Data Structures and Algorithm

Project Proposal

Title: HAZIR

Approved with Revision

Problem Statement

Our project idea is inspired to solve, perhaps, the most basic yet crucial problem in regard to student's performance at Habib which is the issue of attendance. It's serious than we can think or comprehend. As a student at Habib, it first seemed like a personal issue for me, not keeping up with the attendance roster on PSCS and failing to check my attendance daily on PSCS, but after talking to other students, and finally taking a whole survey, it is now evident that the majority study body is facing the issues related to attendance. And these issues are either related to the PSCS being too slow or laggy, or the attendance not updating even after you attended a class and marked yourself, or issues with biometric system etc. All these problem compel both professors to ask students to check PSCS frequently and students to keep a track of their attendance status.

On top of that, recently, Habib's management announced a new policy for attendance which expects a student to have at least 85% attendance and the attendance will also be counted in the add drop period. Now for the next semester, management wants every student to have 85% attendance or else RO will drop their course.

Considering all this, we came up with an idea to create an attendance app that collects your data from PSCS and notifies the user about their current attendance status. It will also keep a track of your absences and will tell you if you are on the verge of dropping from the course or not. It's a simple idea but it can have a great impact. Students don't have to check their attendance by logging in on PSCS and click on several pages to get at the actual attendance roster. They don't even have to open the app daily; app will generate a notification if the information updates. On the other side, instructors and RO will have fewer requests and complains from the students, unlike now.

Our Survey

Before actually start working on this pretty big project, we confirmed that our targeted audience needs this product or not. We surveyed students at Habib with three simple questions and the result of the survey clearly shows that students are indeed facing technical issues related to attendance. This is the result of that survey: Survey Result

Working

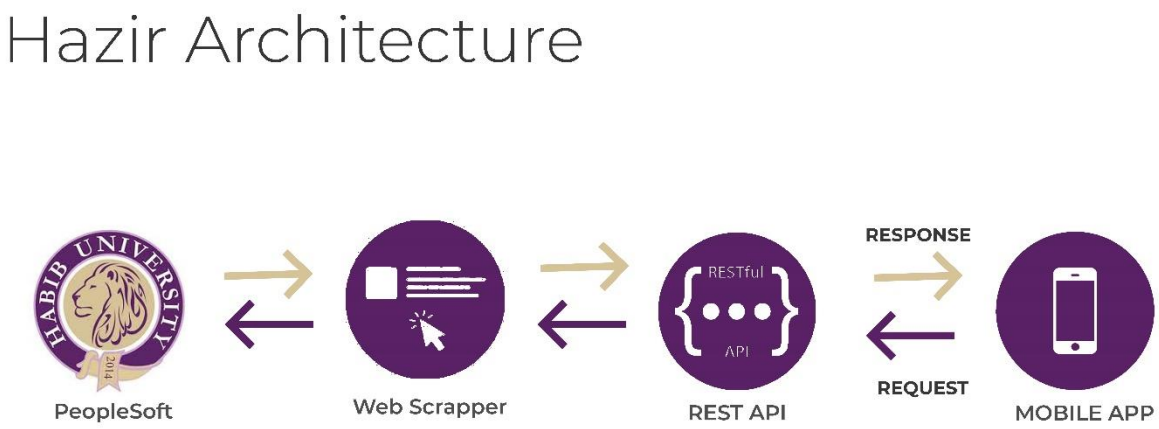
The app will consist of three major parts.

1. Python Backend: which will be a python script that collects all the user's data from the PSCS servers and organize that data in structural form. This part is the brain of our project. Script will do all the parsing and screening to user's data and return it in to the app for the user to see. This script will basically send the request to the PSCS server with the user's credentials and collects a HTML file for the attendance roster, then it will clean

the garbage data and organize that in a proper data structure. It will then return it to the Web API (discussed in 3).

2. Flutter App (Frontend): We will be using hybrid platform called flutter to create apps for both android and IOS platforms. As most of the tasks are server centered, hybrid approach should be the best option to make IOS and Android apps from a single code base. Flutter framework uses a static language called Dart and it's quite similar to Java. We will also be taking care of creating minimal and strong UI design to engage our users effectively.
3. REST API: The REST API will connect both the app and the data from the python script. Python script will be programmed to serve as an API and that API will be deployed on a server to run independently according to the user's request. REST API will give the user's data from the script and return it in JSON format, which will be easier for our app to read. We have found several servers that we might use like AWS, Heroku, Render and etc.

Architecture



Tentative Data Structures

1. Nested Dictionaries: The most important part of our project is the communication between the Mobile Application and the Scraper, which is done through a REST API. This API consists of a JSON tree-like data structure which is generated via the Jsonify

library in Python. This library needs information in the nested dictionaries that are then converted to JSON Data. For example:


```
{
"courses": {
"C0": {
"code": "1002",
"name": "What is Modernity?",
"subject": "CORE 102"
},
"C1": {
"code": "1010",
"name": "What is Modernity?",
"subject": "CORE 102"
},
"total": 2
}
```


THE ABOVE CODE SHOWS A VERY BASIC NESTED DICTIONARY THAT CAN BE USED IN OUR PROJECT THE ACTUAL DICTIONARIES WILL BE MORE COMPLEX AND NESTED.

2. Hash Maps: Our mobile application will be based on the Dart programming language which is pretty much similar to Java. Instead of dictionaries in python, Dart consists of HashMaps. The only difference between the python dictionaries and the Dart HashMaps is that in Dictionary Data type of the key-value pair is inferred by the programming language itself, but in HashMap we need to define the DataType of the key value pair for example HashMap<String,int>. The Hashmaps are used here because we want to parse the data provided by the REST Api. Once the data is parsed it is stored in HashMaps which can be then used to create objects from custom class.

Tentative Algorithms

The use of Algorithms isn't the required essence of this project, however if we are left with some time we can incorporate efficient searching and sorting algorithms, so that users can search or

sort between any of the enrolled courses. We have to work on this part more and think of efficient algorithm to reduce the runtime and response time of our app and API.

Tentative Libraries/other resources

1. requests (Python library)
2. BeautifulSoup (Python library)
3. Flask (Python library)
4. Jsonify (Python library)
5. HTTP (Flutter dependency)
6. Flare (Flutter dependency)
7. API hosting

Outcomes

Being computer science students we understand our responsibility as real world problem solvers, therefore our sole purpose is to solve problems of our community using our course knowledge. Students face a lot of attendance problems; the Hazir Application will help them keep a track of their attendance which will not only benefit students but will also have a greater impact on the faculty as well as the registrar's office. This will also reduce the chance of course drops due to false absences. Moreover, we feel that this project is not just about the implementation of data structures and algorithm but it's about actual real world problems around us. Perhaps, this is just a step forward in increasing the student interaction with online tools and this could be expanded significantly. Maybe, one stop solution to all the students' problems.

Outcomes:

1. Functional Attendance App Sync with PSCS
2. Optimized API
3. User Friendly UI unlike PSCS
4. Proper Notification Pipeline
5. Students' Feedback

We would like to end on this quote by Buckminster Fuller, "You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete."