ACTIVITY MANAGEMENT SYSTEM USING IMAGE PROCESSING

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled **"Activity Management System Using Image Processing"**, submitted by **Md. Rezaul Karim** and **Md. Pias Hossain** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering (BSc) and approved as to its style and contents. The presentation has been held on 09th December 2018.

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DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Ms. Nazmun Nessa Moon, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

The main agenda of this project is the formation of the automatic attendance system by using image processing that can save the valuable time of teachers and students. It is used the computer algorithms to perform the image processing to detect and recognize faces for attendance. In case of attendance, image processing allows a large amount of algorithms and libraries that have the various advantage such as it can ignore noise and distortion during processing an image. The main reason for the quality of face recognition is that here Python and OpenCV are used as programming language and library, capturing more images on real time for comparing with trained image data. Moreover, the mobile application is designed to help students to know their activities such as total attendance, the number of absence in the class and application will give notification to students either they attend to class or not. We have designed a desktop software and mobile application which will use local storage and online server. There will be data related to the database in the online server and related to the image in the local.

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CHAPTER 1

Introduction

1.1 Introduction

Face recognition is a most important types of biometric authentication. The years of 1960's date gone to introduced of face recognition in the world [1]. Face Recognition is high popularity researches area in web communication and apps communication, provides security, person verification, internet communication, and computer recreation [2]. We have developed student activity management system using by digital image processing and face recognition idea. This is an automated version of manual attendance system. Our student activity management system obviously provides of accuracy for automatic attendance up to 95% successful recognition rate, out of which less than 3% of the detected faces are false positive. Where bargain online access login system. We are used three hardware component of database server, admin training PC and camera and class room PC and camera. This system firstly inputs as image then face detect after that feature extraction then face recognition with identification/verification. These systems are two general applications of face recognition, one is identification. It's mean given face image and tells them who he/she is? Another is verification. Its mean given an image and guess of the identification and system tells this guess true or false.

So we are creating this Student activity system two application base, firstly we have created desktop based application and secondly creates mobile based application. Desktop based application system develop for computerization device such as computer, laptop etc. and mobile based application develop for PDAs device such as smart phone (Android), tab etc. Into the desktop software admin will make students registration and teachers assign for any course. Where teachers can able to take attendance using face recognition, can see percentage of student attendance, view student course details, student personal details etc. Where every student can see their class attendance, percentage of attendance, course details, faculty etc, and every student can develop their present position from this all the details information. Using the software, teachers/admin can get all information about their students.

This is very simple thinking but that system gives how to easily manage automatic attendance with student activity and admin can easily assign the course teachers by using this system. It also provides interactive communication to the students and teachers. [1, 6]

1.2 Motivation

Face recognition has recently received an exhibited attention and interest from the scientific community as well as from the common public. The general public is interested with image processing system due to the recent events of terror around the world, which has increased the demand for useful security systems [2, 3]. So we have also need to security system in my class room. That's why we are motivated and develop the student activity system using by image processing. Another motivation issues are reduced waste time for student attendance. In this modern world user expectation are too high that's the reason we are motivated and design efficient system design for student attendance system. It is difficult to manage of huge amount of students by teachers and admins. That's the reason behind of developing this system. We believe our system is fast and efficient and it will make happy to administration, teachers and students.

We have visited corporate office of ACI Logistics Ltd (Shwapno). It placed on nearby Mohakhali of Dhaka. They are using face recognition process and take attendance of employee one by one during entry to office and exit from the office. This is very interesting system, employee has no need to show their id card, just detect their faces and automatic attendance will have done. We are thinking, our project will more efficient than other because our system provides automatic attendance for all students at a time. We hope that it will be very effective and helpful automatic attendance system. So we are motivated from it.

We are also motivated from social media of Facebook. When we upload any picture to Facebook then Facebook firstly detect this picture then identification and compare this picture. When matched this picture with any person, then it givens name of person. Facebook are also using face recognition system for identification. It is very interesting feature of Facebook and we are glad to their intelligence.

Amazon and Alibaba also used image processing for arrange industrial parts by automation/robots. [29, 29]

We think that face recognition idea may provide smart system for student attendance. Above motivation area are very helpful hints for developing our automatic attendance system by using image processing.

1.3 Objectives

The intention of this project is to pursue of face detection and recognition that provide face recognition attendance system in a university environment. We have to need design, develop and implement face recognition system in a favorable way. Where algorithm should be usable in a simple and easily adaptable setup [4]. That means a single camera setup (Web camera) and no need to other costly equipment. Objectives of student activity management system is given below,

- To provide online database.
- Admin can assign any teachers and students.
- To detect faces using by automated system.
- It can detect faces and ignored other background objects such as chair, table etc.
- It can detect face even though there are glass.
- To provide automated update to database without human intervention.
- To provide of any student information for the management and guardian.
- To provide of activity notification for students to mobile apps.

Also propose to maximum utilization of our valuable time. Where management can use this effective, efficient system at low cost.

1.4 Expected Outcome

We have mentioned about some expected outcome in given below,

For Admin of an Institute: Admin freely to login the system and readily manage of huge amount of students with generate an information base database. Which define all of the student's personal information, academic information, technical skill information, program and course information with extra activities information. Admin can define the course like the course name, batch, section etc. Admin also provides students registration and assign teachers for courses. So its valuable system for institute.

For Automatic Attendance: We can gain of automatic attendance system. Where class room keep of under the web camera when teacher click the attendance button of system then web camera is going on and take some images then detect and recognize individual image compare with local storage and make attendance and send update to online server. It can provide 95% perfect result by the automatic attendance system.

For Teachers: Teacher can freely access to the system by using username and password. Teacher takes auto attendance for all of the students at a time in a class room, just a single click. Teacher seen individual or all of the student's activity in a single system. So it's time utilization system.

For Students: Student must be login the system at first to view of previous class attendance, attendance percentage for individual course, course details, faculty. Student will become attentive to class because they will notify regularly by using their apps. It's very helpful for every student with accept competitive challenge.

For an Academic: Academic activity softly handles by using this activity system. So this developed system must be proposing of student performance. So we hope this student activity management system must be helpful and needful application for developing an institute. So academic work will smartly handle by the system.

1.5 Report Layout

In the chapter 1 we have given some information about introduction to image processing system and compare with our project, given some objective and how we get motivation to developed our project and finally we have tried to give some outcome of our project.

In the chapter 2 we have discussed about background of image processing and given some related work which developed by image processing, also we have given challenges and scope of problem and tried to give briefly discussion of comparative studies that we have gained from onsite observation and online.

In chapter 3 we have gathered requirements that need to be developed our project and we have maintained our processing and analysis to developed our project using Business process model, Use Case diagram and Logical model.

In chapter 4 we have designed front-end and back-end of our system based on proposal of project and requirements with integrate user experience design.

In chapter 5 we have implemented our database and front-end design by using MySQL and Python, Java programming language and finally we have tested our project by using Functional testing, Structural testing, Integration and System testing, and finally we have given testing report of our project.

In chapter 6 we have given our personal discussion and conclusion and given some scope for further development.

CHAPTER 2

Background

2.1 Introduction

In earlier 1920s a newspaper company had used an application based on image processing which was the first used. There were some problems that's why image quality was not very well. They trying to solve the problem of image and think about how they done their image quality full. Since the 1921s the digital image has started circulating. [6]

These talents works are there later make interest to image processing and this interest created increasing need of theoretical knowledge about it. There are several books and papers that prepare for image processing, but there was not efficient algorithm to detect, recognition and analyses an image or object. [7, 8]

Now days there are a lot of framework, library and algorithm are available to implement several ways of conduct and it more successful. OpenCV is one type of library that using for human face recognition. So we have used this types of efficient libraries and recognition algorithms. It might give us a good result overall.

2.2 Related Works

We have visited ACI Company Limited and Securex Private Limited and discussed about their attendance system with the employee of company. ACI Company Limited are using image processing for face recognition of employee. During entry point of office a camera capture his/her face individually and send it to local storage and update database after verifying them. On other hand Securex private limited are using the figure thumb detection process. This is one of the image processing field that can recognize the employees figure thumb comparing with the previous trained images of finger thumb. [32, 33]

2.3 Comparative Studies

For our respective onsite observation we have gather idea about the process of attendance for ACI and Securex Private Limited, they use local storage and online storage for manipulate the images of employee. In our project we have also using the local and online server to manipulate of students. The theme are same in the different platforms.

Long ago there were few libraries and algorithms which were not enough for image processing. Now there are different algorithms and libraries that allow to process images very accurately. For example, currently a very popular library is OpenCV that can detect and recognize images. Now for images recognition we have used 'Local Binary Patterns Histograms' (LBPH) that overcome previous algorithm's drawbacks. Example for previous algorithms is Eigen faces Face Recognizer and Fisher faces Face Recognizer. This two types of algorithm were affected by light. [11, 12]

2.4 Scope of the Problem

Before long, the study of image processing started when security was not efficient used by only username and password. Since then, the image processing had been using for security and other purposes. But there are some problems maybe occurred during processing the images such as implementation of design and the following criteria. [11]

In the development of our project may be we have faced the following problem and issues that we must be overcome.

- Bad lighting
- Identifying face of an image
- Illumination problem
- The pose problem

2.5 Challenges

In the time of the develop our project, there are main challenges that we may face,

- Delivery the Project on Time.
- Cost of Project.
- Quality of Project.
- Scope in Future.
- Risk Management.
- Budget of the Project.
- Making Decision.
- Resources of the Project.
- Professional Qualifications.

- Efficient Design of the Project.
- Uniqueness.

Time: The most important challenge of developing a project is time, Project must complete within duration of time.

Cost of Project: During development a project estimated cost knowing is very important. Depend on amount of cost project will be made.

Quality of Project: Another main challenge of developing a project is quality of project. Quality full project is more demanded in market place.

Scope in Future: To ensure that developing project is efficient for specific field.

Risk Management: Sometime fail must be come but staying into the fail we must overcome it and will must finish project.

Budget of the Project: At first ensure the budget for specific project.

Making Decision: The important things are to make decision during developing the project. In some case we must need an interactive decision during some critical situation.

Resource of the Project: Before starting the project ensure the resource of developing project are available and it enough to complete.

Efficient Design of the Project: To make a project, at first we need to design that will make user satisfactory level.

Uniqueness: Project must be unique that means ensure it is not match with another project, because it is tradeoff a developer.

Professional Qualifications: It is also an important challenge when we have to develop a project, because knowledge about project can make more efficient.

CHAPTER 3

Requirement Specification

3.1 Business Process Modeling

The BPM (Business Process Modeling) is a collection of notation, tools that integrate each other, structured activities that serve the goal for an organization or person. The BPM might be structured processing or unstructured processing. Another way, it could be Static processing or Dynamic processing. [14-15]

For making a Business Process Modeling we have to learn about UML diagram.

Unified Modeling Language: It is a modeling language in the Software Engineering that make visualize of a design. Core components of UML diagram are actor, attribute, class, interface, object, activity, event, message, state, use case, association, composition, depends, generalization, aggregation, inheritance etc. There are some different types of diagram, such as:

- Class Diagram
- Activity Diagram
- Use Case Diagram
- Sequence Diagram
- Timing Diagram

In the following figure 3.1 expressed the Class Diagram of our project,

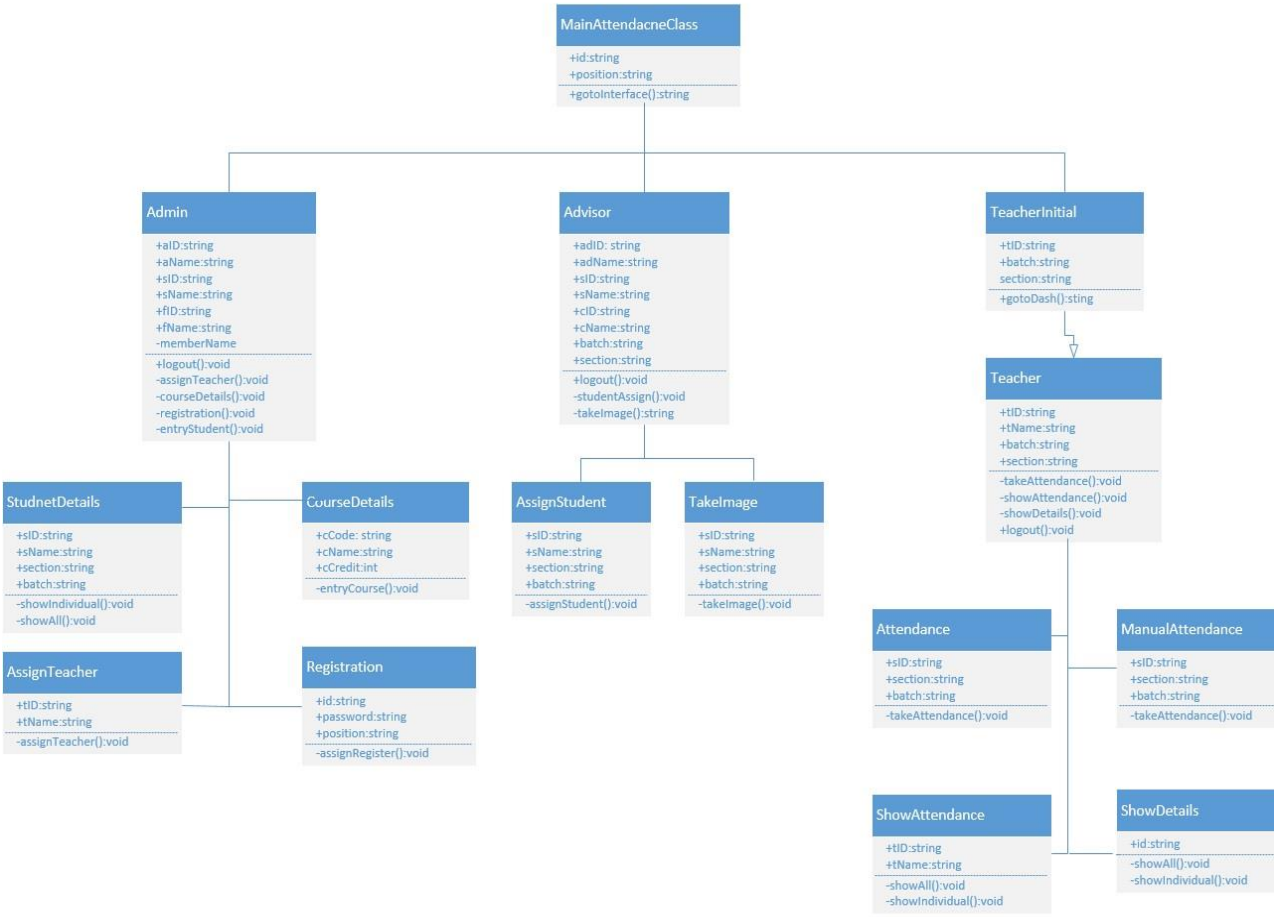


Fig. 3.1: Class diagram of attendance system

3.2 Requirement Collection and Analysis

Requirement collecting is the process that gathering all information about the project which was the requirements of users or organization. [16-18]

Purpose of collecting requirements:

- It can define the efficiency of project
- It helps to define the scope in future
- To know about user demand

- To maintain track to complete project
- It gives idea how much cost will be need

Process of requirements management:

- Gathering all data
- Link requirements
- Decompose requirements

Analysis of requirements:

There are some processes to analysis requirements,

- Data Flow Diagram (Context, Level 0, Level 1)
- Data Dictionary
- Decision Table
- Decision Tree
- E-R Diagram
- USE Case Diagram
- Gantt Chart
- PERT Chart
- Sequence Diagram

3.3 Use Case Modeling and Description

The design of my own project Activity Management System using Computer Vision, we have been given Use Case Diagram in below,

For details description of our project we need to identify 7 points that we have given below

- Use Case
- Actor
- Type
- Description
- Usage
- Extends
- Extended by

The details description of above points, we have given below of Use Case diagram.
In the following figure 3.2 expressed the use case diagram of desktop based software,

In our desktop based software four actor included separately, such as Advisor, Admin, Teacher and Student.

Some of use case has association by include and extends that defines mandatory and partial mandatory function for actors.

