Mobile Application for UAIC Home

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ABSTRACT
"UAIC Home" is an Android app which brings students of the "Alexandru Ioan Cuza" University closer to its faculties, teachers and courses. From now on, every student of our University will know the exact location of each classroom they learn in, where they can find a teacher for consultations or the schedule of the administrative office. Also, they can identify the schedule of a room just by pointing the phone at it. This solution can be adapted easily to other Universities or to other buildings with a similar structure.

Author Keywords
Android; Mobile app; Orientation and movement inside buildings.

General Terms
Human Factors; Design; Measurement.

INTRODUCTION

On the first day of college, a first-year student must arrive from 8:00 on his first course. Being for the first time in college, the student has difficulty orienting himself and finding this room. On the first day, half an hour after the beginning of the course, the teacher instructs students to visit his site so they can read more about the subject, get lessons, etc. so they must write the link on a sheet and not forget where they wrote it. For a few days, the student had a problem solved at the secretariat and did not know the program, and it did not work until 13:00, because the program with the public was already over. Two weeks later, the student had to go to a teacher for some discussion and struck another problem: he did not know where his cabinet was. In fact, the problem was not like him as he believed, but he actually realized that there was no place to find all this information and that he had not faced these problems alone, but actually all students in that year and even the second year had a problem at one point in finding a room, the program at the secretariat, the email or the office of a teacher, etc. That's why we thought we could solve this problem, working on an application that would gather all this information and not just for us, students from Informatics but for the whole University. We are surely many students have communication problems with their faculty and teachers because there is no such solution yet.

SIMILAR SOLUTIONS

Campus Maps

"Campus Maps" application does exactly what its name says, provides a complete map of over 250 campuses from the big universities in America. The user can browse the buildings of a campus, can easily host canteens, dormitories, faculties etc.

Lost On Campus

The "Lost on Campus" app offers the same benefits as the above application, but in a more interactive way, with many pictures, an appreciation system, location schedules, external links and a more attractive design.

Brock University Wayfinding

"Brock University Wayfinding" works only for one university but offers real-time pictures, real-time directions and an interactive map.

Unlike "UAIC Home", these three applications only work in America, and none provide the same level of detail, lists of teachers, rooms or courses. Also, apps are maintained by some people who add or remove information when we rely on our own students, making it much easier to keep the app up to date.

PROPOSED SOLUTION

Using the device location and a custom machine learning data model, "UAIC Home" can identify any classroom or teacher office just by taking a photo of it. Also, it can provide useful information about teachers, students or rooms of each faculty such as *exact location and floor, email address, phone number, schedule, official webpage*, etc. The app gives you suggestions based on your habits, searches and overall most popular and loved teachers or courses of your faculty. Each user will receive also a list of news based on faculty and group they are from such as administrative information, direct information from teachers about exams or scholarship information. Also, each teacher, room, course, faculty, etc. have a rating system based on "hearts" so we can receive feedback and use it to improve our faculties and courses. One of the most original features of this application is called "Live Schedule" that shows live information about location and course of each teacher or room you searched for.

Similar applications can be found in US for American Universities (Campus Maps[1], Lost on Campus[2] or Brock University Wayfinding[3], [5]) or in Europe (Ireland [1], Sweden [4], Dutch [3], UK [2]).

Service Architecture

The UAIC Home app works in close relationship with the services provided by Google Firebase. It provides added convenience when it comes to configuration because the service initialization process is very easy and does not take much time. The app make calls to (see Figure 1):

- **The authentication service** at startup when a user wants to authenticate;
- **Database** to provide the information needed for the first roll using lazy-loading for increased performance;
- **Machine learning service** and **Vision API** for identifying the classroom boards;
- **Cloud function** that will determine which are free rooms in the faculty where the user is at the time of the call.

