microsoft .NET is a set of Microsoft software technologies for rapidly building and integrating XML Web services, Microsoft Windows-based applications, and Web solutions. The .NET Framework is a language-neutral platform for writing programs that can easily and securely interoperate. There's no language barrier with .NET: there are numerous languages available to the developer including Managed C++, C#, Visual Basic and Java Script. The .NET framework provides the foundation for components to interact seamlessly, whether locally or remotely on different platforms. It standardizes common data types and communications protocols so that components created in different languages can easily interoperate.

“.NET” is also the collective name given to various software components built upon the .NET platform. These will be both products (Visual Studio.NET and Windows.NET Server, for instance) and services (like Passport, .NET My Services, and so on).

THE .NET FRAMEWORK

The .NET Framework has two main parts:

1. The Common Language Runtime (CLR).
2. A hierarchical set of class libraries.

The CLR is described as the “execution engine” of .NET. It provides the environment within which programs run. The most important features are

- ◆ Conversion from a low-level assembler-style language, called Intermediate Language (IL), into code native to the platform being executed on.
- ◆ Memory management, notably including garbage collection.
- ◆ Checking and enforcing security restrictions on the running code.
- ◆ Loading and executing programs, with version control and other such features.
- ◆ The following features of the .NET framework are also worth description:

Managed Code

The code that targets .NET, and which contains certain extra Information - “metadata” - to describe itself. Whilst both managed and unmanaged code can run in the runtime, only managed code contains the information that allows the CLR to guarantee, for instance, safe execution and interoperability.

Managed Data

With Managed Code comes Managed Data. CLR provides memory allocation and Deal location facilities, and garbage collection. Some .NET languages use Managed Data by default, such as C#, Visual Basic.NET and JScript.NET, whereas others, namely C++, do not. Targeting CLR can, depending on the language you're using, impose certain constraints on the features available. As with managed and unmanaged code, one can have both managed and unmanaged data in .NET applications - data that doesn't get garbage collected but instead is looked after by unmanaged code.

Common Type System

The CLR uses something called the Common Type System (CTS) to strictly enforce type-safety. This ensures that all classes are compatible with each other, by describing types in a common way. CTS define how types work within the runtime, which enables types in one language to interoperate with types in another language, including cross-language exception handling. As well as ensuring that types are only used in appropriate ways, the runtime also ensures that code doesn't attempt to access memory that hasn't been allocated to it.

Common Language Specification

The CLR provides built-in support for language interoperability. To ensure that you can develop managed code that can be fully used by developers using any programming language, a set of language features and rules for using them called the Common Language Specification (CLS) has been defined. Components that follow these rules and expose only CLS features are considered CLS-compliant.

THE CLASS LIBRARY

.NET provides a single-rooted hierarchy of classes, containing over 7000 types. The root of the namespace is called System; this contains basic types like Byte, Double, Boolean, and String, as well as Object. All objects derive from System. Object. As well as objects, there are value types. Value types can be allocated on the stack, which can provide useful flexibility. There are also efficient means of converting value types to object types if and when necessary.

The set of classes is pretty comprehensive, providing collections, file, screen, and network I/O, threading, and so on, as well as XML and database connectivity.

The class library is subdivided into a number of sets (or namespaces), each providing distinct areas of functionality, with dependencies between the namespaces kept to a minimum.

LANGUAGES SUPPORTED BY .NET

The multi-language capability of the .NET Framework and Visual Studio .NET enables developers to use their existing programming skills to build all types of applications and XML Web services. The .NET framework supports new versions of Microsoft's old favorites Visual Basic and C++ (as VB.NET and Managed C++), but there are also a number of new additions to the family.

Visual Basic .NET has been updated to include many new and improved language features that make it a powerful object-oriented programming language. These features include inheritance, interfaces, and overloading, among others. Visual Basic also now supports structured exception handling, custom attributes and also supports multi-threading.

Visual Basic .NET is also CLS compliant, which means that any CLS-compliant language can use the classes, objects, and components you create in Visual Basic .NET.

Managed Extensions for C++ and attributed programming are just some of the enhancements made to the C++ language. Managed Extensions simplify the task of migrating existing C++ applications to the new .NET Framework.