In the following figure 3.2 expressed the Use Case diagram of attendance system:

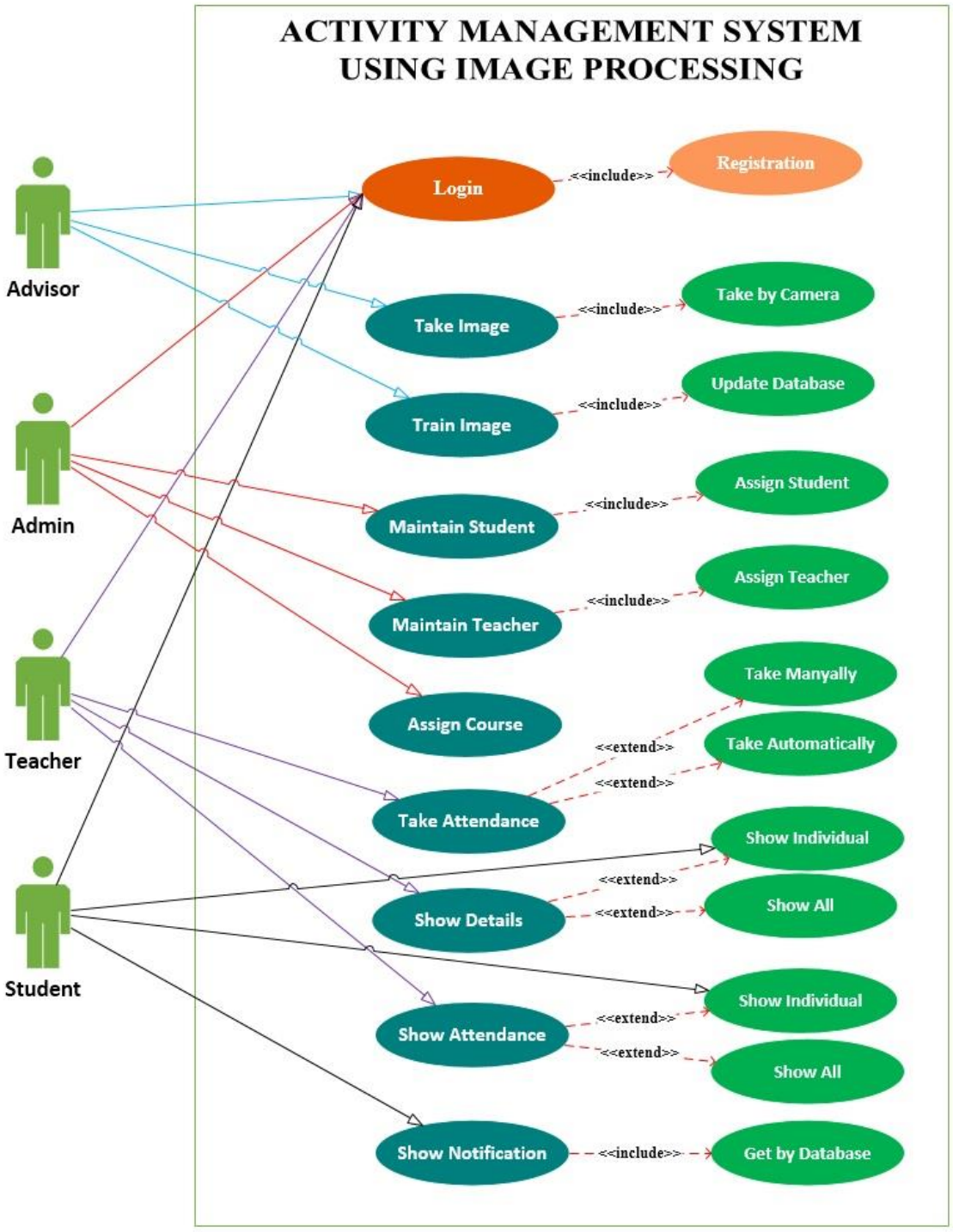


Fig. 3.2: Use Case of attendance system

Details description of Login:

- Use Case : Login
- Actor : Advisor, Admin, Teacher, Student
- Type : Primary
- Description : Advisor, Admin, Teacher and Student needs to login to provide/access his/her own activities.
- Usage : Registration
- Extends : None
- Extended by : None

Details description of Take Image:

- Use Case : Take Image
- Actor : Advisor
- Type : Primary
- Description : Advisor needs to take image of students to trained for attendance.
- Usage : Take by Camera
- Extends : None
- Extended by : None

Details description of Train Image:

- Use Case : Train Image
- Actor : Advisor
- Type : Primary
- Description : After taking image Advisor needs to trained those images.
- Usage : Update Database
- Extends : None
- Extended by : None

Details description of Maintain Student:

- Use Case : Maintain Student
- Actor : Admin
- Type : Primary
- Description : Admin can maintain students and can assign to courses.
- Usage : Assign Student
- Extends : None
- Extended by : None

Details description of Maintain Teacher:

- Use Case : Maintain Teacher
- Actor : Admin
- Type : Primary
- Description : Admin can maintain teachers and can assigned to courses.
- Usage : Assign Teacher
- Extends : None
- Extended by : None

Details description of Assign Course:

- Use Case : Assign Course
- Actor : Admin
- Type : Primary
- Description : Admin can maintain teachers and can assigned to courses.
- Usage : None
- Extends : None
- Extended by : None

Details description of Take Attendance:

- Use Case : Take Attendance
- Actor : Teacher
- Type : Primary
- Description : Teacher can take attendance by manually or automatically.
- Usage : None
- Extends : None
- Extended by : Take Manually, Take Automatically

Details description of Show Details:

- Use Case : Show Details
- Actor : Teacher
- Type : Primary
- Description : Teacher can see the details about students.
- Usage : None
- Extends : None
- Extended by : Show Individual, Show All

Details description of Show Attendance:

- Use Case : Show Attendance
- Actor : Teacher
- Type : Primary
- Description : Teacher can see the attendance of students.
- Usage : None
- Extends : None
- Extended by : Show Individual, Show All

Details description of Show Notification:

- Use Case : Show Notification
- Actor : Student
- Type : Primary
- Description : Student can see the regular notification into his/her apps.
- Usage : Show All
- Extends : None
- Extended by : Get by Database

Details description of Registration:

- Use Case : Registration
- Actor : Advisor, Admin, Teacher, Student
- Type : Primary
- Description : Advisor, Admin, Teacher and Student needs to registration to login.
- Usage : None
- Extends : Login
- Extended by : None

Details description of Take by Camera:

- Use Case : Take by Camera
- Actor : Advisor
- Type : Primary
- Description : Advisor take images by camera.
- Usage : None
- Extends : Take Image
- Extended by : None

Details description of Update Database:

- Use Case : Update Database
- Actor : Advisor
- Type : Primary
- Description : Advisor update database by trained image.
- Usage : None
- Extends : Trained Image
- Extended by : None

Details description of Assign Student:

- Use Case : Assign Student
- Actor : Admin
- Type : Primary
- Description : Admin can assign students to courses.
- Usage : None
- Extends : Maintain Student
- Extended by : None

Details description of Assign Teacher:

- Use Case : Assign Teacher
- Actor : Admin
- Type : Primary
- Description : Admin can assign teachers to courses.
- Usage : None
- Extends : Maintain Teacher
- Extended by : None

Details description of Take Manually:

- Use Case : Take Manually
- Actor : Teacher
- Type : Primary
- Description : The Teacher can take attendance in manually.
- Usage : Take Attendance
- Extends : None
- Extended by : None

Details description of Take Automatically:

- Use Case : Take Automatically
- Actor : Teacher
- Type : Primary
- Description : Teacher can take attendance in automatically by clicking attendance button into the software.
- Usage : Take Attendance
- Extends : None
- Extended by : None

Details description of Show Individual:

- Use Case : Show Individual
- Actor : Teacher, Student
- Type : Primary
- Description : Teacher can see details and attendance about student and Student can see his/her own information.
- Usage : Show Attendance, Show Details
- Extends : None
- Extended by : None

Details description of Show All:

- Use Case : Show All
- Actor : Teacher
- Type : Primary
- Description : Teacher can see details and attendance about students.
- Usage : Show Attendance, Show Details
- Extends : None
- Extended by : None

Details description of Get by Database:

- Use Case : Get by Database
- Actor : Student
- Type : Primary
- Description : Student can see notification in his/her apps in regularly.
- Usage : Show Notification
- Extends : None
- Extended by : None

3.4 Logical Data Model

This is the conceptual view of whole project that helps to implement of easiest way. The most components of the Logical Data Model are the entity, attribute, relationships, keys, data types, etc. [23, 24]

- Entity Relationship Model
- Normalization

Entity Relationship Model:

In the following figure 3.3 expressed the E-R Diagram of attendance system:

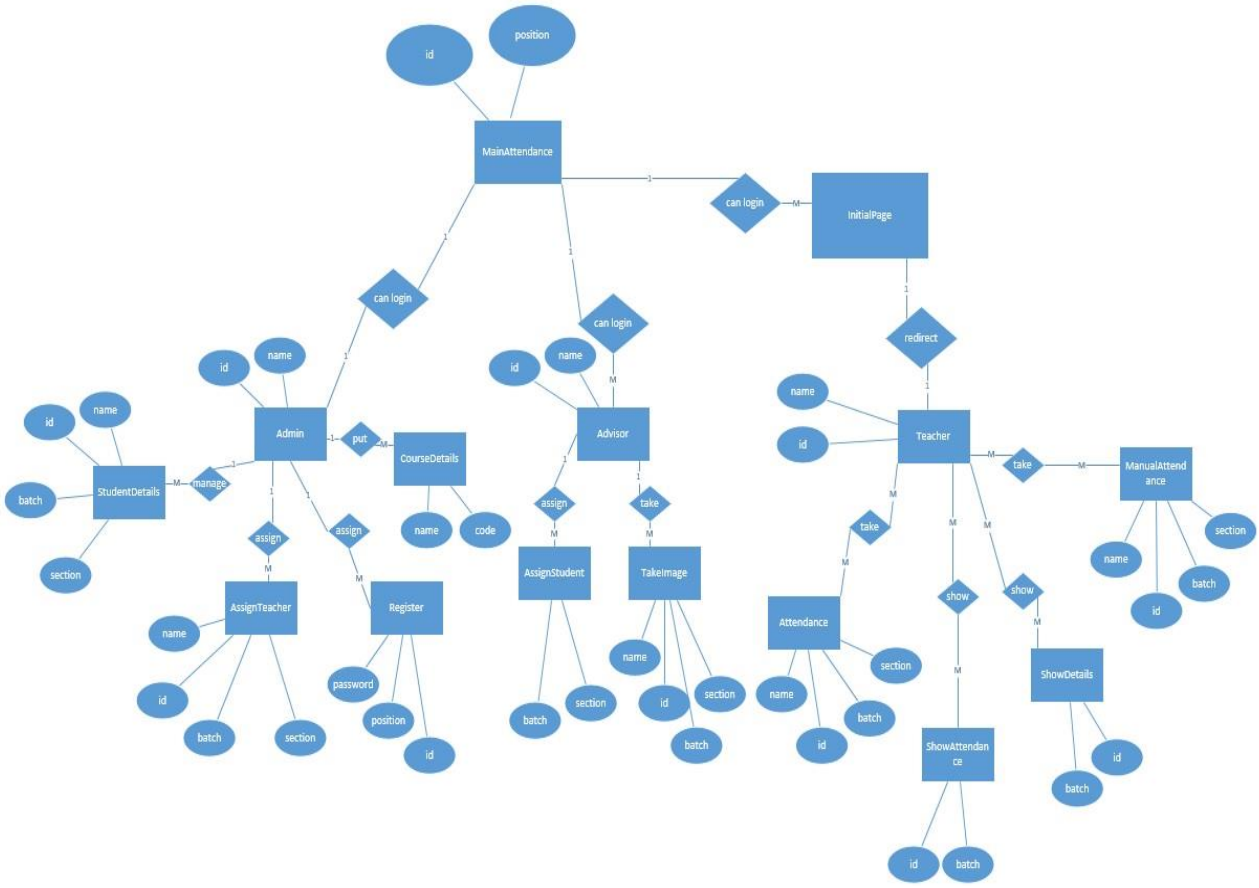


Fig. 3.3: Entity-Relationship model of attendance system

Key:

We have used three types of key such as Primary key, foreign key and Candidate key.

- Primary key

  It refers the unique identity for an entity.

- Foreign key

  One primary key is the foreign key for another entity.

- Candidate key

  When more than one key participate for identifier then is called candidate key.

Data Types: In our project we have used some of data types such as, integer, float, String, date, time etc.

Normalization:

1NF: The derivation of 1NF is First Normal Form. Remove attribute that refers two or more value.

2NF: The derivation of 1NF is Second Normal Form. Only select whose value which can be determinate by primary key.

3NF: The derivation of 1NF is Third Normal Form. Into the 3NF we have to remove all of derived data and transitive dependencies from entity.

3.5 Design Requirements

Design requirements for the teacher:

- Login interface
- Menu bar of teacher's dashboard
- Take attendance
- Interface of individual attendance
- Interface of all attendance
- Interface of individual student details
- Interface of all student details form

Design requirements for the admin:

- Login interface

- Logout button to session clear
- Student details
- Assign teachers
- Course details
- Registration

Design requirements for the advisor:

- Login interface
- Logout button to session clear
- Assign students
- Take image of students

Design requirements for the student:

- Login panel
- Dashboard of student
- Show attendance
- Show registered courses
- Logout

CHAPTER 4

Design Specification

4.1 Front-end Design

Basically we are working on two main parts: -

- Computer based software
- Android mobile based application

Now we want to describe of front-end design for computer based software. We are showing image of software with description in sequentially.

There are three position that can access the interface of desktop based software they are, Teacher, Admin and Advisor. On the other hand one interface is the mobile based that can used by students.

Now we want to describe for teacher interface:

1st: Home page that will show login panel for faculty in following figure 4.1:

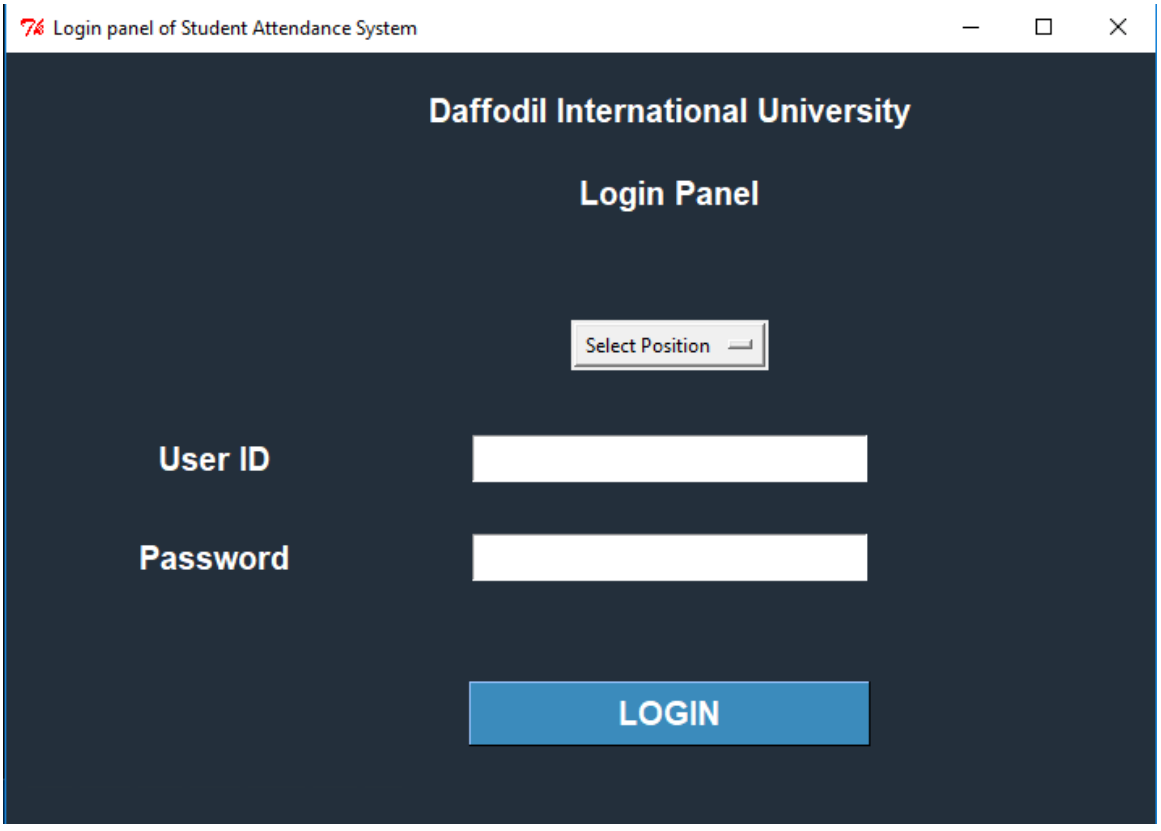


Fig. 4.1: Login panel

To go next page faculty member needs to login at first by giving valid user id and password. This page under validation so any types of wrong information it cannot go ahead. After giving user id and password then need to press LOGIN button to go next page (course selection page).

2nd: Course selection page that will show course selection options with login status in following figure 4.2:

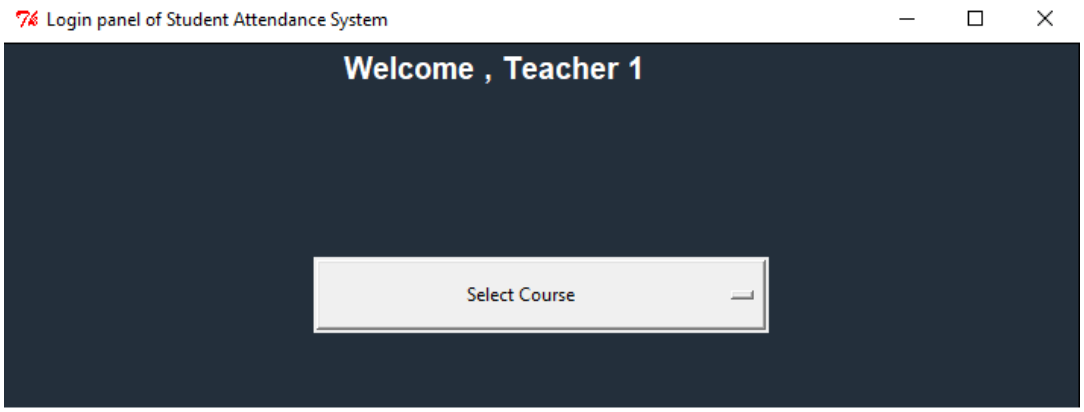


Fig. 4.2: Course selection interface 1

After click the Select Course it will show some course name with batch, section, course code in following figure 4.3:

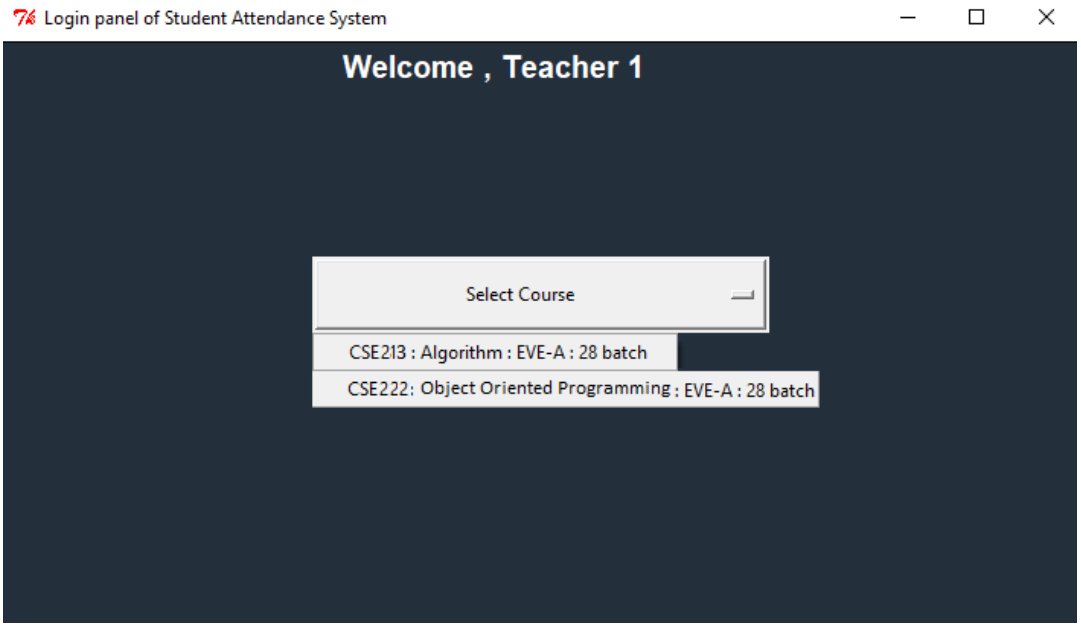


Fig. 4.3: Course selection interface 2

We need to click any of course to visible Submit button. In the above interface we can see Welcome, Teacher 1 that's mean Teacher 1 is the name of teacher who logged in to this interface by putting 'user id and password'. There are two courses we can see because Teacher 1 assigned only for this two courses. In following figure 4.4 shows that course selection interface:

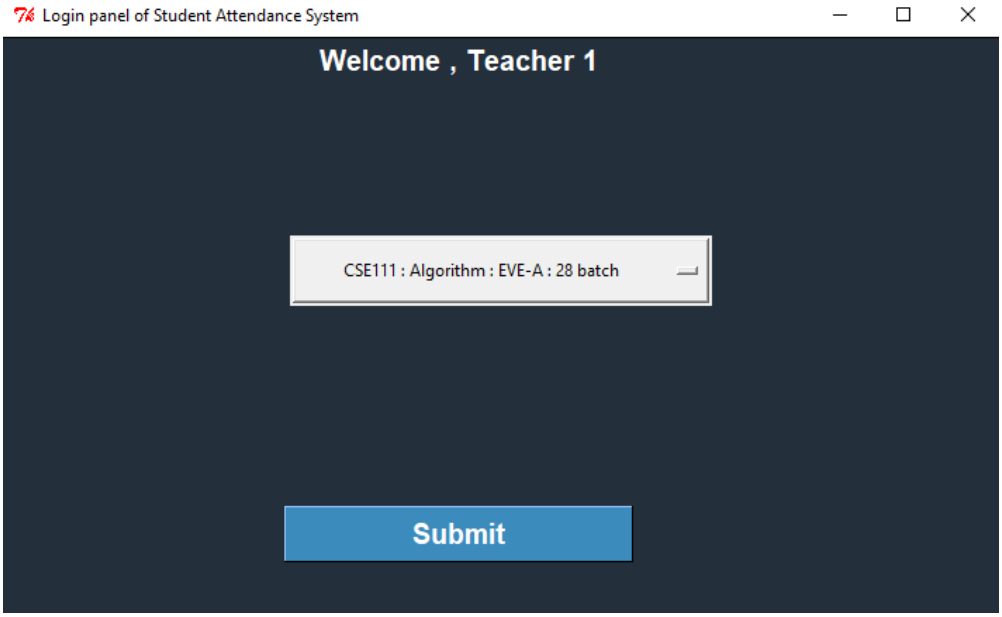


Fig. 4.4: Course selection interface 3

After click the course option we will see Submit button that faculty will have needed to go next page. After press the Submit button there's main page will come.