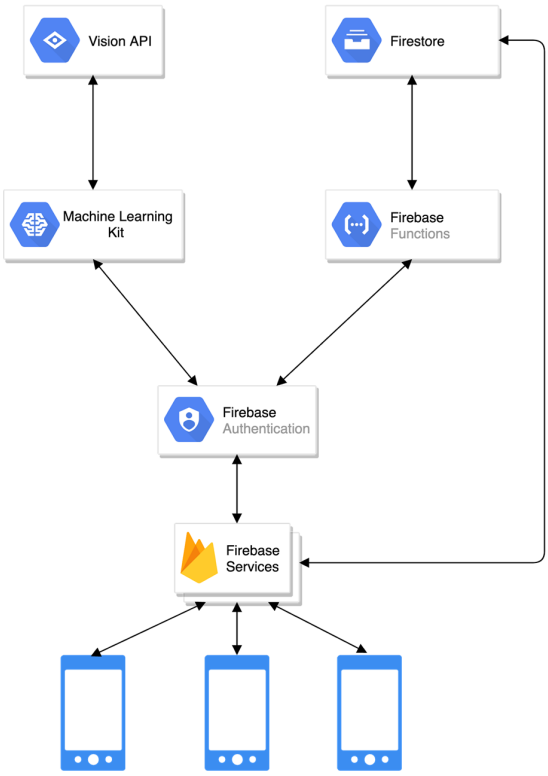

Fig 1: Diagram of services used by "UAIC Home"

Database architecture

The database used by the application is called Firestore, it is noSQL and is based on a Document-Collection-Document structure. The UAIC Home database is based on two large collections: Users and Faculties.

The Users collection contains multiple documents, each representing a user uniquely identified by an id, having as auxiliary fields the name, the group they are part of, the faculty they are studying, the email address they registered, the reputation that is based on the activity the user in the application and the date when the account was created.

Each user has 6 collections: *Loved Faculties, Loved Groups, Loved Rooms, Loved Teachers, Loved Classes, and Personal News*. The first 5 contain minimal information about the entities the user has appreciated, such as their faculty, the name and date they gave to that entity, and the last one contains a list of news that the user sees in the main activity application. The Faculties Collection contains multiple documents, each of which is one of the faculties of our university, uniquely identified by an id, having as auxiliary fields: full name, email address, telephone number, fax number, official website, the address in words, the address expressed in geographic coordinates, the number of website visits of each faculty and the number of hearts received by it.

Each faculty has 5 sub-collections: *Groups, Rooms, Teachers, Classes and News.*

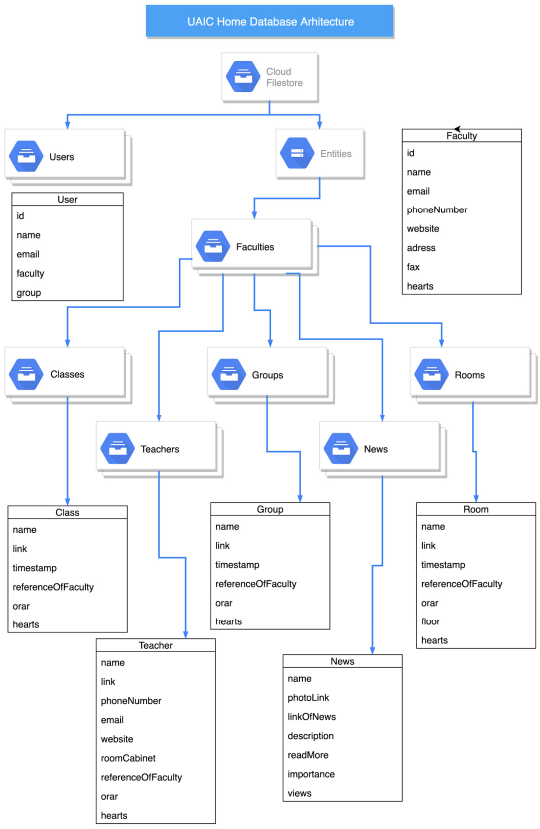

Fig 2: Diagram of the database used by "UAIC Home"

[1] https://play.google.com/store/apps/details?id=com.campusmaps
[2] https://play.google.com/store/apps/details?id=com.studentservices.lostoncampus
[3] https://play.google.com/store/apps/details?id=ca.brocku.wayfinding

The first 5 collections have information about the entity they represent: their name, faculty, document type, timetable, and JSON schedule to perform certain calculations and operations that cannot be done without this structure, email, phone, and website if this is the case for the Teacher entity, the number of views and the number of hearts received. The last collection contains a list of faculty newsletters that will be received by each user individually when opening the application, each news story having a name, a description, a link to the complete news, along with other useful details.

Application architecture

The "UAIC Home" application contains 5 activities, 7 fragments, 34 classes totaling 6150 lines of code. The application's activities are:

Welcome Activity

Welcome is the first thing the user interacts with, including the logo of our university with a *LoadingBar*. This activity has several uses:

- Verifies whether the device on which the application is running has an Internet connection and notifies the user otherwise.
- Requests the user permission to store photos and local data to shorten application load time for future runs.
- Makes connection with Firebase services and with the database.
- Download part of vital running application data to lower opening time for main activity.
- Check if a previously logged-in user who has ticked the "remember me" check box is in the application's memory, and if there is his/her information being logged in.