C# is Microsoft's new language. It's a C-style language that is essentially "C++ for Rapid Application Development". Unlike other languages, its specification is just the grammar of the language. It has no standard library of its own, and instead has been designed with the intention of using the .NET libraries as its own.

Microsoft Visual J# .NET provides the easiest transition for Java-language developers into the world of XML Web Services and dramatically improves the interoperability of Java-language programs with existing software written in a variety of other programming languages.

Active State has created Visual Perl and Visual Python, which enable .NET-aware applications to be built in either Perl or Python. Both products can be integrated into the Visual Studio .NET environment. Visual Perl includes support for Active State's Perl Dev Kit.

Other languages for which .NET compilers are available include

- FORTRAN



- COBOL
- Eiffel

ASP.NET XML WEB SERVICES	Windows Forms
Base Class Libraries	
Common Language Runtime	
Operating System	

Figure 5: .Net Framework

C#.NET is also compliant with CLS (Common Language Specification) and supports structured exception handling. CLS is set of rules and constructs that are supported by the CLR (Common Language Runtime). CLR is the runtime environment provided by the .NET Framework; it manages the execution of the code and also makes the development process easier by providing services C#.NET is a CLS-compliant language. Any objects, classes, or components that created in C#.NET can be used in any other CLS-compliant language. In addition, we can use objects, classes, and components created in other CLS-compliant languages in C#.NET .The use of CLS ensures complete interoperability among applications, regardless of the languages used to create the application.

CONSTRUCTORS AND DESTRUCTORS:

Constructors are used to initialize objects, whereas destructors are used to destroy them. In other words, destructors are used to release the resources allocated to the object. In C#.NET the sub finalize procedure is available. The sub finalize procedure is used to complete the tasks that must be performed when an object is destroyed. The sub finalize procedure is called automatically when an object is destroyed. In addition, the sub finalize procedure can be called only from the class it belongs to or from derived classes.

GARBAGE COLLECTION

Garbage Collection is another new feature in C#.NET. The .NET Framework monitors allocated resources, such as objects and variables. In addition, the .NET Framework automatically releases memory for reuse by destroying objects that are no longer in use. In C#.NET, the garbage collector checks for the objects that are not currently in use by applications. When the garbage collector comes across an object that is marked for garbage collection, it releases the memory occupied by the object.

OVERLOADING

Overloading is another feature in C#. Overloading enables us to define multiple procedures with the same name, where each procedure has a different set of arguments. Besides using overloading for procedures, we can use it for constructors and properties in a class.

MULTITHREADING:

C#.NET also supports multithreading. An application that supports multithreading can handle multiple tasks simultaneously, we can use multithreading to decrease the time taken by an application to respond to user interaction.

STRUCTURED EXCEPTION HANDLING

C#.NET supports structured handling, which enables us to detect and remove errors at runtime. In C#.NET, we need to use Try...Catch...Finally statements to create exception handlers. Using Try...Catch...Finally statements, we can create robust and effective exception handlers to improve the performance of our application.

THE .NET FRAMEWORK

The .NET Framework is a new computing platform that simplifies application development in the highly distributed environment of the Internet.

OBJECTIVES OF .NET FRAMEWORK

1. To provide a consistent object-oriented programming environment whether object codes is stored and executed locally on Internet-distributed, or executed remotely.
2. To provide a code-execution environment to minimizes software deployment and guarantees safe execution of code.
3. Eliminates the performance problems.

There are different types of application, such as Windows-based applications and Web-based applications.

BACK END DESIGN

MY SQL

A database is a separate application that stores a collection of data. Each database has one or more distinct APIs for creating, accessing, managing, searching and replicating the data it holds.

MySQL is a fast, easy-to-use RDBMS being used for many small and big businesses. MySQL is developed, marketed and supported by MySQL AB, which is a Swedish company. MySQL is becoming so popular because of many good reasons –

- MySQL is released under an open-source license. So you have nothing to pay to use it.
- MySQL is a very powerful program in its own right. It handles a large subset of the functionality of the most expensive and powerful database packages.
- MySQL uses a standard form of the well-known SQL data language.
- MySQL works on many operating systems and with many languages including PHP, PERL, C, C++, JAVA, etc.
- MySQL works very quickly and works well even with large data sets.
- MySQL is very friendly to PHP, the most appreciated language for web development.
- MySQL supports large databases, up to 50 million rows or more in a table. The default file size limit for a table is 4GB, but you can increase this (if your operating system can handle it) to a theoretical limit of 8 million terabytes (TB).