3rd: Main page that will show attendance section with others important features given in following figure 4.5:

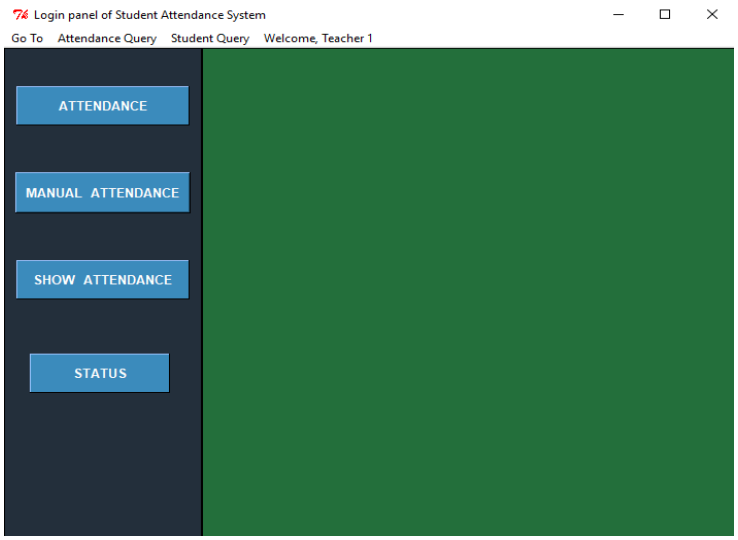


Fig. 4.5: Course selection interface 3

In the above image we can see there are some menu such as ‘Go to, Attendance Query, Student Query, Welcome Teacher 1’. These all are menu to go an individual page. We can see in the UI there are some button such as ‘ATTENDANCE, MANUAL ATTENDANCE, SHOW ATTENDANCE, STATUS’ etc. ATTENDANCE button use for take attendance of all students, after taking attendance the total status will show in right side of page in green area. We also can see status by pressing STATUS button. We can also take attendance by manually by clicking MANUAL ATTENDANCE button.

Now we want to describe about different types of menu:

Go to: In following figure 4.6 shows that go to menu:

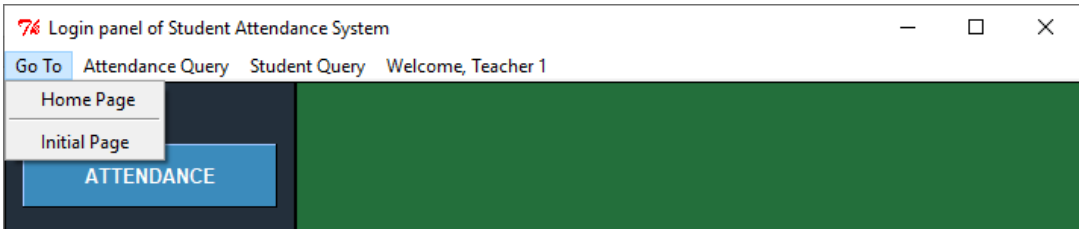


Fig. 4.6: Go to menu

We can go to Home page by clicking Home page option and can go to Initial page by clicking Initial page option. In following figure 4.7 shows that go to home page:

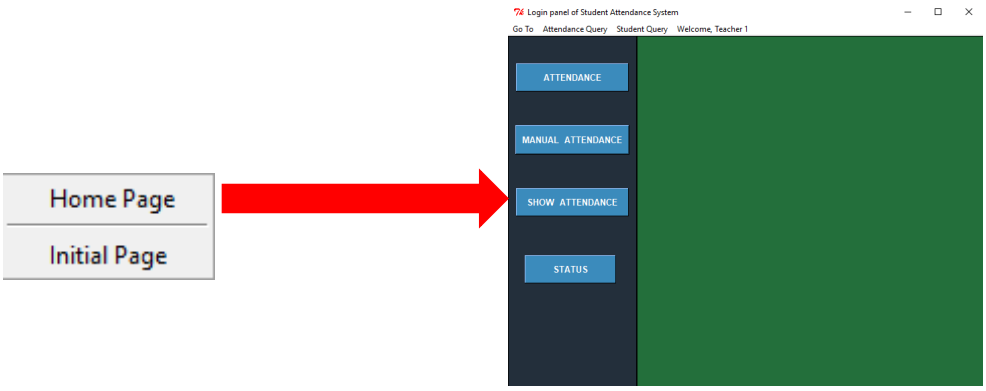


Fig. 4.7: go to home page

In following figure 4.8 expressed that go to initial page interface:

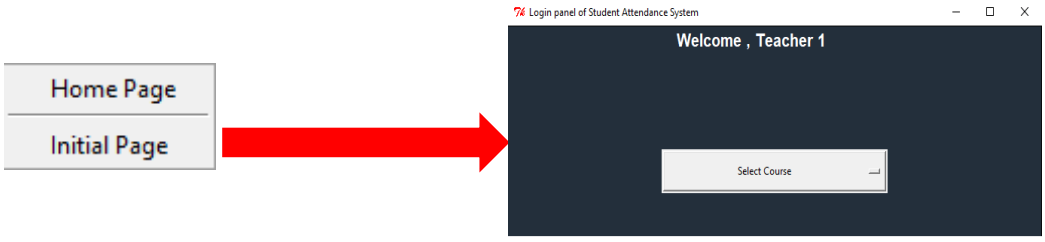


Fig. 4.8: go to initial page

Attendance Query: In following figure 4.9 expressed that attendance query menu:

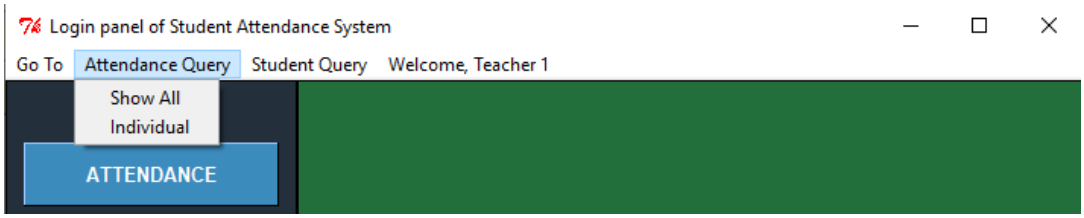


Fig. 4.9: Attendance Query menu

We can see all attendance by clicking Show all and can see it individually by clicking Individual option. In following figure 4.10 expressed that show all attendance interface:

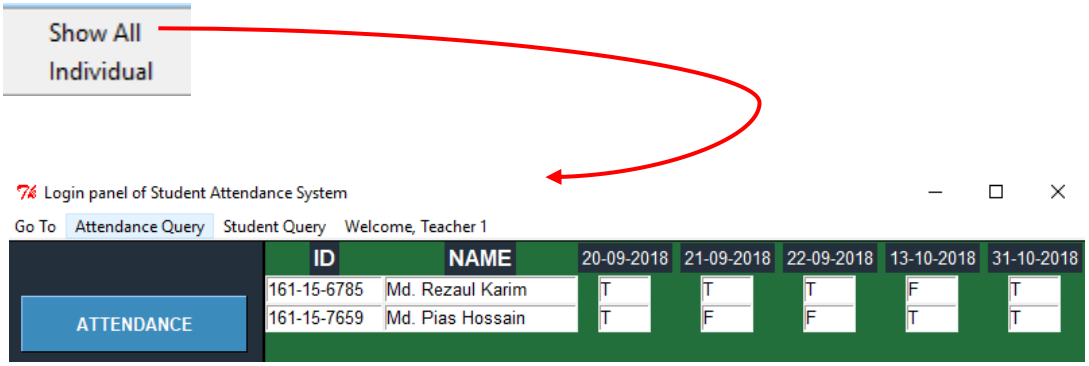


Fig. 4.10: Show all attendance page

In following figure 4.11 shows that individual attendance entry interface:

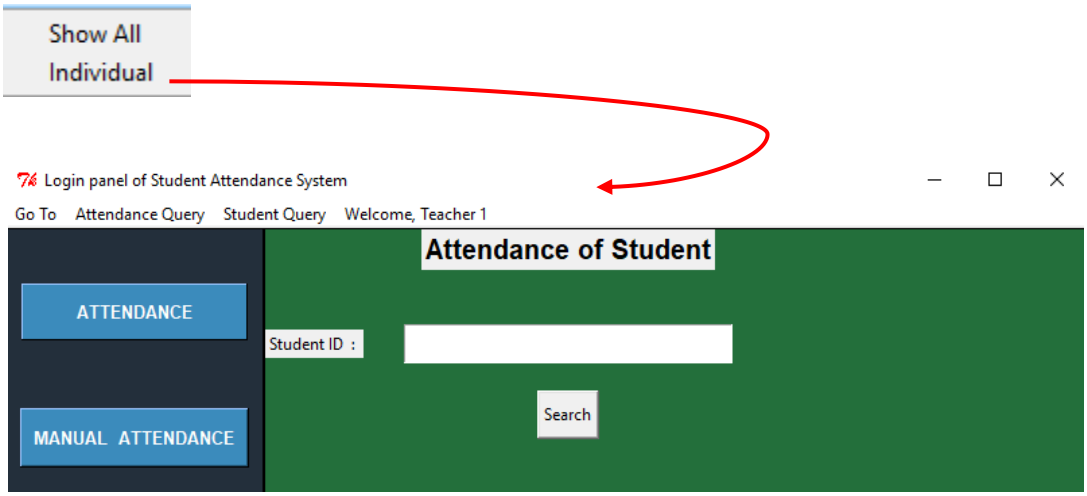


Fig. 4.11: Individual attendance entry page

After clicking individual, the above individual attendance will be show, after putting the student id we will get an individual attendance history about that student. In following figure 4.12 shows that individual attendance page:

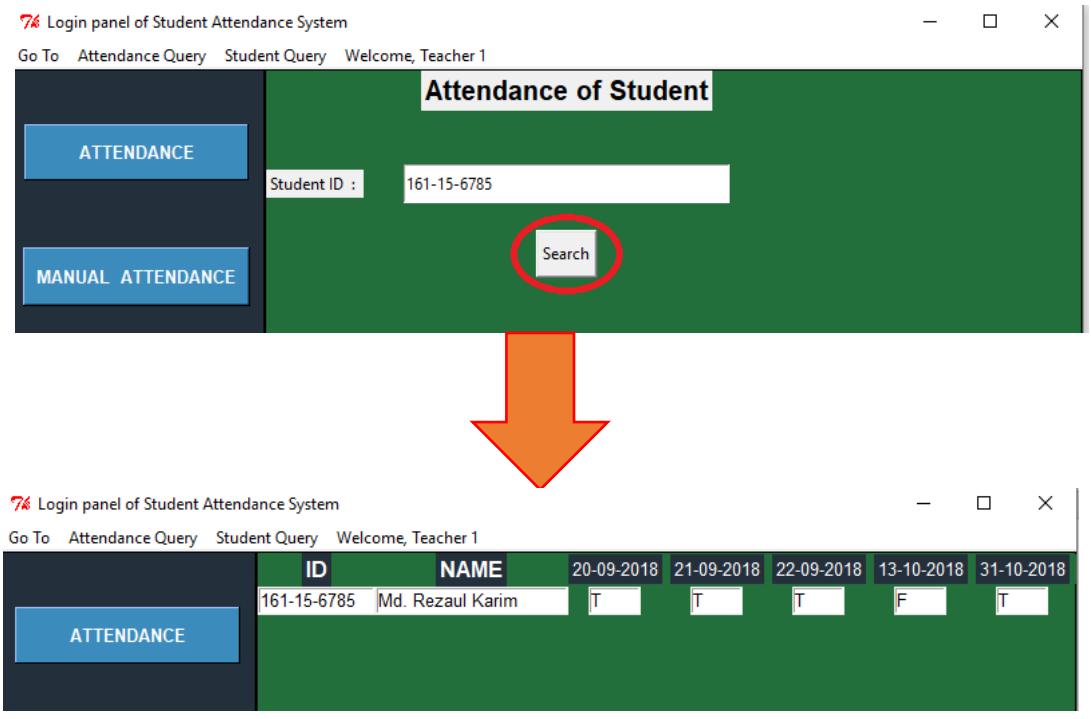


Fig. 4.12: Show individual attendance page

Student Query: In following figure 4.13 shows student query menu:

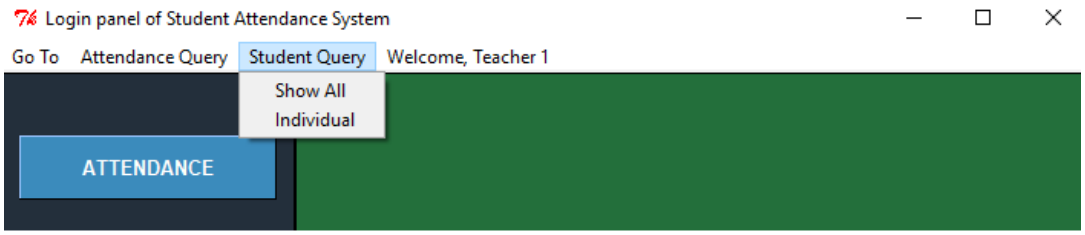


Fig. 4.13: Student Query menu

We can see all student details by clicking Show all and can see it individually by clicking Individual option. In following figure 4.14 shows all student details interface:

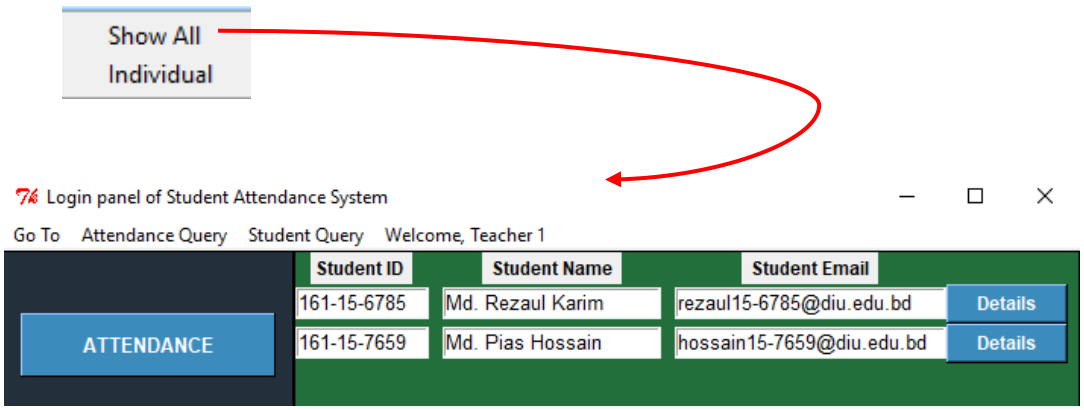


Fig. 4.14: Show all student details link page

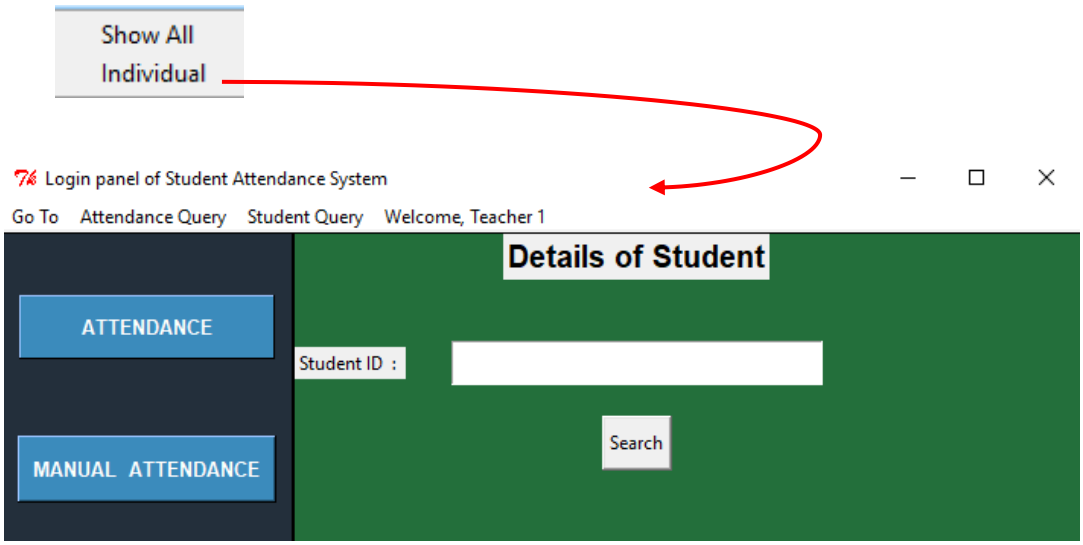


Fig. 4.15: Show individual details page

After clicking individual, the above individual details page will be show, after putting the student id we will get an individual detail about that student. In following figure 4.16 shows student individual details page:

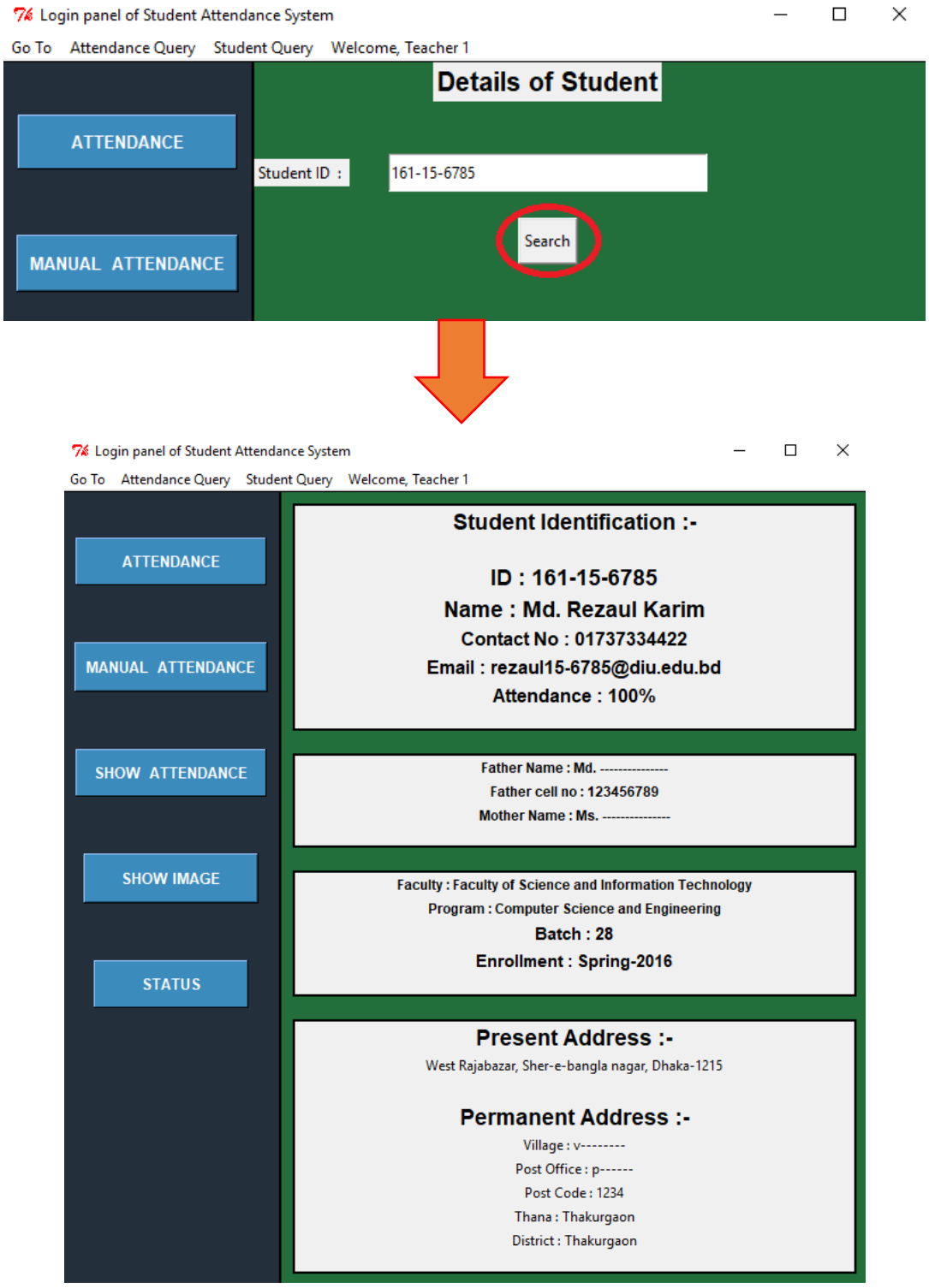


Fig. 4.16: Show individual details page

Sign out: The sign out interface in the following figure 4.17:

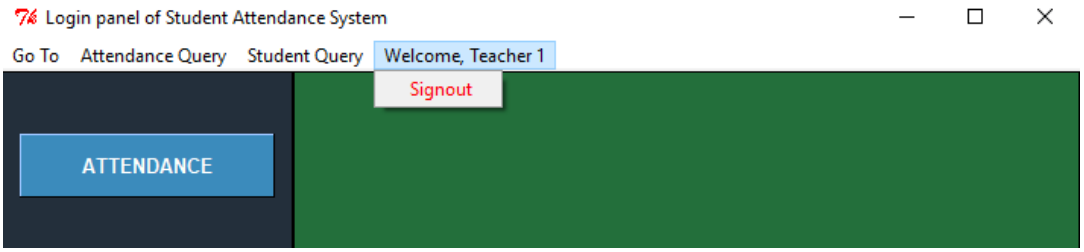


Fig. 4.17: Sign out menu

We can destroy all of session by clicking sign out option, after clicking this menu page will go to login panel. The login interface in the following figure 4.18:

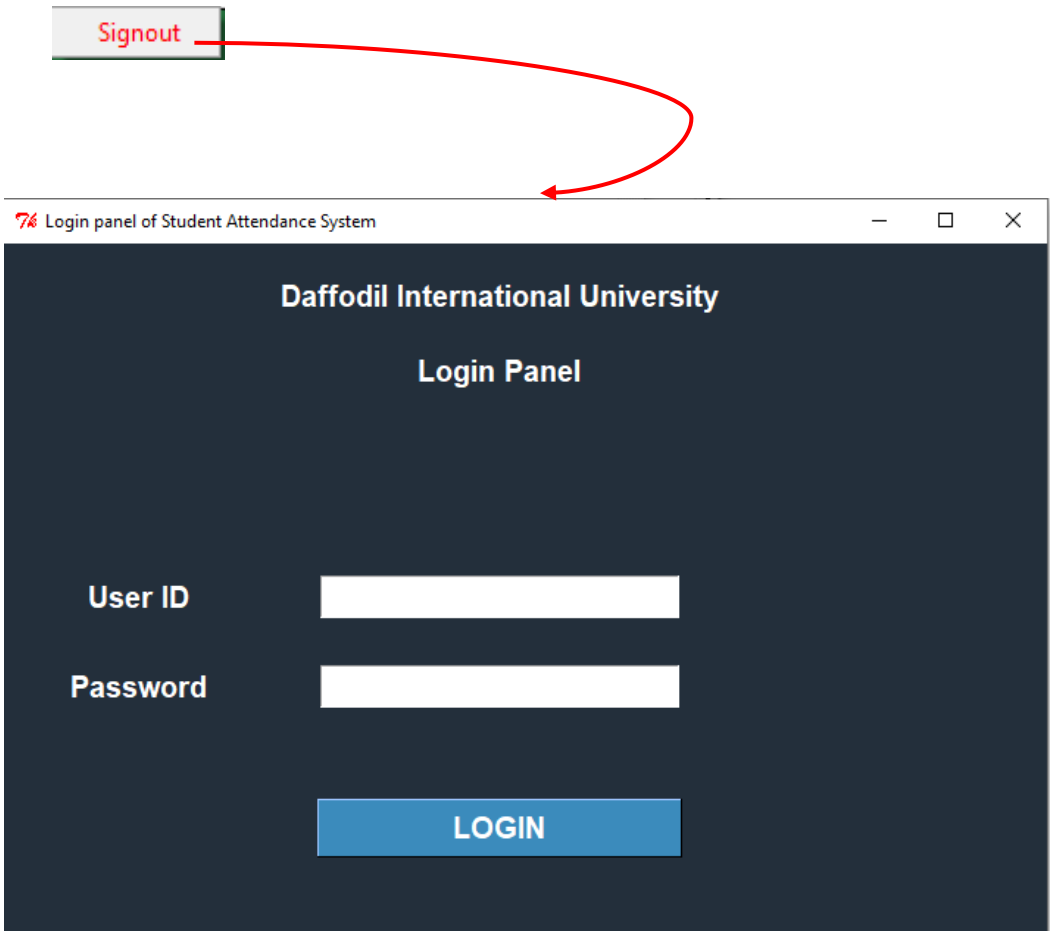


Fig. 4.18: Go login panel

Now we want to describe for Admin interface:

1st: Home page that will show login panel for admin given in the following figure 4.19:

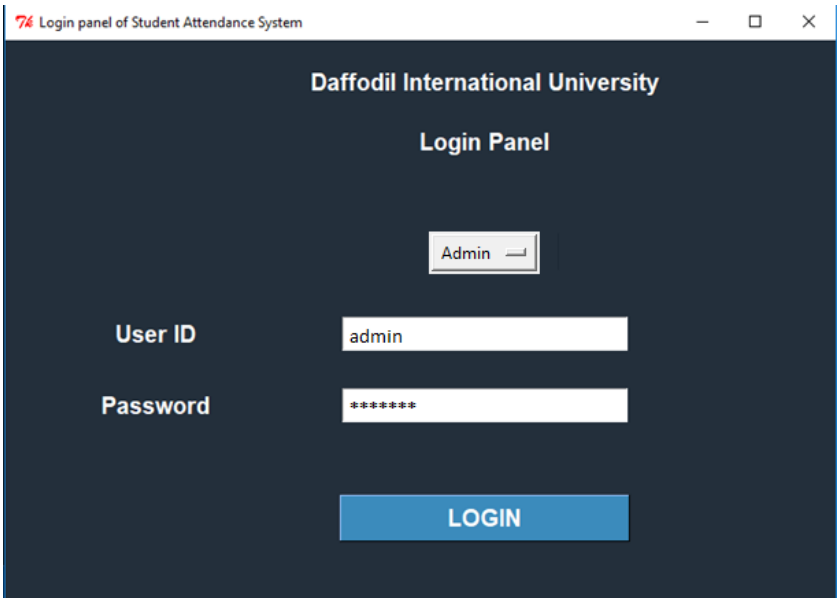


Fig. 4.19: Go login panel for admin

In this interface, the total interface are involve to verification and validation with error handle. An admin can login easily by giving his/her valid 'user-id and password'. If user-id or password didn't match then he/she will be notified.

2nd: Interface of admin after he/she logged in given in the following figure 4.20:

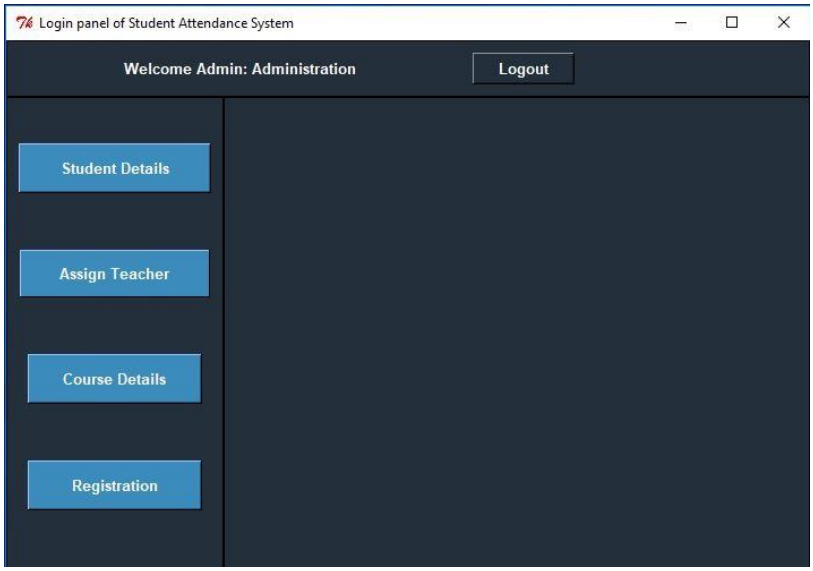


Fig. 4.20: Admin interface after login

3rd: Interface of admin after he/she logged in given in the following figure 4.21:

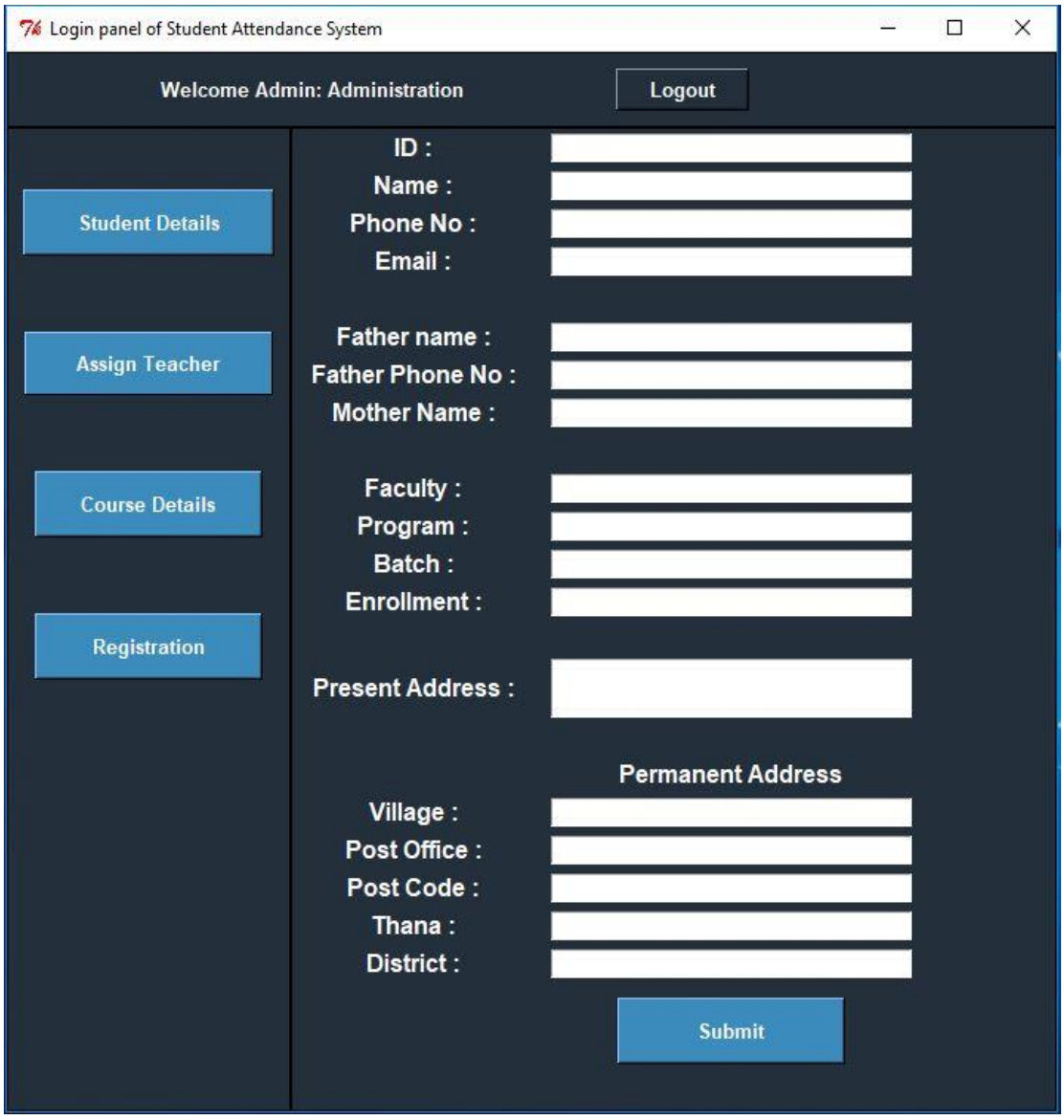


Fig. 4.21: Student details interface

This is the interface of student details form, from here admin can give details about students and students can show his/her personal information by accessing database.

4th: Interface of assign teacher for courses given in the following figure 4.22:

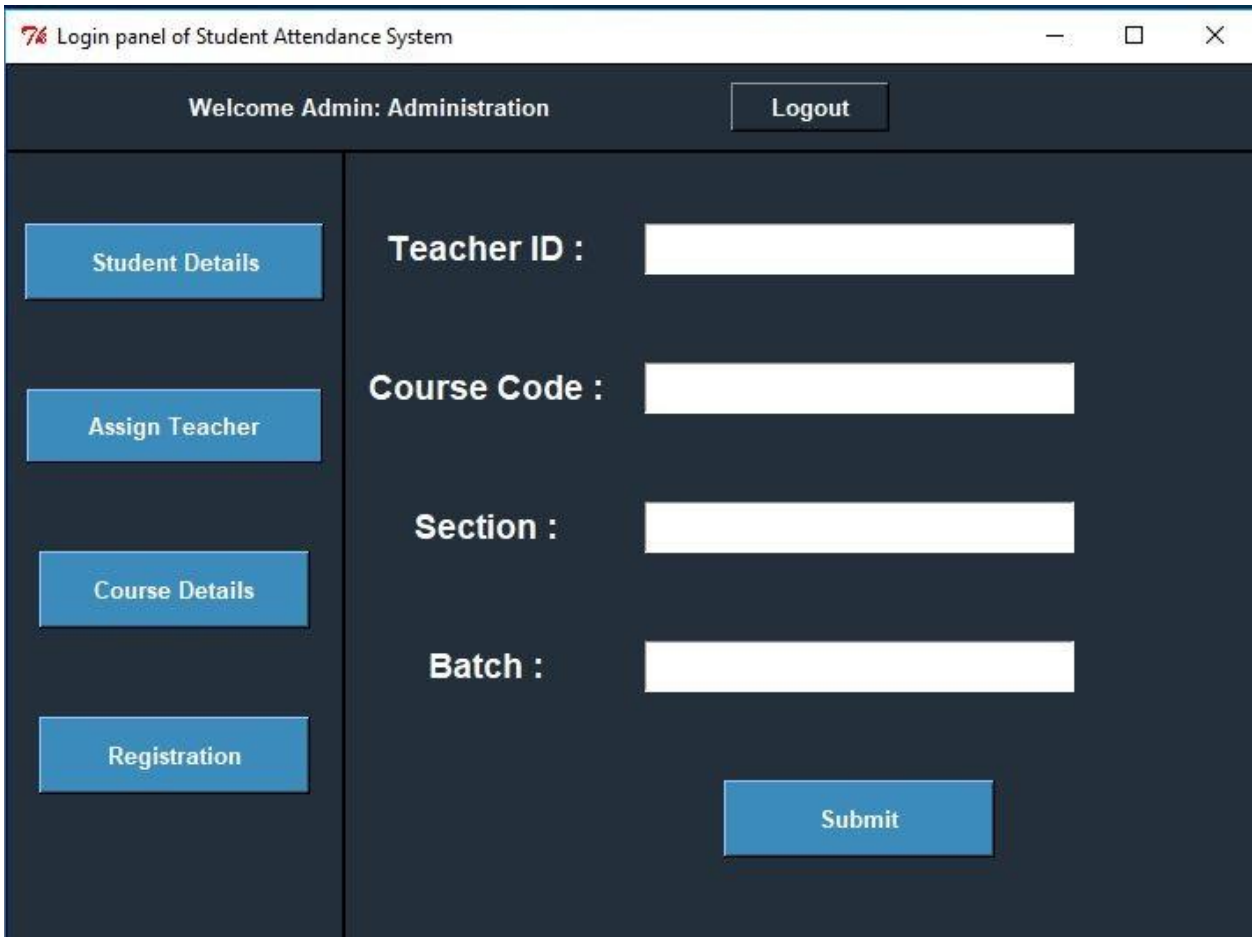


Fig. 4.22: Teacher assign to courses

The admin are able to assign teacher for some courses with include by course code, section and batch.