Login Activity

Login activity is the second user interaction, it also contains the university emblem, two EditText fields for email and password respectively, a CheckBox for the ability to retain user credentials until the next opening of the application, and three buttons, one for normal log-in, one for Log-in as guest if a user does not want to create an account but only to look for a teacher, a room or a stuff and another button for registration that will open the Register Activity.

This activity has several uses:

- Gives the user access to the account he/she created;
- Offers the possibility of quick access to data if the user does not want an account;
- Offers the possibility of registering if the user does not have an account;
- After the actual login is made, will make a call to the database to bring high priority information to the logged-in user such as the news list, user favorite's lists, etc.

Register Activity

The activity of Register is the one with which the user interacts only once and then only if he wants to create an account. The activity contains 4 EditTexts for name, email, password and confirmation, and a Dropdown to select the faculty to which the user belongs.

This activity has several uses:

- Requests user information;
- Verifies the veracity, consistency and accuracy of the information received;
- Check if there is no user already using that email address;
- Provides real-time instructions on how the name should look like, how it should be the email address, and how complex the password should be;
- At the click of the Register button, before submitting a request to the database, the activity will verify the entered data by passing them through the regex filters;
- If all entered data are correct and complete and the user does not already exist in the database, the activity will register the user.

Camera Activity

Camera Activity is the one with which the user interacts when he wants to find out about a particular classroom or teacher by scanning the plaque outside the room. The activity wants to make the search process easier for the user not to have to write the name of the room. It contains the camera module and a list of rooms that are relevant to the picture taken. This activity has several uses:

- Ask for the necessary permissions (camera and storage) if they do not exist;
- The picture taken will be processed and sent to the ML module in Firebase Services; A JSON will be returned with the server's response to the plaque recognition;
- Provides the functionality to identify the faces of each faculty room from which the picture is taken;
- Provides the opportunity to open the fragment corresponding to each identified room;
- If the picture does not return any valid response, the user will be informed that the desired classroom could not be processed.

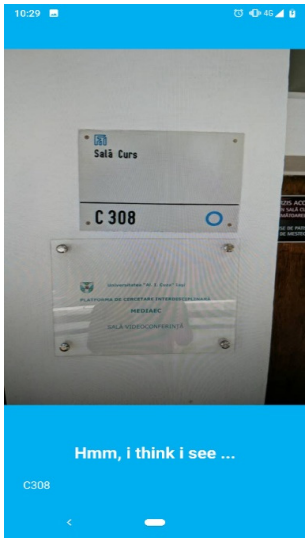

Fig. 3: Camera Activity

Main Activity

Main activity is the main one with which the user interacts most often, offering the opportunity to open 12 different fragments. It contains at the top 3 buttons: Free Rooms that open Free Rooms Fragment, Search that opens Search Fragment and Camera that opens Camera Fragment. At the bottom, the activity contains a menu to open the three main fragments: My Profile Fragment, Dashboard Fragment, and Favorites Fragment. By default, the Dashboard fragment is the one opened first.

Dashboard Fragment

The Dashboard fragment is the main one where the user can find all the news and news that faculty wants to convey to them as quickly as possible. This snippet contains a list of news items, each with a title, a short description, a photo and an importance expressed as a number between 1 and 10. The news will be published/sent by the administrator of the faculty to which the student belongs, these being taken over by each user at the opening of the main activity. If the user clicking on one of the news items will be redirected to the Instance Fragment to see the auxiliary data provided for that news such as the complete news link or additional details. A story also contains a date when it will "expire", meaning that at some point an irrelevant news will disappear from the user list. He can also delete a news story if it does not seem relevant to him. If at any given time the user deletes all news or remains without them due to the inactivity of the faculty administrator, he will be given the opportunity to search for and download new news relevant to him by using the hearts offered by other users to other news.

Fig. 4: Dashboard Fragment

My Profile Fragment

The My Profile snippet is where the user has access to their personal data and has the ability to modify them. When it opens, it will look at its name, the group it belongs to, its faculty, its group's schedule for quick access to the hours of the day, and two buttons, one for "Log-out" and another "Change account settings" that allows you to change your account data.

The group schedule will be rendered as a mini browser page to be updated live with all the news or exams that are announced on the page.

If the first button is pressed, the user will be logged off and the data downloaded to the memory will be cleaned to avoid conflicts with the following login sessions.