FEATURES OF MYSQL:

The following list shows the most important properties of MySQL. This section is directed to the reader who already has some knowledge of relational databases. We will use some terminology from the relational database world without defining our terms exactly. On the other hand, the explanations should make it possible database novices to understand to some extent what we are talking about.

- **Relational Database System:** Like almost all other database systems on the market, MySQL is a relational database system.
- **Client/Server Architecture:** MySQL is a client/server system. There is a database server (MySQL) and arbitrarily many clients (application programs), which communicate with the server; that is, they query data, save changes, etc. The clients can run on the same computer as the server or on another computer (communication via a local network or the Internet).

Almost all of the familiar large database systems (Oracle, Microsoft SQL Server, etc.) are client/server systems. These are in contrast to the file-server systems, which include Microsoft Access, dBase and FoxPro. The decisive drawback to file-server systems is that when run over a network, they become extremely inefficient as the number of users grows. Ease of Use & Administration Ease of use has been a design goal for MySQL since its inception. MySQL offers exceptional quick-start capability with the average time from software download to installation completion being less than fifteen minutes. Once installed, self management features like automatic space

expansion, auto-restart, and dynamic configuration changes take much of the burden off already overworked database administrators. The visual database design, development, administration and monitoring tools delivered within MySQL Enterprise Edition and presented later in this document further enhance MySQL's ease of use and administration. The LAMP Stack Describing why MySQL became the #1 database choice for web-based applications would not be complete without mentioning the LAMP stack. LAMP (standing for Linux, Apache, MySQL, PHP/Perl/Python) became the leading open source web platform, adopted by a large majority of popular Web sites across the world including Facebook, Google, Twitter, YouTube, Craigslist and Zappos. LAMP is chosen by savvy IT leaders as a way to improve operational efficiency and reduce IT infrastructure costs.

RELIABILITY & UPTIME:

Web-based applications must typically be available 24/7. Downtime can be extremely detrimental to customer loyalty, and potentially very costly. Web properties need their database platform to exhibit high code quality, fault tolerance, rapid restart & restore, dynamic adaptation to increasing workload as well as simple upgrades and easy maintenance operations. Robustness In addition to extensive QA testing at Oracle, MySQL is battle-tested by millions of users in a very wide variety of application scenarios. As Eric Raymond noted: "given enough eyeballs, all bugs are shallow", the huge MySQL community contributes to the extremely high quality of the world's most popular open source database. Security Because guarding the data assets of corporations is the number one job of database professionals, MySQL offers exceptional security features that ensure absolute data protection. In terms of database authentication, MySQL provides powerful mechanisms for ensuring only authorized users have entry to the database, with the ability to block users down to the client machine level being possible. SSH and SSL support are also provided to ensure safe and secure connections. A granular object privilege framework is present so that users only see the data they should, and powerful data encryption and decryption functions ensure that sensitive data is protected from unauthorized viewing. Finally, backup and recovery utilities are provided through MySQL Enterprise Edition.

MYSQL DATABASE ARCHITECTURE:

There are two flavors of Database Management System (DBMS) known as shared-file and client-server. A shared file based DBMS consists of a database access application which interacts directly with the underlying database files. These types of database are typically designed for less demanding data storage needs and are used almost exclusively on desktop computers. Microsoft Access is a typical example of this category of DBMS. Such database systems are never used in distributed or enterprise level environments. MySQL falls into the client-server DBMS category. A client-server DBMS is split into two components. The server component typically resides on the same physical computer as the database files and is responsible for all interactions with the database. The second component is the client. The client sends all database requests to the server which in turn processes the request and returns the results of the request back to the client.