5th: Interface of logout menu given in the following figure 4.23:

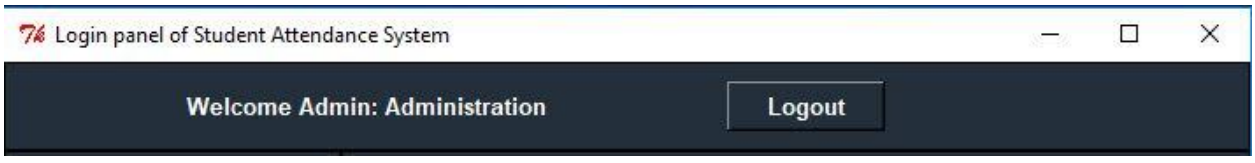


Fig. 4.23: Log out menu for admin

This Logout menu using for logged out from this interface to initial page.

5th: Interface of details about course given in the following figure 4.24:

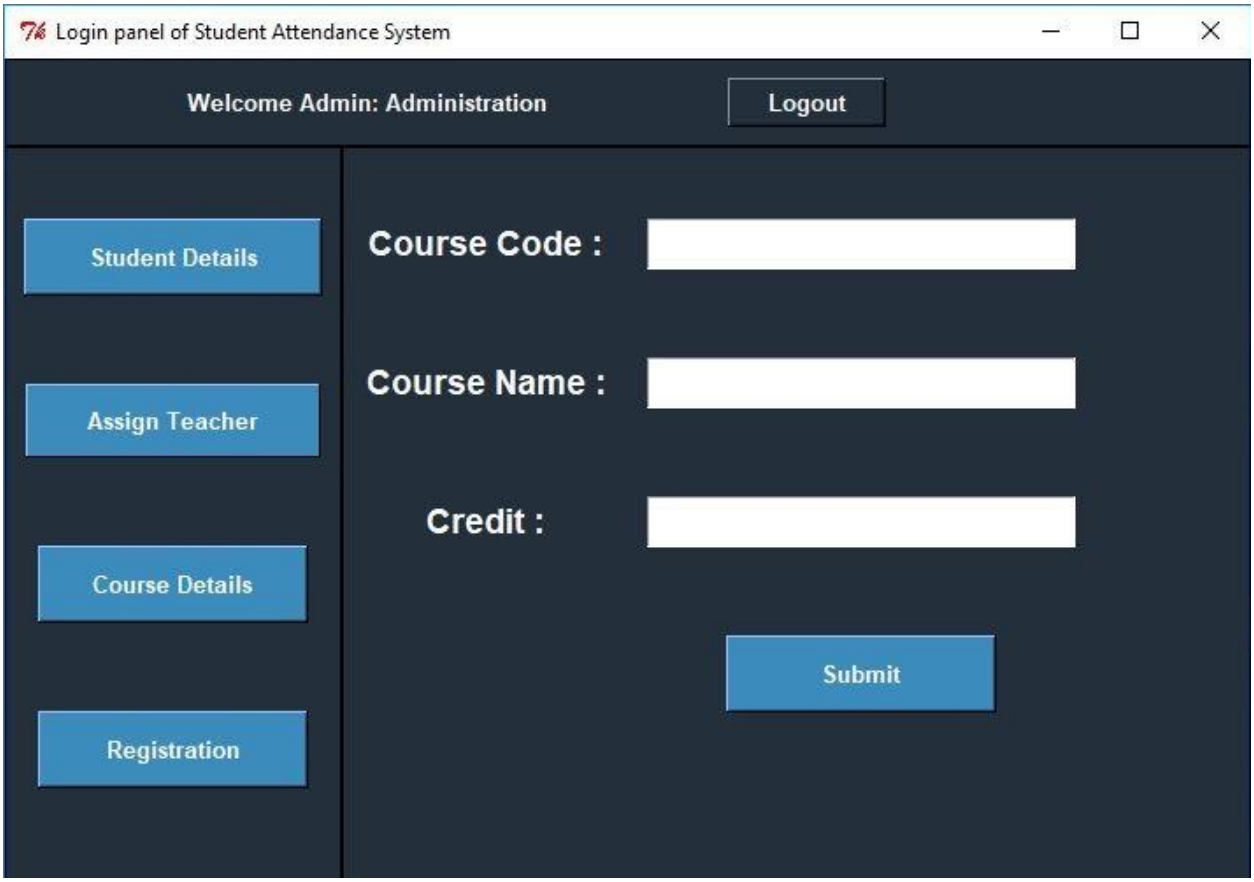


Fig. 4.24: Assign course name with credit

This interface gives to assign course name with credit and save on to database. If already it have in the database then it will notified not possible to submit, because this page under validation and verification.

6th: Interface of give up register of advisors and teachers given in the following figure 4.25:

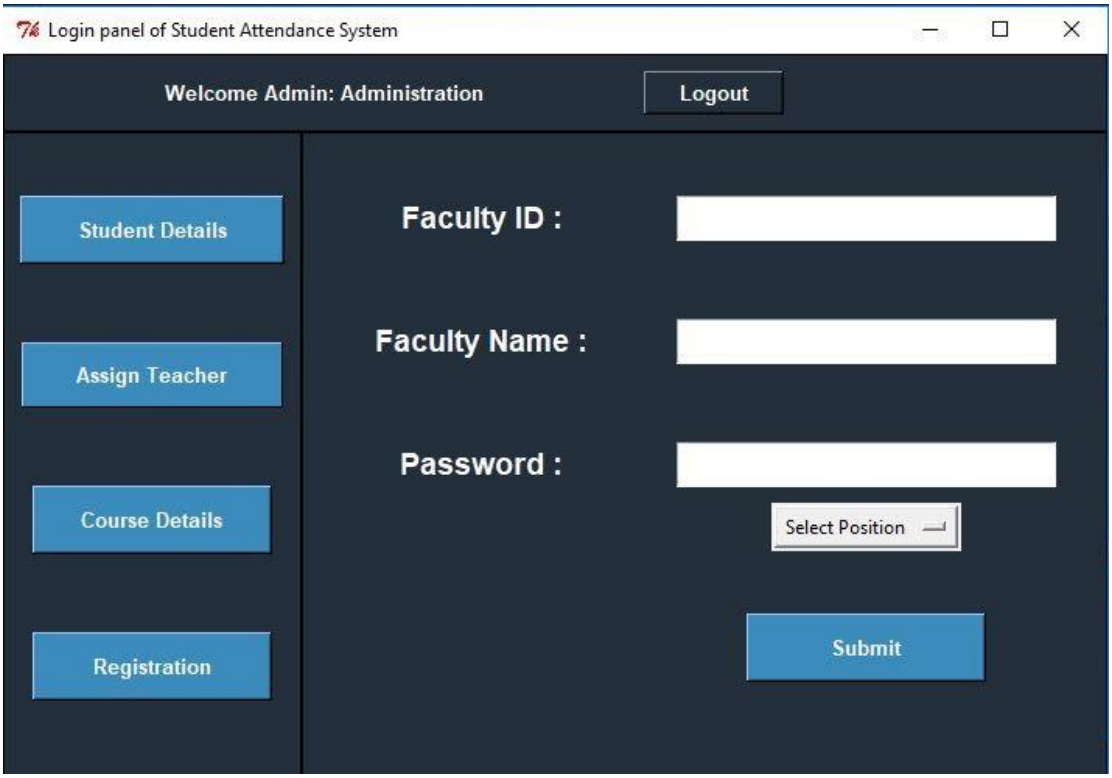


Fig. 4.25: Assign to access teacher and faculty

This interface gives faculty id and name of faculty assign with password. After completion of this process the faculty and advisor can able to access the software. Same as previous, it also made of validation and verification form.

7th: Select position drop down button given in the following figure 4.26:

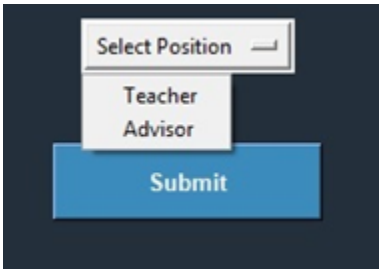


Fig. 4.26: To show drop down button

Now we want to describe for Advisor interface:

1st: Home page that will show login panel for admin given in the following figure 4.27:

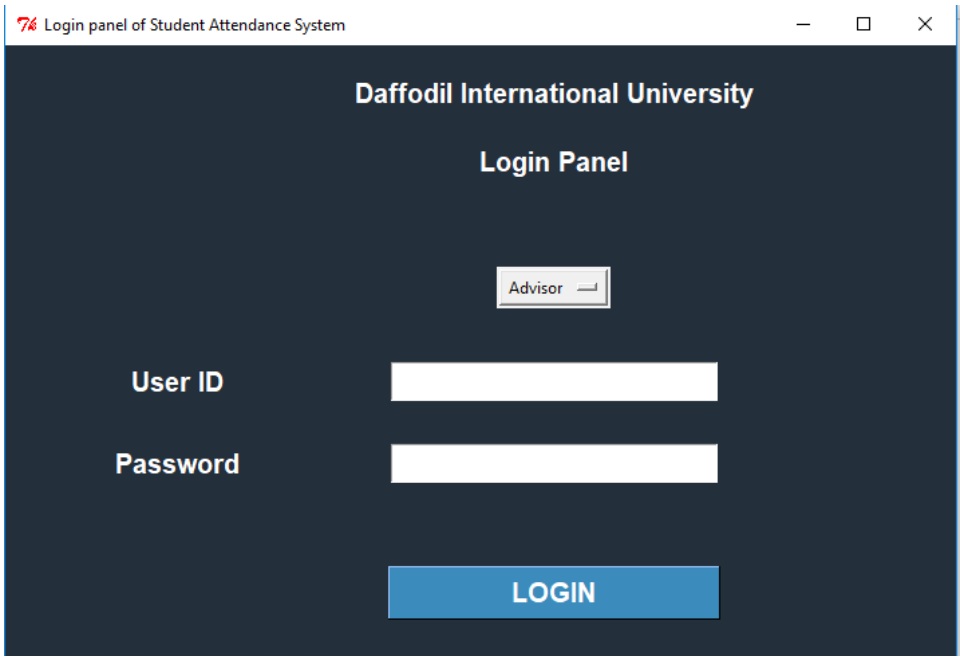


Fig. 4.27: Login interface for advisor

1st: Interface of advisor after login given in the following figure 4.28:

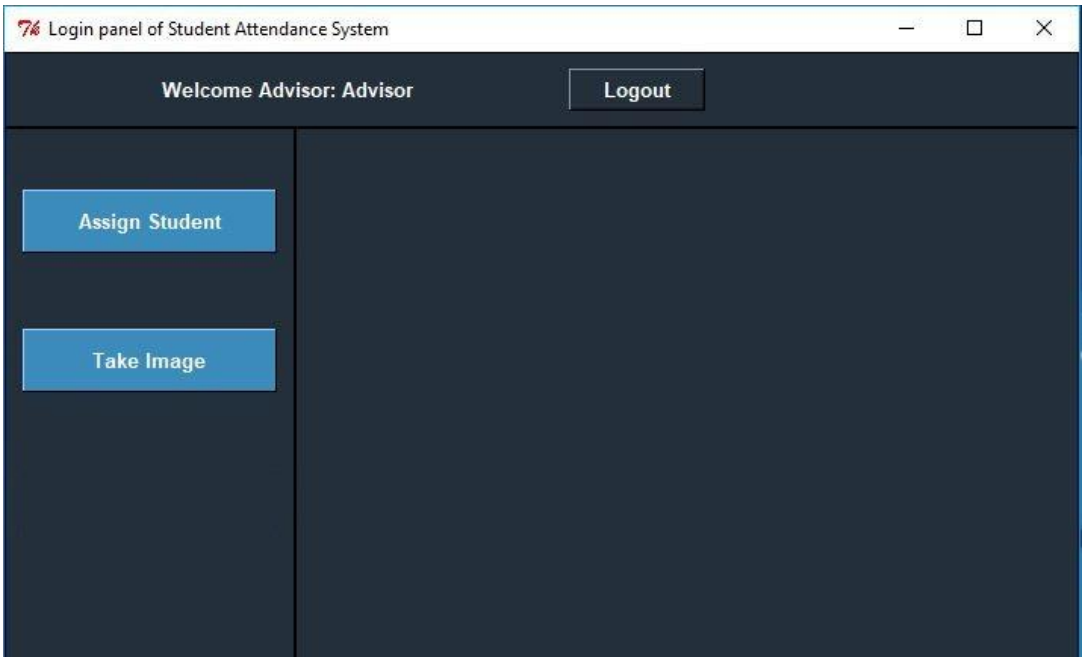


Fig. 4.28: Interface of advisor after login

As like as admin and teacher login this same process to advisor that advisor can login to give his/her ‘id and password’. If ‘id and password’ are correct then he/she can able to go to his/her interface. If it is wrong he/she will get a notification about wrong input value. An advisor can accessibility only two criteria such as Assign student and Take Image for trained. This trained image are needed when attendance process will occurred.

2nd: Interface of assign student to courses given in the following figure 4.29:

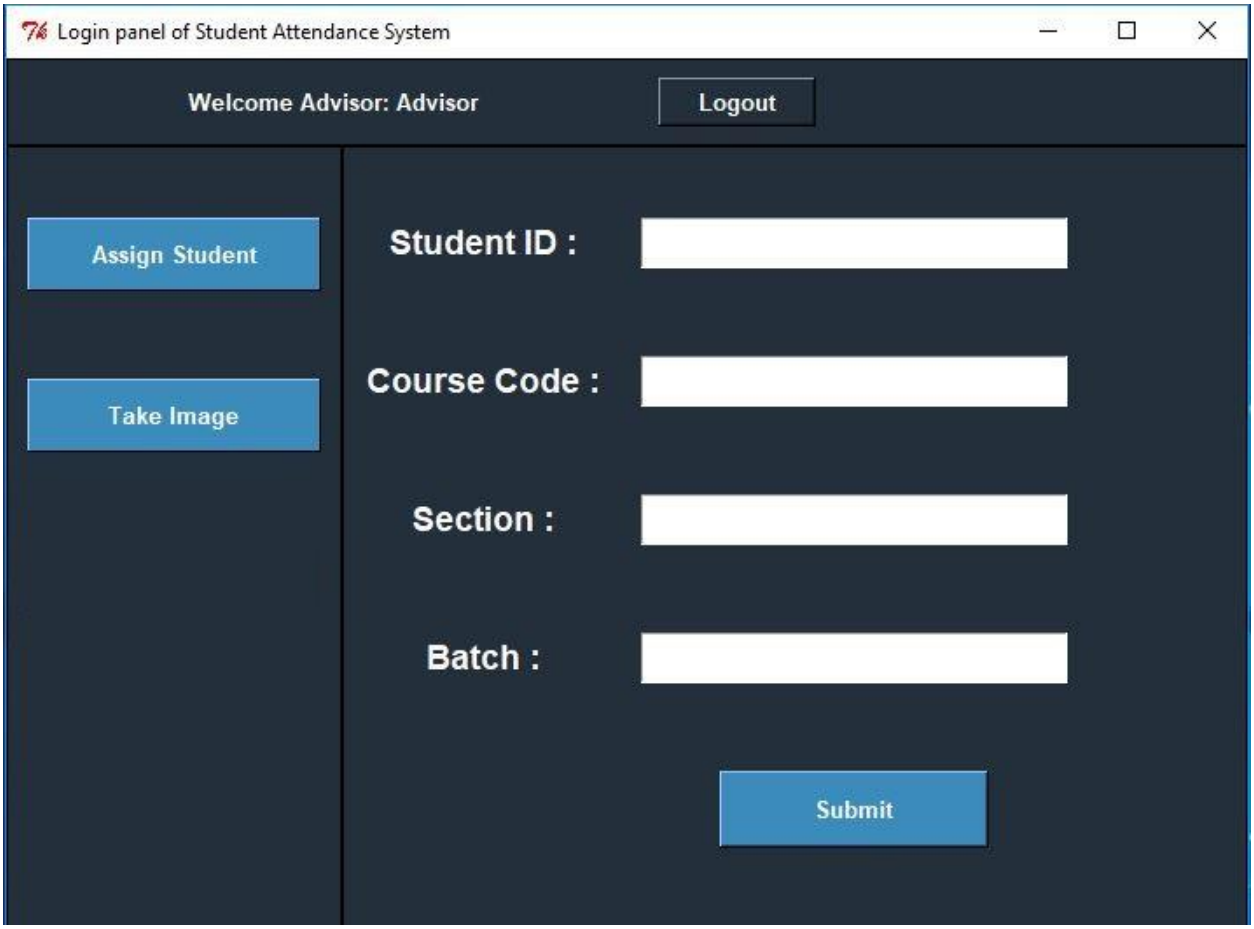


Fig. 4.29: Interface of student assign

This field will be fill by advisor, who are appointed to this responsibilities. This filed covered by four identities such as student id, name, section and batch. If any of field is empty then it cannot be push data to database and if data is available to database then it also cannot be go to the database, this condition totally based on using by a composite key. This composite key made by two field

name such as student id and course id. So during push data to database it compare with database composite key for upload the data.