If the second button is pressed, the user will be presented with the 3 options he/she has to change the account settings, namely: changing the name, changing the password or changing the group to which it belongs, the functionality of changing the email address or faculty possible only by contacting the administrator because it is possible to meet the scenario to say that a user has an address with @ info.uaic.ro but the faculty has selected the Faculty of Biology, this being a conflict and we do not want it to happen.

When changing the name, the process is quite simple, the user just needs to enter the new name, which is checked with a regression and changed later.

Fig. 5: My Profile Fragment

In case of changing the group, the user has only to select another group from a dropdown and the change will take place. If you change your password, it must enter the old password and then write twice a new password. If the old password is not entered correctly or the new password is not the same in both fields, the change will not occur.

When the Go button is pressed, all changes will be updated both in the application and in the asynchronous operation database as the application can continue to run fluently.

Favorites Fragment

The Favorites snippet is where the user has access to the teachers, groups, rooms and faculties they liked.

In the first phase, the page contains a list of the 4 types of entities available at the top and at the bottom the user can receive two suggestions that can be teachers, rooms, classes and groups that are determined by the number of views of those entities but also a classification of how many hearts those entities have received from other users who have things in common with the current user, or links between teachers, subjects, and groups.

Considering that users can hit the heart for any entity, suggestions will come as a steady wave, ending only when the user has tapped the heart for each teacher, group, faculty, room, and matter.

After clicking on one of the entities' icons available on the Favorites snippet, the user will see the list of all the entities he has appreciated over time. The list comes in handy so that a user who is more often looking for a teacher can say he can go to his favorites and not have to look for him every time. If the user has no teacher, no group, no classroom or preferred faculty, then he will receive a message telling him that before he has a list of favorites he must press the heart to the right its favorite entity.

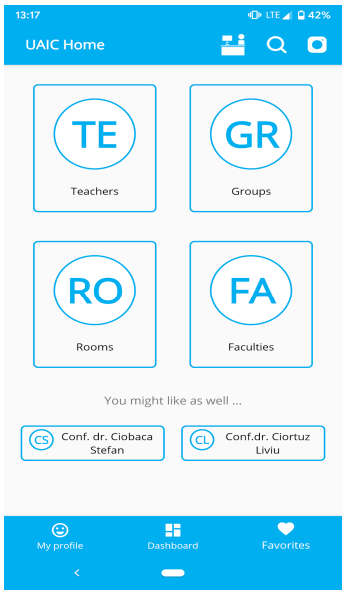

Fig. 6: The four types of entities lists in the Favorites snippet

Free Rooms Fragment

The Free Rooms Fragment is the one with which the user interacts when he wants to know which classrooms are available near him at that time. The fragment uses data from the device's GPS sensor to calculate the perimeter of the faculty of the user. If he/she is in a university faculty, he/she will be shown all of the available classrooms at that time.

Otherwise, he will see a message telling him that he is not in a college faculty and that he can check the manual rooms if he so desires.

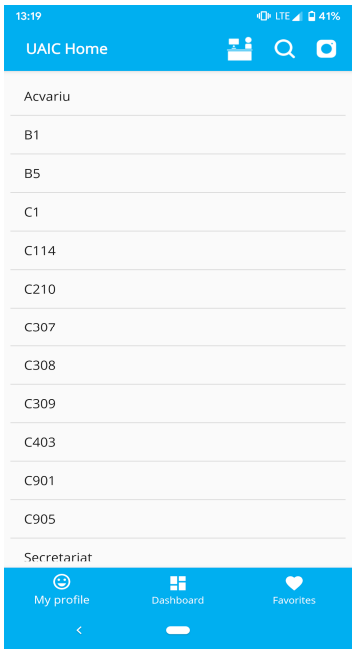

Fig. 7: Fragment Free Rooms

Search Fragment

The Search Fragment is where the user reaches if he wants to look for anything in the app. This will bring from the memory a list of all the news, teachers, rooms, groups, and classes containing a particular string that the user wants.

After clicking on one of the entities in the list displayed, the user will be redirected to the Instance Fragment of that entity to see more details about it.