There are a couple of key advantages to the client-server architecture DBMS. Firstly, there is no need for the client to be running on the same computer system as the server. Instead, requests can be sent by the client over a network or internet connections to the server on a remote host. The fact that the server resides on a remote computer is invisible to the client user. This makes the database available to greater numbers of users than a shared-file DBMS offers. In large scale enterprise environments this also allows high levels of fault tolerance and load balancing to be implemented. Secondly, separating the client from the server allows a wider range of client types to be used to access the database. Valid clients can be the MySQL tools, applications written in other programming languages such as C, C++ or Java, or web based applications developed using languages such as PHP or JSP).

TESTING

Software testing can be conducted as soon as executable software (even if partially complete) exists. The overall approach to software development often determines when and how testing is conducted. For example, in a phased process, most testing occurs after system requirements have been defined and then implemented in testable programs. In contrast, under an Agile approach, requirements, programming, and testing are often done concurrently. Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

TYPES OF TESTS

UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. It is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

Unit testing is usually conducted as part of a combined code and unit test phase of the software lifecycle, although it is not uncommon for coding and unit testing to be conducted as two distinct phases.

Test strategy and approach

Field testing will be performed manually and functional tests will be written in detail.

Test objectives

All field entries must work properly.

Pages must be activated from the identified link.

The entry screen, messages and responses must not be delayed.

Features to be tested

Verify that the entries are of the correct format

No duplicate entries should be allowed

All links should take the user to the correct page.

INTEGRATION TESTING

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfactory, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

Integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects.

The task of the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

Test Results: All the test cases mentioned above passed successfully. No defects encountered.

FUNCTIONAL TEST

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is entered on the following items:

Valid Input : Identified classes of valid input must be accepted.

Invalid Input : Identified classes of invalid input must be rejected.

Functions : Identified functions must be exercised.

Output : Identified classes of application outputs must be exercised.

Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

SYSTEM TEST

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.