3rd: Interface of take images of student given in the following figure 4.30:

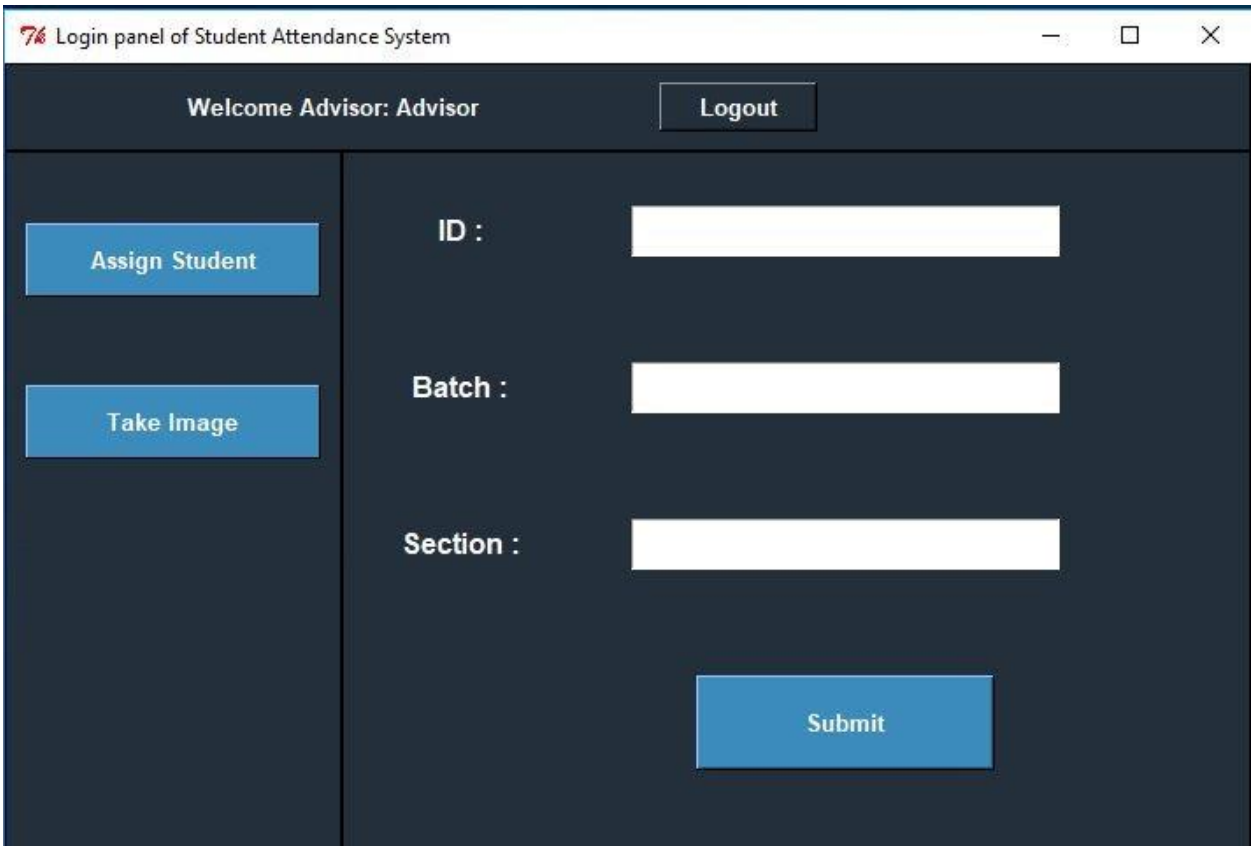


Fig. 4.30: Interface of take image of student

During registration time of students they will come to advisor and advisor will take image by putting the values of id, batch and section. After pressing the submit button some image automatically will be captured by camera and save on by crate an folder, folder name will be concatenation between batch and section, and image name will be his/her id with auto increment number by extension with jpg. If folder existed then it will not create more, it will just give images.

Now we want to describe for Students interface (Mobile Apps Interface):

1st: Home page that will show login panel for students given in the following figure 4.31:

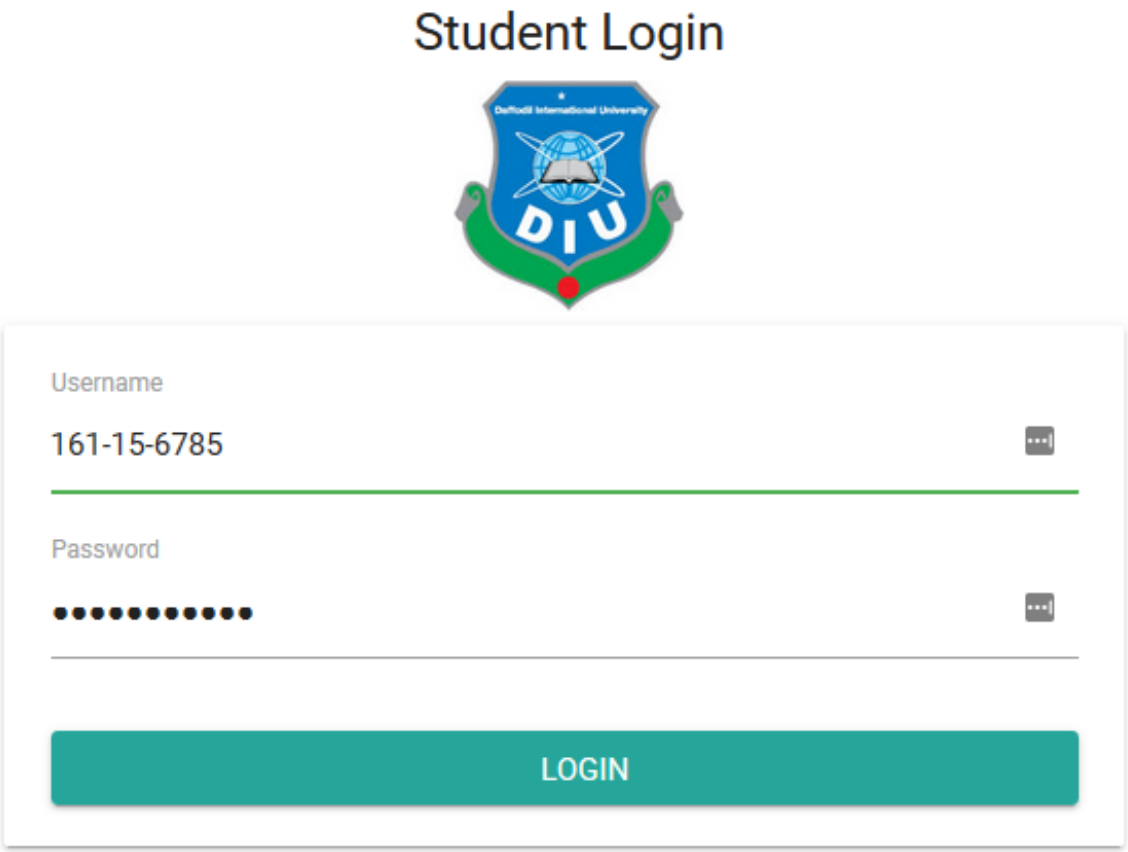


Fig. 4.31: Interface of login panel for student

This interface is under validation and verification. After given 'username and password' it will compare with online database and student can get permission after acknowledgement of his/her validation. If any of filed is empty then it will give a notification that please type your username or password.

2nd: Dashboard of student after successfully login given in the following figure 4.32:

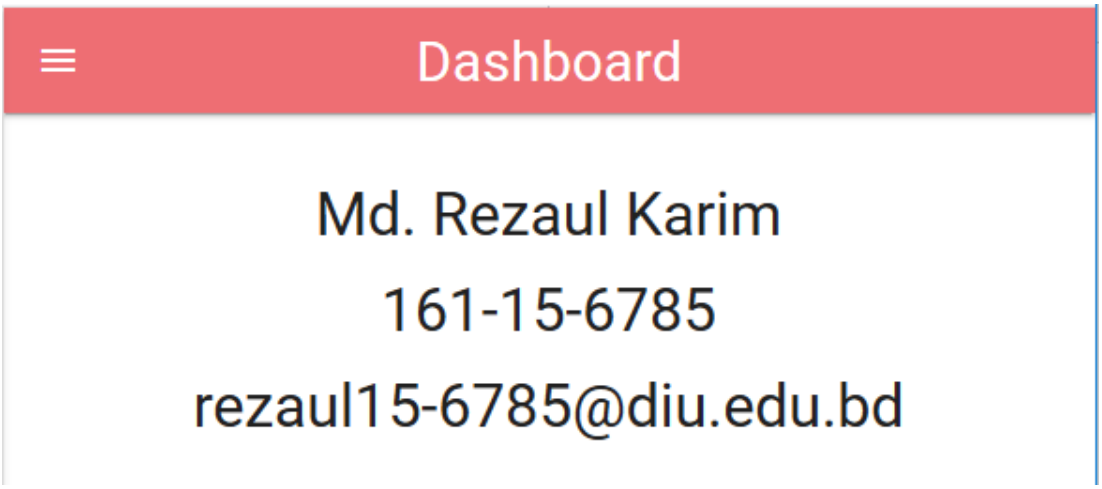


Fig. 4.32: Interface of dashboard for student

This is the first page of student who are logged in to the database. In the left top side, this the menu button that are hidden. It will be shown after click or swipe by finger.

Fig. 4.33: Hidden menu's bar

3rd: Menu's with welcome message given in the following figure 4.34:

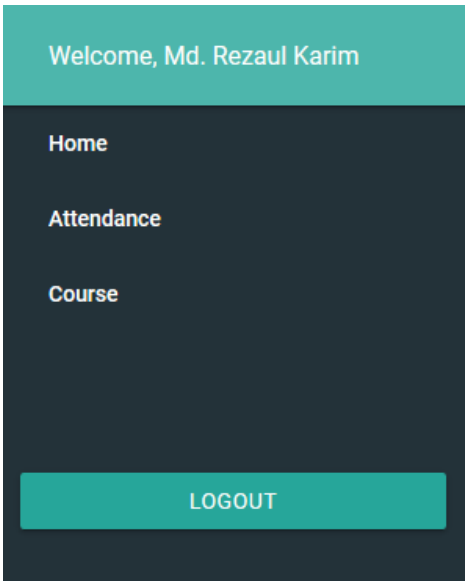


Fig. 4.34: Menu with welcome message

4th: Attendance menu that give data of individual course given in the following figure 4.35:

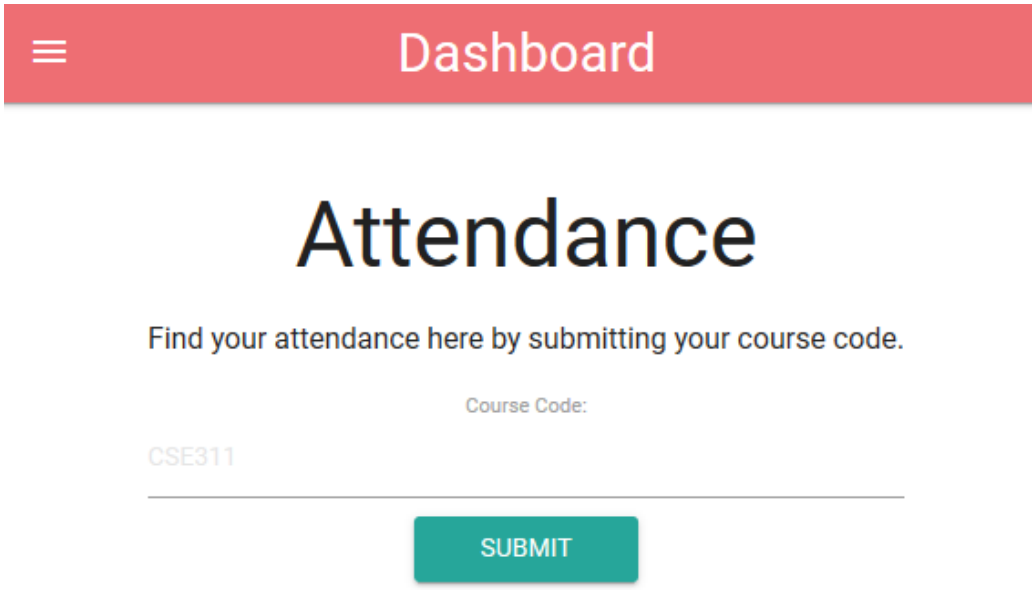


Fig. 4.35: Interface of individual attendance form

4th: Individual attendance interface after given course id given in the following figure 4.36:

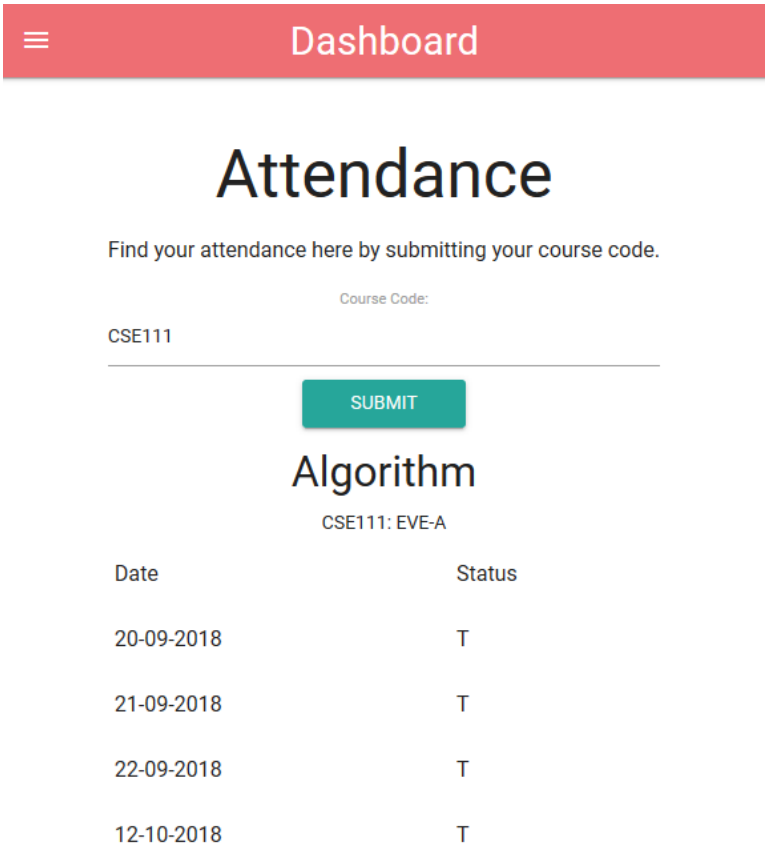
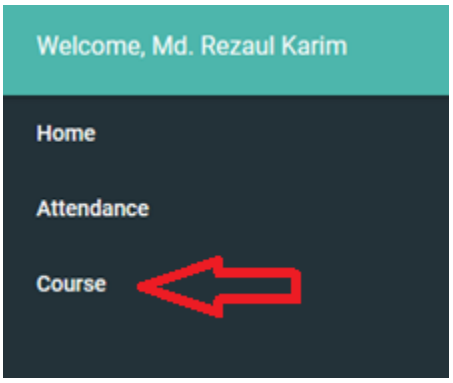


Fig. 4.36: Interface of individual attendance for CSE111

5th: Individual attendance interface after given course id.



After pressed course menu it will show the followin intrface:

Interface of total registered courses given in the following figure 4.37:

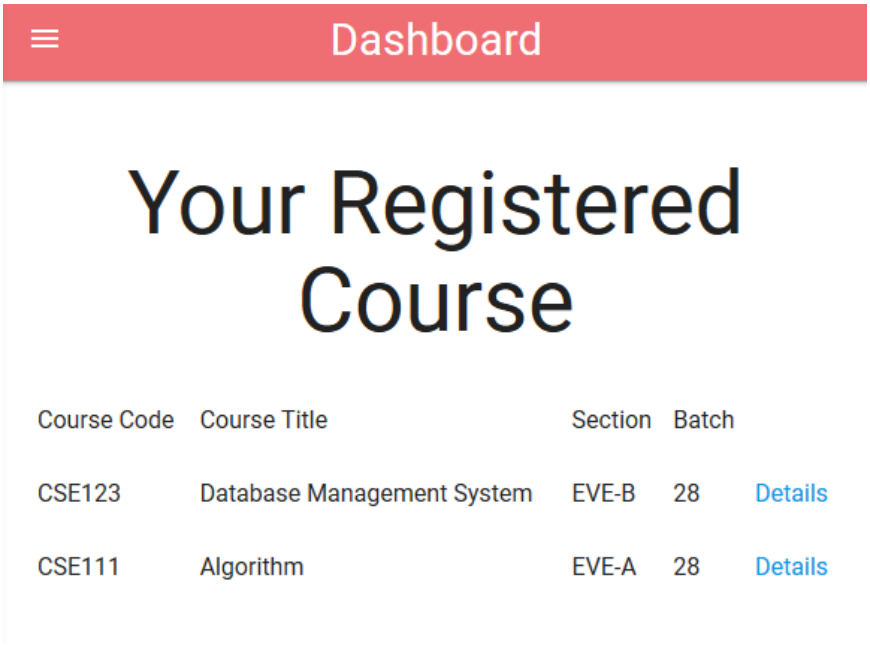


Fig. 4.37: Interface of total registered courses

5th: Show attendance after pressed the details button given in the following figure 4.38:

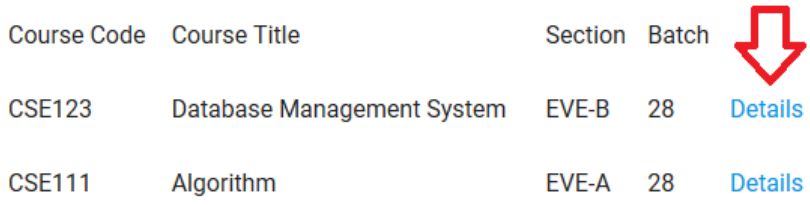


Fig. 4.38: Show attendance by using details button

After pressed Details button it will directly go to 4th step that will show for selected course attendance.

4.2 Back-end Design

The back-end design is hide from users but not hidden to admin or developer. There are some criteria of back-end design that we have used in my software. We want to describe about that,

- Access data from database for individual purpose
- Combine the information
- Read information from database
- Give information to database
- API (Application Programming Interface)

Now we are discussing about this with configuration images.