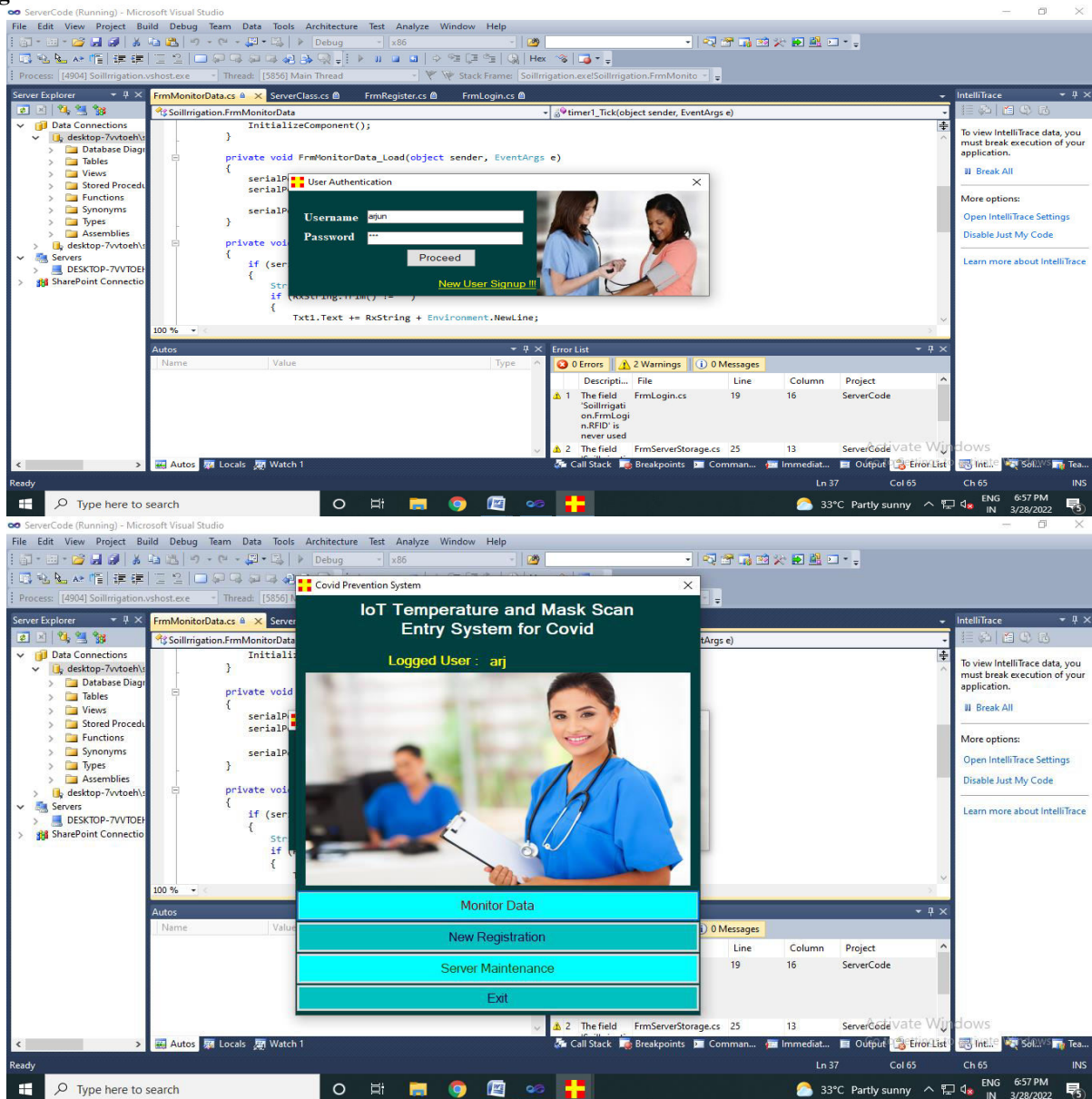
WHITE BOX TESTING

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

BLACK BOX TESTING

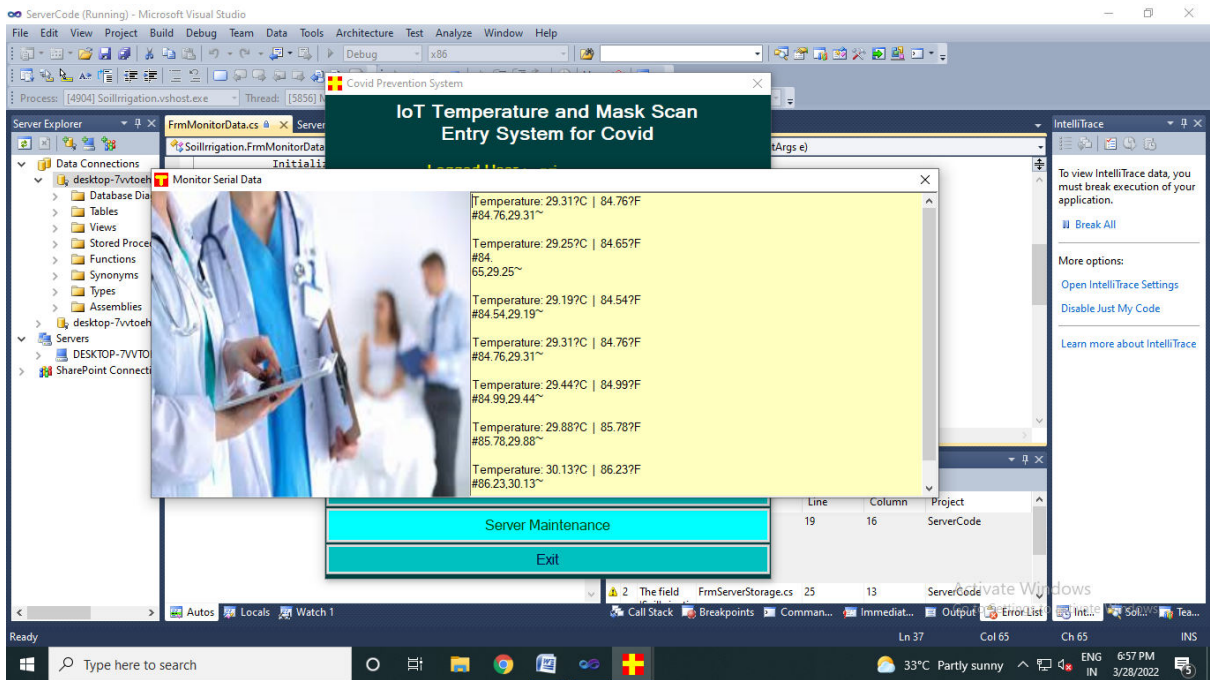
Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .you cannot “see” into it. The test provides inputs and responds to outputs without considering how the software works.

Login

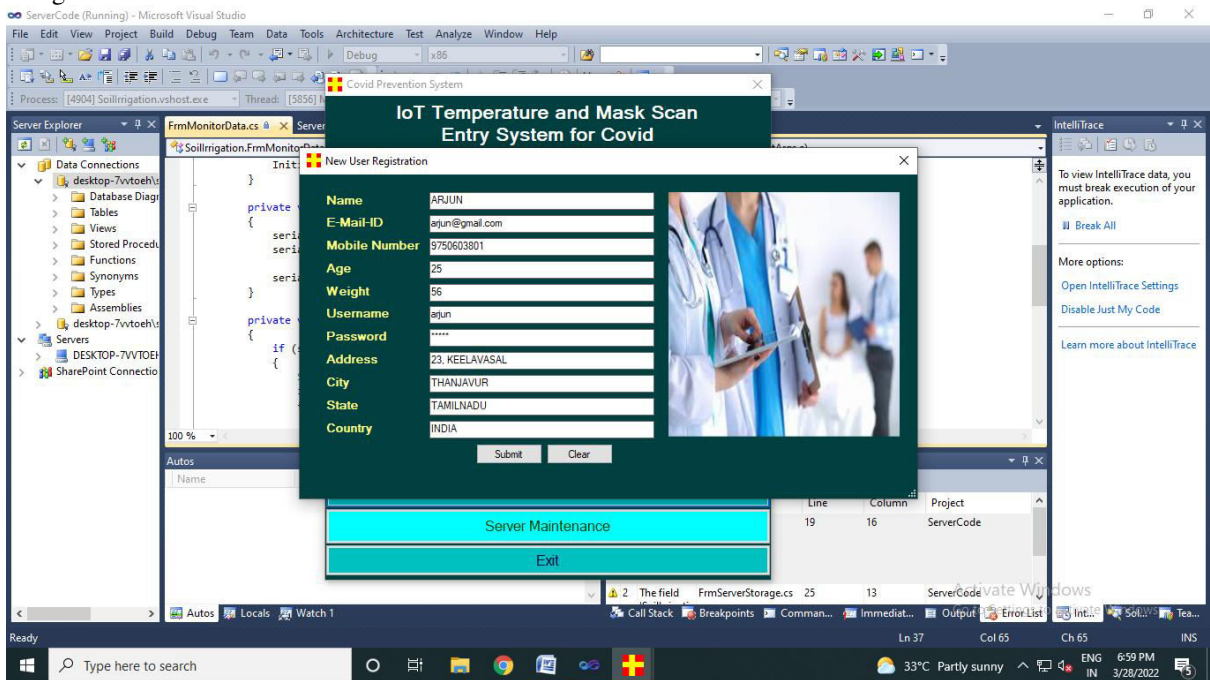


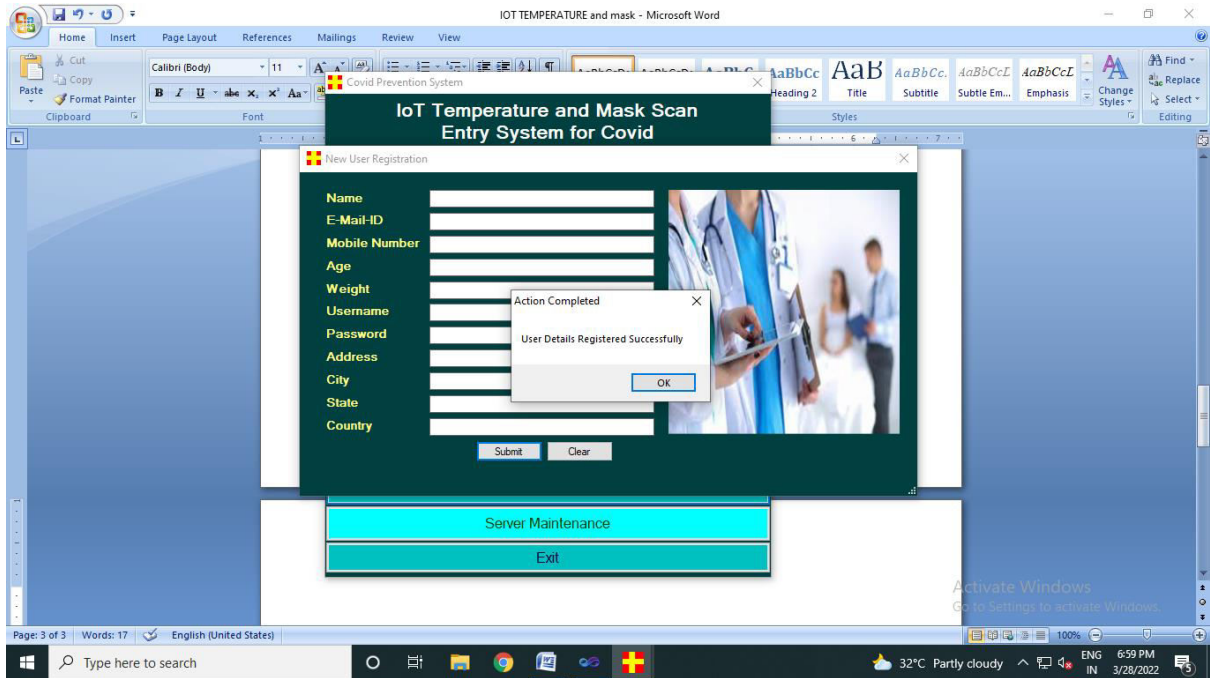


Monitor Data

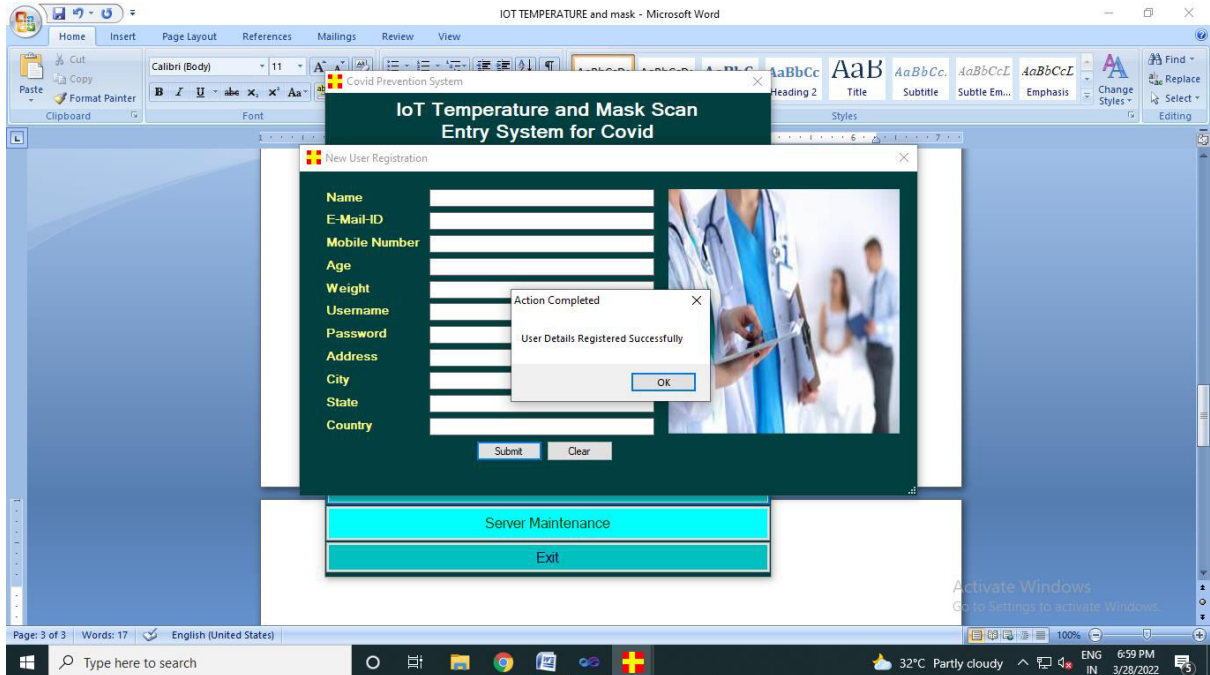


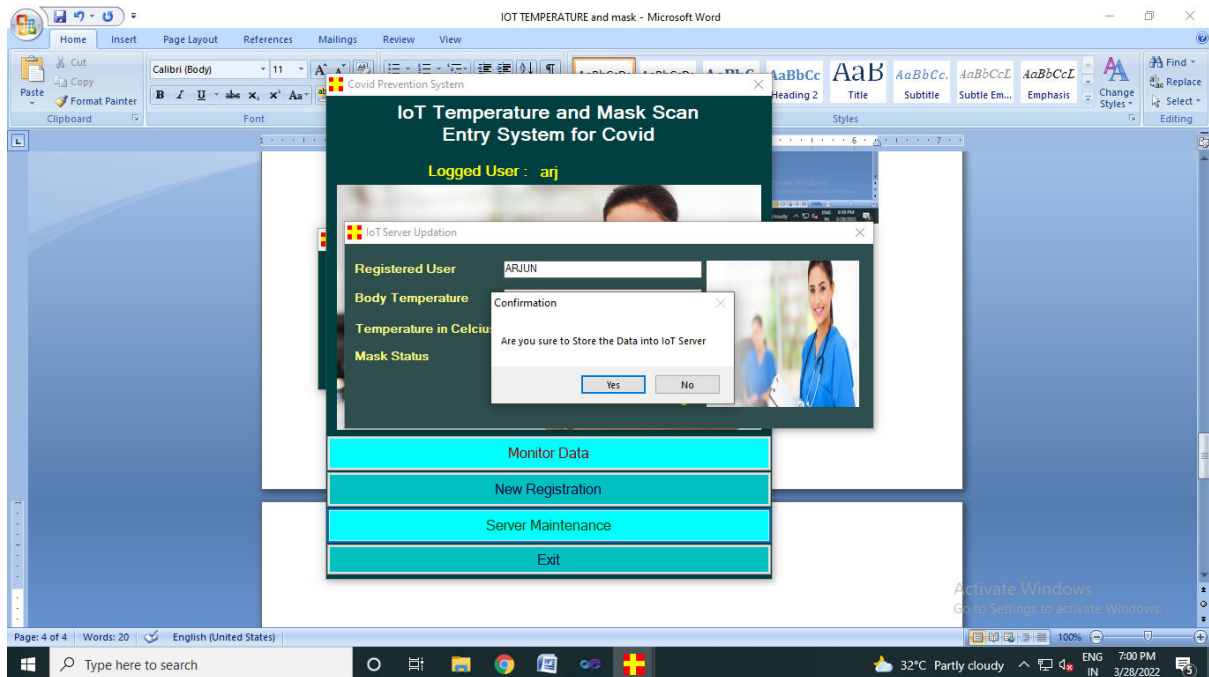
New Register





Server Maintenance





V. CONCLUSION AND FUTURE SCOPE

According to the achieved results, the proposed solution is usable for its purpose under certain performance limitations (such as number of processed frames or measurements per second). Moreover, it relies on both open hardware and free software, being definite and desirable advantage for such systems. In future, it is planned to experiment with various deep learning and computer vision frameworks for object detection on Computer in order to achieve higher frame rate. Moreover, we would like to extend this solution with environment sensing mechanisms for adaptive building air conditioning and ventilation airborne protection in order to reduce the spread of coronavirus indoors, especially during summer. Finally, the ultimate goal is to integrate the system presented in this paper with our framework for efficient resource planning during pandemic crisis in order to enable efficient security personnel scheduling and mask allocation, together with risk assessment based on statistics about respecting the safety guidelines.

As the actual implementation of the system for commercial purpose is taken in to the consideration the system can be upgraded with advance components. For improving system Performance, best and advance versions of the components used, can be included in the system Advance version refers to Orange-pi for faster processing, high resolution cameras, higher accuracy digital sensors etc. All the sensors of black box are excellent at performance and provide adequate data to the system for monitoring and accurate information about the status of vehicle is provided to the owner and family. This means that the systems fulfil all the expected results and it is fruitful for the user.

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