Access data from database for individual purpose:

In the following figure 4.39 and 4.40 shows that login interface interact with login database:

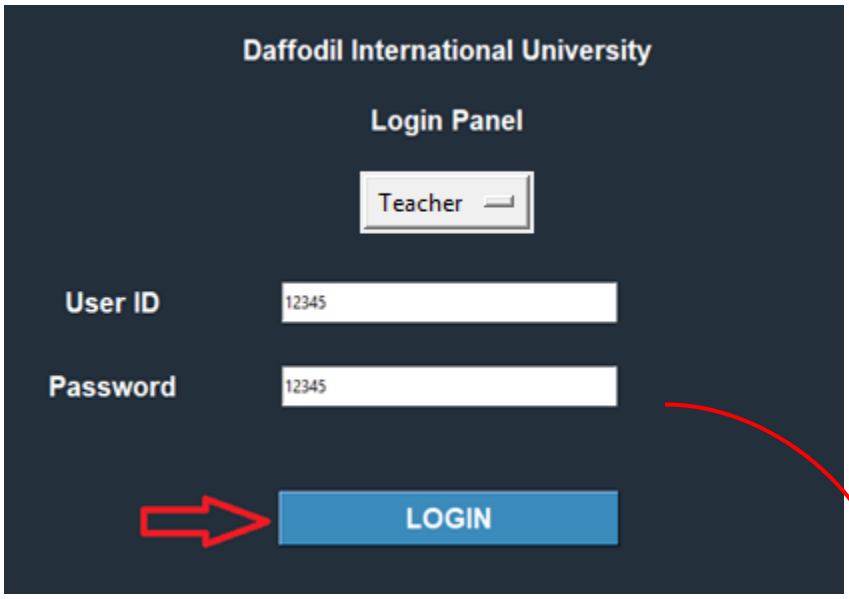


Fig. 4.39: Login panel interface

userId	name	password
12345	Teacher 1	12345
123456	Teacher 2	123456

Fig. 4.40: Login table of database

When a faculty member will give his/her user id and password and press login button then the login function will have called and will try to connect the database to match between both data. In following the image is the code for login function.

In the following figure 4.41 shows that code for login interface:

```
import pymysql
conn = pymysql.connect("localhost","root","","project")
loginR = conn.cursor()

sql = 'SELECT * from `login`'
loginR.execute(sql)
rowCount = loginR.execute(sql)

for loginRow in loginR:
    if(loginIdTaken == loginRow[0] and loginPassTaken == loginRow[2]):
        print "Successfully Login"
        mainSubjectPage()


conn.close()
```

sn	teacher_id	course_id	section	batch
1	12345	CSE111	EVE-A	28
2	12345	CSE222	EVE-B	28

Fig. 4.41: Code for login function

If both of data are matched to database login table data then page will automatically go to next interface. This process is hide to users but this process line is visible to developer so it is a back-end design.

Combine the information:

Combine information refers that different data are collected from different table of database and merge in one of place in user interface. The student details page is one of them that collected data from various table of database and combined in a place to software interface. In the following image is a details description for a student.

In the following figure 4.42, 4.43 shows that student details interface interact with student details database:

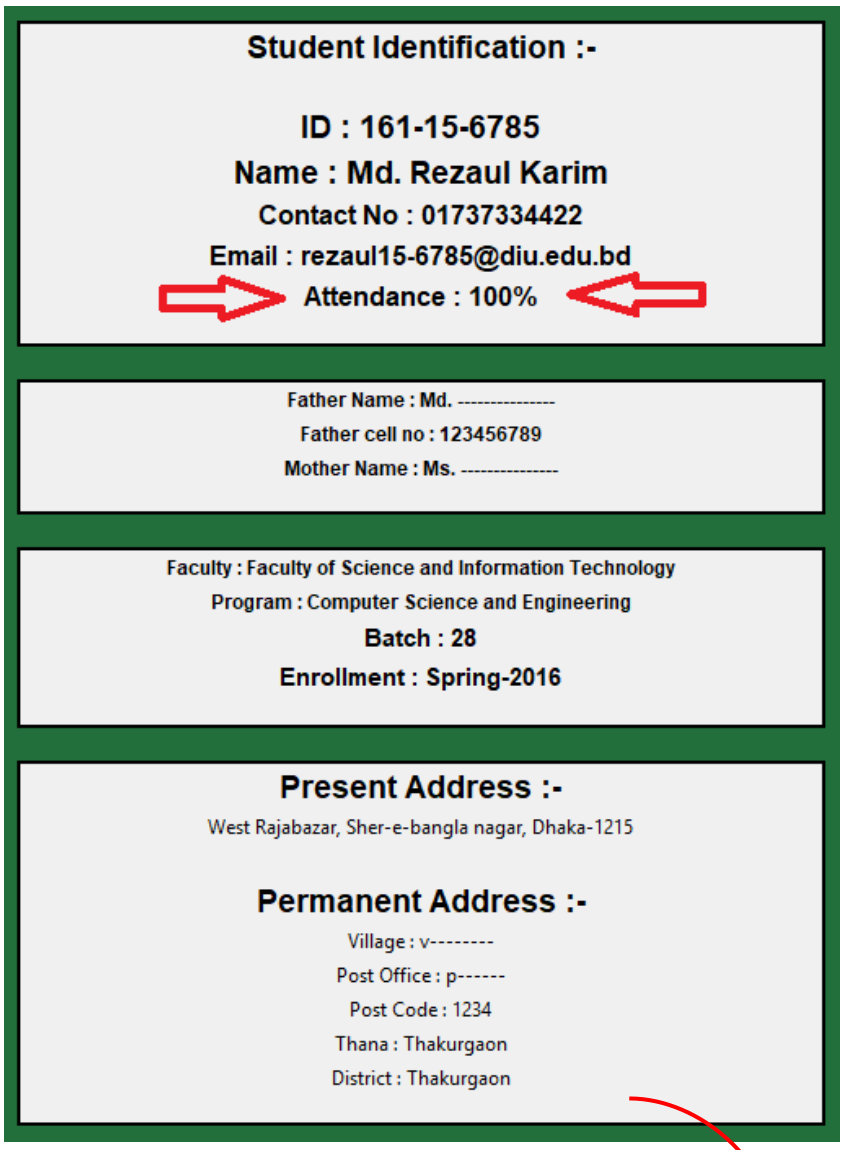


Fig. 4.42: Details of student interface

id	name	phone_no	email	father_name	father_phone_no	mother_name	faculty	program	batch	enrollment
161-15-6785	Md. Rezaul Karim	01737334422	rezaul15-6785@diu.edu.bd	Md. ----------	123456789	Ms. ----------	Faculty of Science and Information Technology	Computer Science and Engineering	28	Spring-2016
161-15-7659	Md. Pias Hossain	01719539574	hossain15-7659@diu.edu.bd	Md. ---------	123456789	Ms. ---------	Faculty of Science and Information Technology	Computer Science and Engineering	28	Spring-2016

Fig. 4.43: Student details table of database

In the following figure 4.44 shows that student attendance table of database:

sn	student_id	course_code	section	batch	date	status
1	161-15-6785	CSE111	EVE-A	28	20-09-2018	T
3	161-15-7659	CSE111	EVE-A	28	20-09-2018	T
4	161-15-6785	CSE111	EVE-A	28	21-09-2018	T
5	161-15-7659	CSE111	EVE-A	28	21-09-2018	F
21	161-15-6785	CSE111	EVE-A	28	22-09-2018	T
22	161-15-7659	CSE111	EVE-A	28	22-09-2018	F
67	161-15-6785	CSE111	EVE-A	28	13-10-2018	T
68	161-15-7659	CSE111	EVE-A	28	13-10-2018	T
123	161-15-6785	CSE111	EVE-A	28	31-10-2018	T
124	161-15-7659	CSE111	EVE-A	28	31-10-2018	F

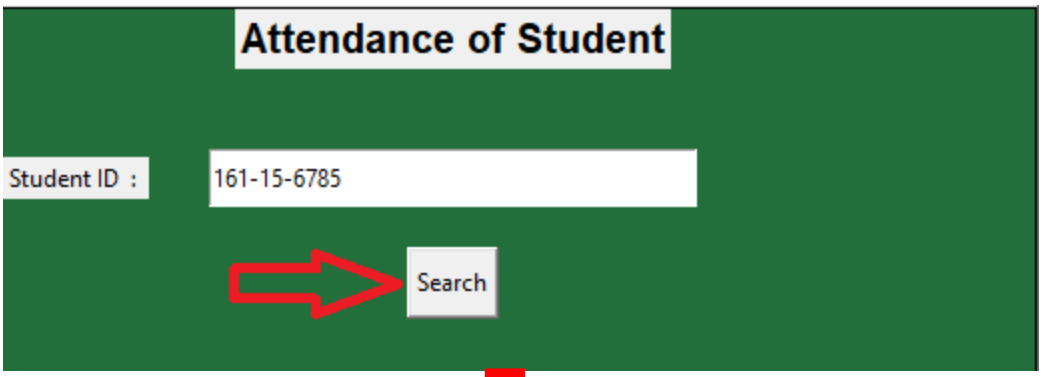
Fig. 4.44: Attendance table of database

Above student details image refers details about that student, that details collected from two separate table of database, one is student details table and other is attendance table. The table data are combined into student details interface.

Read information from database:

All of data / information that we collected from database that refers to read information from database. Suppose we need to read attendance list of a student then we have to call individual attendance function by individual query interface. Then individual attendance function will call attendance table of database to collect data about that student. In the following we have given process of functionality how software interface collect data from database and how it visible to user/faculty.

In the following figure 4.45 shows that process of read data from database:




```
import pymysql
conn = pymysql.connect("localhost","root","","project")
studentAssignTable = conn.cursor()
getDate=conn.cursor()
attend=conn.cursor()
attendIdName=conn.cursor()
    •
    •
    •
    •
print len(columnArray)
Label(rightFrame, text = "ID", font='none 12 bold', bg='#232F3B',
      fg='white').grid(row=0, column=0)
Label(rightFrame, text = "NAME", font='none 12 bold', bg='#232F3B',
      fg='white').grid(row=0, column=1)
replaceRowName=''
j=2
    •
    •
    •
    •
conn.close()
```

sn	student_id	course_code	section	batch	date	status
1	161-15-6785	CSE111	EVE-A	28	20-09-2018	T
3	161-15-7659	CSE111	EVE-A	28	20-09-2018	T
4	161-15-6785	CSE111	EVE-A	28	21-09-2018	T
5	161-15-7659	CSE111	EVE-A	28	21-09-2018	F
21	161-15-6785	CSE111	EVE-A	28	22-09-2018	T
22	161-15-7659	CSE111	EVE-A	28	22-09-2018	F

Fig. 4.45: Process of read data from database

Give information to database:

Into the student details, registration, teacher assign,

API (Application Programming Interface):

We have made a API that are using on mobile app to get information about student and status of attendance which will show in percentages.

4.3 Interaction Design and UX

There are five elements of User Experience Design, [22]

- Strategy Plan
    - Product Objectives
    - User Needs
- Scope Plan
    - Functional Specifications
    - Content Requirements
- Structure Plan
    - Interaction Design
    - Information Architecture
- Skeleton Plan
    - Interface Design
    - Navigation Design
    - Information Design
- Surface Plan
    - Sensory Design

Strategy Plan:

There are two main questions in this plan these are, what will we get? And what we want?

Product Objectives

There are objectives that must be include into our project such as, make an Automatic Attendance System, notifies status to student is he/she attend to the class or not, prepare a chart for Student

details and activity, display student attendance (%), make a feedback Panel, gives suggestion panel, etc.

User Need

We have proposed our project and approved it on title defense with some modification such as, to protect the privacy of the classroom we will do the capturing of the images with the web camera and just need to include a mobile app which will relate to the desktop software.

Scope Plan:

There are two main questions in this plan these are, why are we making this product? And what are we going to make?

Functional Specifications

We want to save time for teachers and students any we have made a software that are very easy to use. Students will get his / her daily status into their mobile apps and he able to know how long did he / she missed the class?

Content Requirements

It is important to project, which can make a project valuable to users. We have made it very carefully to our project that we have already discussed into front-end design part.

Structure Plan:

Interaction Design

How can we make an interaction design and how we implement it? We have broadly discussed about it into Implementation of Interactions part in the chapter of Implementation and Testing.

Information Architecture

In order to understand Information Architecture, in one word it can be said that it is the blueprint of project.

Skeleton Plan:

Interface Design

This is an inevitable thing which can make a project valuable to users. We have broadly discussed about it into Front-end design part in the chapter of Design Specifications.

Navigation Design

There are some issues that must be in navigation design,

- Improve a user's understanding
- For giving this type of facilities we have gave a simple in interactive user interface which will help the user easily understand.
- Give confidence using your product
- Provide credibility to a product

Surface Plan:

Sensory Design

As like we would to like eat taste food, likewise attractive user interface and user experience design make a project valuable to users.

4.4 Implementation Requirements

The necessary requirements given below:

Hardware Requirements:

- Computer (to using of attendance)
- Local storage (to store the images)
- Web camera

Software Requirements:

- Programming Language: Python (for desktop software develop) and Java (for mobile apps develop)
- Framework: Core
- Package: Tkinter
- Libraries: Numpy (for using array, datatypes, mathematics, etc), OpenCV (for computer vision)
- Container Datatypes/classes: collections, datetime
- Online Database: MySQL

CHAPTER 5

Implementation and Testing

5.1 Implementation of Database

Database: A database is a store of collection of data that describe the information about one or more organizations. For example, database of Daffodil International University might contain information about the following: [23]

- Entity such as Student, Faculty, Course, Classrooms etc.
- Relationships between entities such as Student enrolled in course etc.

How manage data in database?

- Database design and development an application
- Data analysis
- Concurrency control and Robustness
- Efficiency and Scalability

In some ways database can be design:

- Requirement Analysis
- Conceptual Database Design
- Logical Database Design

Implementation of Database:

- Local Storage Management
- Online Storage Management
- Hosting into online
- Transaction Management

Secondary Storage Management: In my project during attendance, a web camera will take some image and compare with secondary storage image of students that have taken in the time of registration. So secondary storage management is very important to implement into a database design.

There are some processes to store data into the secondary storage.

- Access to secondary storage
- Arranging data on disk
- Represent address of record

In the following figure 5.1 shows that hierarchy of memory of attendance system.

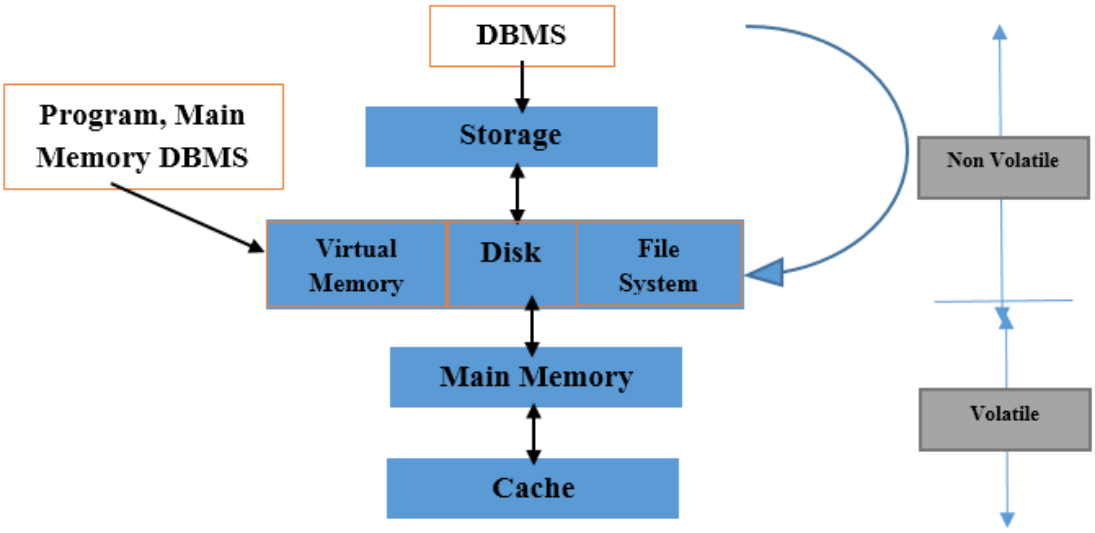


Fig. 5.1: Memory access process of attendance system

Concurrency Control:

When many users use a system then it might be happened conflict. To overcome this type of fails we have design the attendance system software for different interface for different users.

5.2 Implementation of Front-end Design

Implementation of front-end design: [24]

- Design Requiems
    - Grid system
    - Colors
    - Fonts and texts
    - Links and navigations
    - Images
    - Menu and Buttons
    - Geometry size and position of screen, etc.

Grid system: It refers the interaction of page such as width, no of column etc.

Colors: To make more interactive to stack-holders a software needs to make with different color that will make more gorgeous.

In the following color we have used on background of left side button in main interface and login page etc. In the following figure 5.2 shows that left side button background:

Fig. 5.2: Left side button background

In the following color we have used on background of button in main interface and also we have used in login page button etc. In the following figure 5.3 shows that left side button color:

Fig. 5.3: Left side button color

In the following color we have used on background of right main side where status will be shown etc. In the following figure 5.4 shows that right side status background:

Fig. 5.4: Right side status background

We have used two color for text this two color is black and white.

Fonts and texts: We have used just default font family and text that provided by python 2.0. We think it will make elegant to software.

Links and navigations: It is more important to interaction between software to server and local storage to communication for matching faces to attendance. So it must be errors free and needs to implement using efficient framework.

Images: We have used small amount of logo that make it easy to know what type of project is.

Menu and Buttons: There are some menus and buttons we have used to make easy stay on the different pages, because in different pages there are a same menu bar you will get.

In the following figure 5.5 shows that implementation part of menu:

```
#Top Menubar .....................................
menu = Menu(app)
app.config(menu=menu)

#Menu >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
goToMenu = Menu(menu, tearoff=False)
attendanceMenu = Menu(menu, tearoff=False)
studentMenu = Menu(menu, tearoff=False)
signoutMenu = Menu(menu, tearoff=False,fg='red')


#Menu
menu.add_cascade(label="Go To", menu=goToMenu, font = ('Verdana', 14))
menu.add_cascade(label="Attendance Query", menu=attendanceMenu)
menu.add_cascade(label="Student Query", menu=studentMenu)
menu.add_cascade(label="Welcome, "+teacherNamebyId, menu=signoutMenu)


#GoTo
goToMenu.add_command(label="Home Page")
goToMenu.add_separator()
goToMenu.add_command(label="Initial Page", command=initialCommand)

#Attendance
attendanceMenu.add_command(label="Show All", command=attendanceShowTotal)
attendanceMenu.add_command(label="Individual", command=attendanceShowIndividual)

#Student
studentMenu.add_command(label="Show All", command=studentShowTotal)
studentMenu.add_command(label="Individual", command=studentShowIndividual)


#signout
signoutMenu.add_command(label="Signout", command=signoutCommand)
```

Fig. 5.5: implementation part of menu

In the following figure 5.6 shows that implementation part of buttons:

```
#Left side button ..................................
startAttendanceBTN = Button(leftFrame, bg="#3b8bbc", fg="white",
                            text="ATTENDANCE",relief=RAISED, borderwidth=1,
                            font="none 10 bold", width=20, height=2,
                            command=takeAutoAttendance).grid(row=1, column=0,
                            padx=(10, 10), pady=(40, 10))
startManualAttendanceBTN = Button(leftFrame, bg="#3b8bbc", fg="white",
                            text="MANUAL  ATTENDANCE", font="none 10 bold",
                            width=20, height=2).grid(row=2, column=0,
                            padx=(10, 10), pady=(40, 10))
showAttendanceBTN = Button(leftFrame, bg="#3b8bbc", fg="white",
                           text="SHOW  ATTENDANCE",relief=RAISED, borderwidth=1,
                           font="none 10 bold", width=20, height=2).grid(row=3,
                            column=0, padx=(10, 10), pady=(40, 10))
showImageBTN = Button(leftFrame, bg="#3b8bbc", fg="white", text="SHOW IMAGE",
                      font="none 10 bold", width=18, height=2).grid(row=4,
                     column=0, padx=(10, 10), pady=(40, 10))
showStatusBTN = Button(leftFrame, bg="#3b8bbc", fg="white", text="STATUS",
                       relief=RAISED, borderwidth=1, font="none 10 bold",
                       width=16, height=2).grid(row=5, column=0,
                                padx=(10, 10), pady=(40, 10))
```

Fig. 5.6: implementation part of buttons

Geometry 'size and position' of screen: We have used a particular geometry size in different interface to make it same in looking. So it makes free to seen and neither it give a pain to users that will get in different geometry size.

In the following figure 5.7 shows that geometry size of attendance system software:

```
app.geometry('%dx%d+%d+%d' % (w, h, x, y))
app.configure(background="#232F3B")
app.mainloop()
```

Fig. 5.7: Geometry size

5.3 Implementation of Interactions

Interaction Design: Develop an interactive project to support people or organization in their daily activities. [25]

Goals of Interaction:

- Usability goals
    - Effective to use
    - Efficient to use
    - Safe to use
    - Easy to learn
    - Easy to remember how to use
- Users experience goals
    - Satisfying
    - Enjoyable
    - Fun
    - Entertaining
    - Motivating
    - Helpful
    - Support
    - Emotionally Fulfill

Implementation of Interactions:

- Develop language studies
    - Python
    - PHP
    - C#
    - ASP.NET, etc.
- Apply the visual style to the screen
- Form factor, Title and Input method with validation
- Function and Data element
    - Abstract Function
    - Static Function

- Dynamic Function

Develop language studies:

We have found lots of reference about what type of language is better to implement an attendance system design using computer vision. They say there are some most of language that make very easy to implement such as Python, PHP, C#, ASP.NET. So we are selected Python because it has more library and framework that will help me to implement in easier way that rest of other languages.

User experiences goals:

We have gather some information about this project and we have get a positive reaction that makes me more motivate to make it. We have collected data from different website links, discuss with my course mate and onsite observation in some reputed organizations. He ensures me that it will very helpful to all to make safe our valuable time.

Form factor, Title and Input method with validation:

We have been included several form which is include to validation. It will be required during registration as a faculty and during login time as a faculty and student. All form and other instructions has different title to make easier to users. Input field are included label to know what types of field it is. In the following figure 5.8 shows that login input field with title:

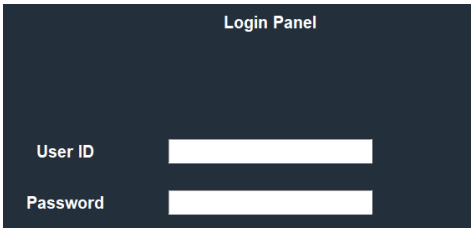


Fig. 5.8: Login input field with title

Function and Data element:

We have done the project using different types of function that will help to reduce the code to write and safe valuable time such as, abstract function, static function, and dynamic function.

Abstract function: It is a function that refers, every faculty has to complete attendance by a particular way that we maintained by some abstract function.

Static function: During starting the project a static function will be call automatically. That is the static function.

Dynamic function: There are various types of function we used that are executed in many times in many step you will have used. Such as in the time of login, registration, update attendance, submit button press etc. In the following figure 5.9 shows that functions of main page:

```
app=Tk()
ws = app.winfo_screenwidth()
hs = app.winfo_screenheight()
mainLoginPage()
```

Fig. 5.9: Some functions of main page

Principles of Interaction design:

We have also make it to overcome in some issues:

- Safe valuable time
- Improving communication
- Reduced tensions by using automatically attendance
- Balancing detection of face

5.4 Testing Implementation

Testing: A testing refers a quality full output of a software that's refers it is out of errors free.

There are some issues to needs a testing: [27]

- Errors

  Most of cases we have faced some errors such as syntax errors and also different types of bugs. Error means that mistake.

- Fault

  A fault is a result of errors, so when errors occurred that means fault will occur.

- Failure

  When fault occurred then failure will occur.

- Incident

  When failure occurred in the project that it will not readable to users so it is an incident. So that failure refers incident.

In the following figure 5.10 shows that the life cycle of testing of our attendance software:

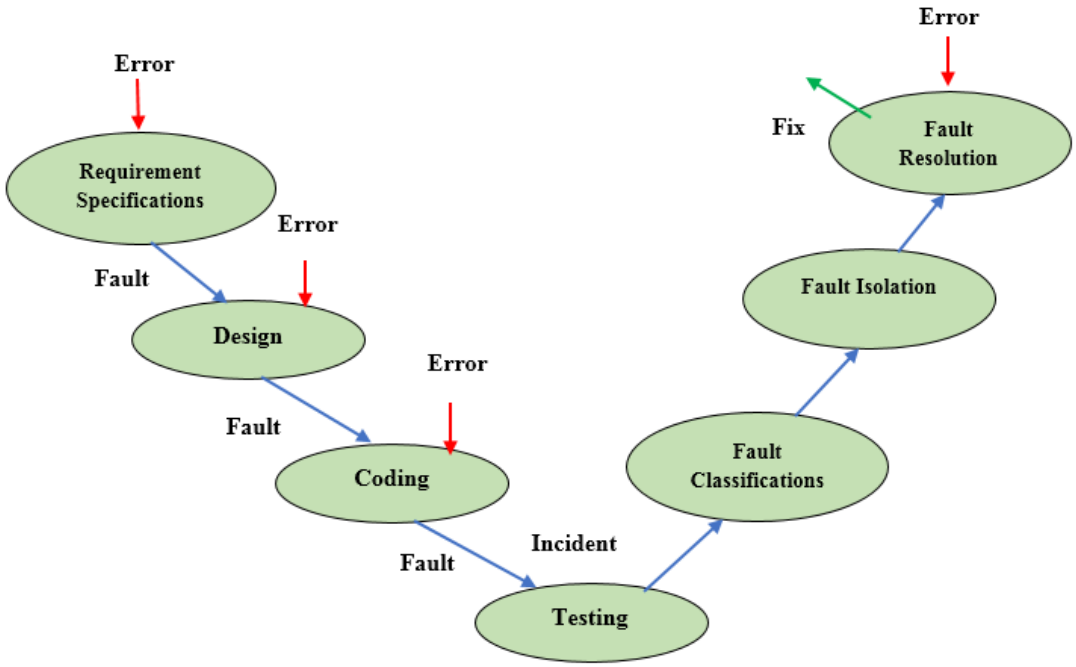


Fig. 5.10: Life cycle of Testing

5.5 Test Results and Reports

Worst Case Testing:

We want to describe confidence value of image during recognition that will refers to worst case testing. In the following is the testing of worst case: [26, 27]

Suppose,

- There are two students, ID of two students are ‘161-15-6785’ and ‘161-15-7659’.
- The confidence value of two students save on variable of var1 and var2.
- In following image refers to confidence value of two students that we have collected during run the attendance.

In the following figure 5.11 shows that confidence values of two students:

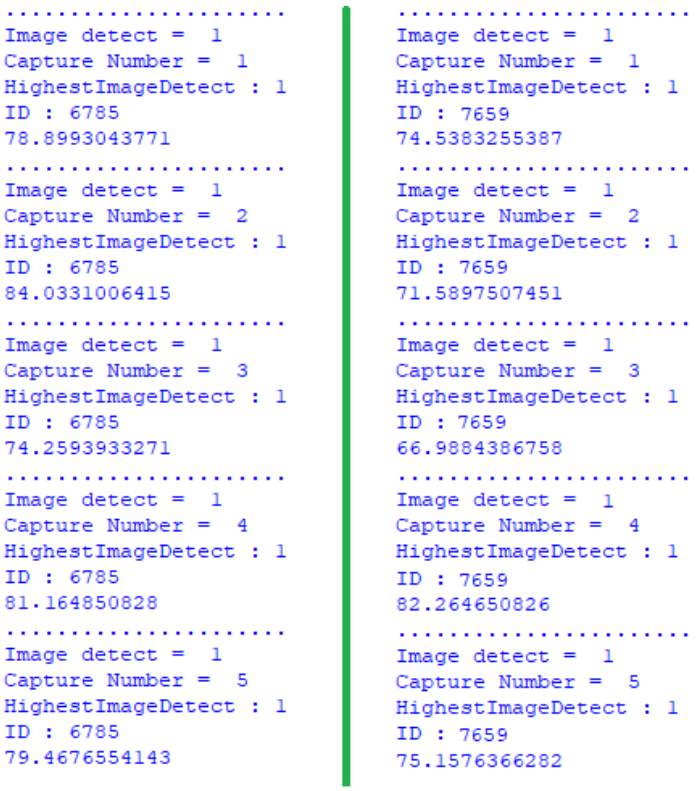


Fig. 5.11: Confidence value of two students

Special Value Testing: We have done special value testing in some following mechanism:

- We have done testing in regularly until complete.
- We have gather a theoretical knowledge about previous experience who made a project that are related to computer vision.
- Onsite observation to ACI Company Limited, to know further about efficiency of image processing they already have managed his employee attendance in a small way of capturing.
- We have seen google already made some automation that detect and recognize part of elements and arrange in a particular place.

Decision table based testing:

In the decision table based testing it refers that comparing between database logical table and user interface input value, if those are same then output return to true and user permit to go to next interface. In the following figure 5.12 shows that login panel into software:

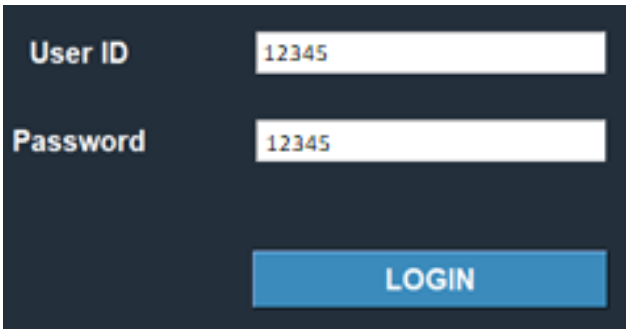


Fig. 5.12: Login panel into software

In the following figure 5.13 shows that login table into database:

Serial no.	user_id	password
1	admin	admin
2	12345	12345

Fig. 5.13: Login table into database

From the above figure we can see that user id and password both of them are match, so user is to able to go next interface.

Path testing:

We have done to path testing and my project works correctly that was my expectation. In following we want to show a path testing for only seven (7) interface from my whole project or software. Suppose,

Home page or Login page = 1

Course select page = 2

Initial query = 3

Student query = 4

Attendance = 5

Initial page = 6

Logout = 7

In the following figure 5.14 shows that path formulation using function:

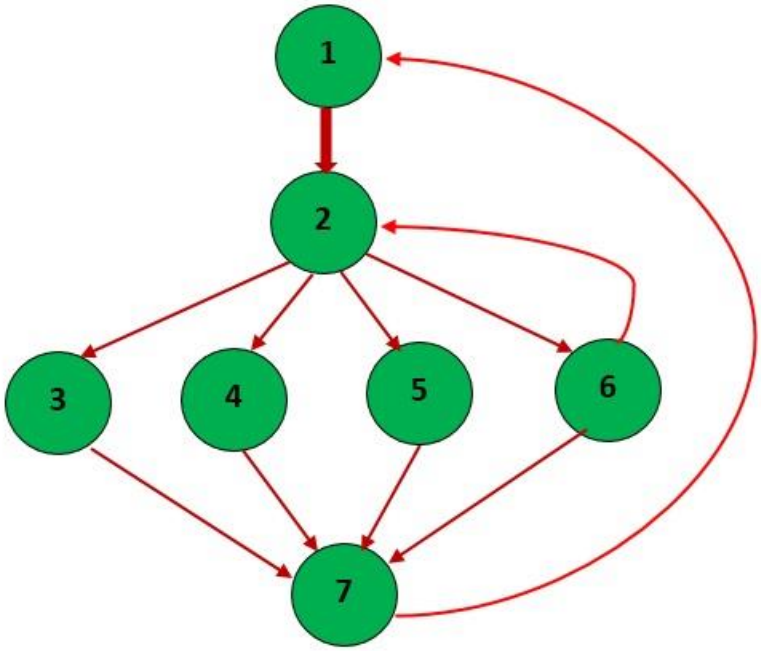


Fig. 5.14: Path formulation using function

Data flow testing:

The main part of my project is attendance section. In the attendance section there are huge data transmit between many variable and also transfer and compare between database and user interface part. So it must need to test a data flow testing for make a project efficient and errors or bugs free. We have shown a data flow process in following to clarify my description.

In the following figure 5.15 shows code for confidence comparing:

Comparing value of confidence and put it into id variable, then it assign to a array to furthur use: -

```
for(x,y,w,h) in faces:

    cv2.rectangle(im,(x,y),(x+w,y+h),(225,0,0),2)
    id, confidence = recognizer.predict(gray[y:y+h,x:x+w])
    print "ID : " + str(id)
    print confidence
    if(confidence >= 20):
        for i in range (len(studentList)):
            if(id == studentList[i]):
                studentDetectCount.append(id)
                break


        cv2.putText(im, str(id),(x,y+h), font, 1 ,(255,255,255),2,cv2.LINE_AA)
    else:
        id="Not"
        cv2.putText(im, str(id),(x,y+h), font, 1 ,(255,255,255),2,cv2.LINE_AA)

    cv2.imshow('im',im)
```

Fig. 5.15: Code for confidence comparing

Above code is being execute after pressing ATTENDENCE button, that into the prime interface of my project or software. In following we have given image of that interface.

In the following figure 5.16 shows that interface of attendance:

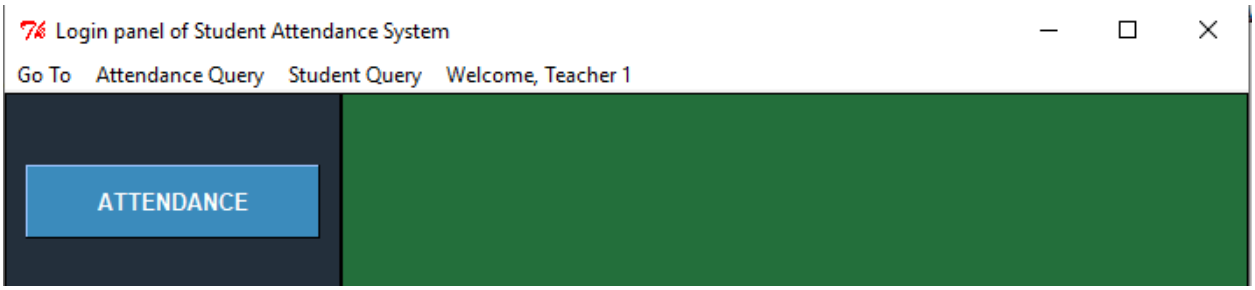


Fig. 5.16: Interface of attendance

Integration testing:

There are three main part that we have develop for,

(i) Students

(ii) Teachers

(iii) Admin

The main purpose of student parts is notified whole attendance report and regular notification using online database.

The main purpose of teacher parts is taking attendance, show details about etc.

The main purpose of admin parts is assigned teachers to course, student registration with taking image etc. All above three interface we have made integrated and it is working well.

Unit Test: It is also called by component test. We have already discussed about unit test in the structural testing section. We have checked validation of following login page by Unit test. Anyone cannot go next page without valid 'user id and password'. Neither you can empty User ID field nor you can empty Password field and a validation notification will show in front of page that we showed in the following image. In the following figure 5.17 shows that validation during user id field is empty:

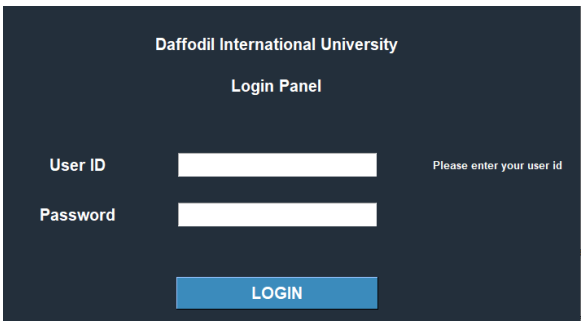


Fig. 5.17: Validation during user id field empty

In the following figure 5.18 shows that validation during password field is empty:

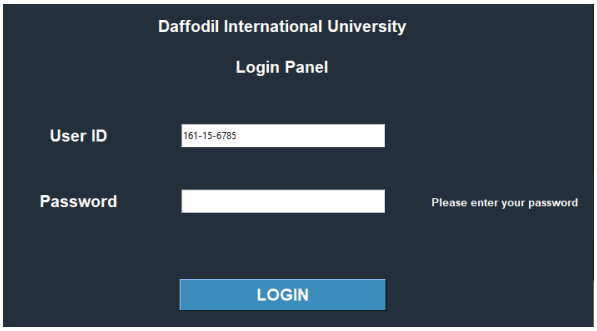


Fig. 5.18: Validation during password field empty

CHAPTER 6

Conclusion and Future Scope

6.1 Discussion and Conclusion

This project will make the students more attentive to come to the class because they will be regularly notified by apps. The processes of this project have been succeeded to meet the objective and it will inspire developers to develop such a project. The knowledge of programming and libraries is very significant to develop this project. The UI of this project has been made very simple but attractive interface, which seems easy to see, which would be easy for everyone to understand.

This project is very useful for students and it will save the valuable time of the teachers and job market of this project is very high because we have used image processing that's why we took the inspiration of such a project. We hope that knowledge about this project will be useful in our future challenging life.

6.2 Scope for Further Developments

There are various ways, where we can develop our career as a profession of image processing field. In presents, the demand for this field is increasing day by day because of providing security and the job market in this field is high. We think there is no one place where it is not using. In the following, we have mentioned some scope/career path of this project.

- IOT (Internet of Things)
- Medical Field
- Astronomy Field
- Robotics
- Automatic attendance using face or fingerprints recognition, etc.

Appendices

- **Appendix A: Project Reflection**

  This section refers to the project reflects that we faced during development. Firstly, we want to say our supervisor helped us a lot, until our defense. We have started developing our project after our project is approved. Before Eid-al-Adha we have lost some time to develop our project due to some inevitable situations in our country. But we are grateful to Allah that we have been able to finish our project in a final state. This project will help students and teachers in various ways. In the direction of UI and UX, we tried to develop our project at our level best. We have used the latest libraries that make our project efficient such as OpenCV, Numpy, etc.

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