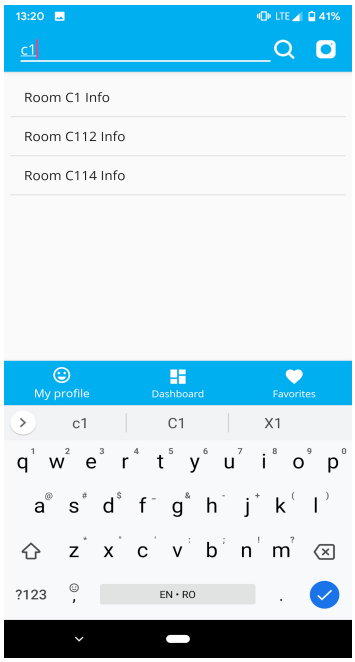

Fig. 8: Fragment Search

Instance Fragment

The Instance snippet is by far the most important and most used menu and fragment in the entire application. It provides custom data about each entity supported by the application. At the top we find a personalized background image, chosen for each of the entities, and a profile photo of that entity that if not found in the database will be replaced with the University coat of arms. In the middle we have the functional part, the one that tells us the name of the entity and the faculty to which it belongs, on the left having a button that will redirect us to the Help Fragment and on the right two other buttons, one for the search function that will open Search Fragment and the other to be able to appreciate that entity and add it to our list of favorites. In the bottom it contains the data itself, divided into different categories according to the type of entity they belong to.

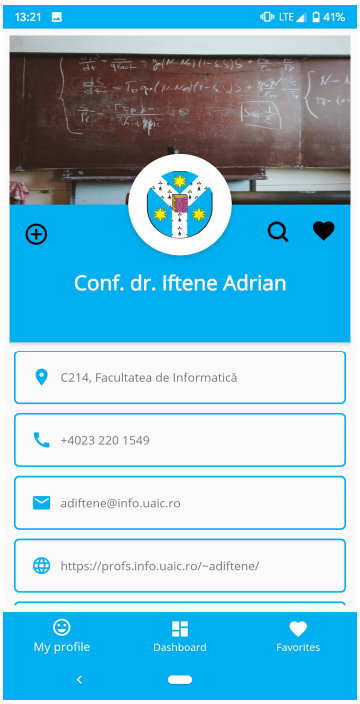

Fig. 9: Instance Fragment

The data that may appear in a Fragment Instance are:

- *Location* - The location will be visually expressed as a readable address and when the user clicks on it, it will be redirected to Google Maps where it can navigate to that entity with great precision;
- *Phone number* - when the user clicks on it, it will be redirected to the device's phone application to call that number;
- *Email address* - when the user clicks on it, it will be redirected to the default email application and the email address it pressed will automatically be populated into the "to" field of the email client;
- *Webpage* - When the user clicks on it, it will be redirected to the default browser to visit the website;
- *Schedule* - the user will display the timetable of the entity he/she has expressed in days with the hours at which the course or laboratory is held, the teacher teaching the course and all the auxiliary timetable information.

For Faculty entities, there are three more types of data that may appear:

- *Teachers* - a list of teachers that that faculty has if the user clicks on any item in the list will be redirected to that teacher;
- *Groups* - a list of groups that that faculty has, if the user clicks on any item in the list will be redirected to that group;
- *Rooms* - a list of classrooms that that faculty has, if the user clicking on any item in the list will be redirected to that room. In addition to all this data, UAIC Home also adds a very important and useful functionality to the Instance fragment. It's called Live Schedule, and depending on the timetable and the data the app has about a teacher, group, room or subject, it can tell at any time what the teacher teaches, what is taught in that room, or what class that group has.

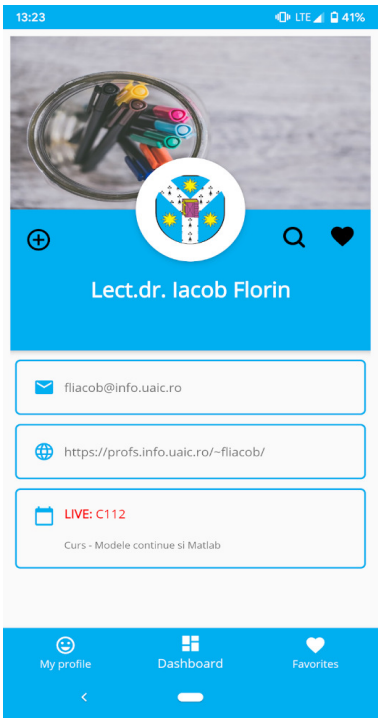

Fig. 10: Live Schedule Feature

Help Fragment

Sometimes, however, there are entities about which the app does not know too much and would need help. In this sense, we also implemented a Help Fragment whose button is located at the top, left. If the user thinks that he has information about a certain entity and wants to help the application, he can come in to give a helping hand by filling in the missing data about that entity. Of course, to make sure that the data is correct and that the user is not malicious, they will be moderated manually by the application administrator of each faculty that the entity belongs to. If a user introduces

vulgarities or constantly erroneous data, he/she will withdraw his/her entitlements through a reputation system implemented internally.

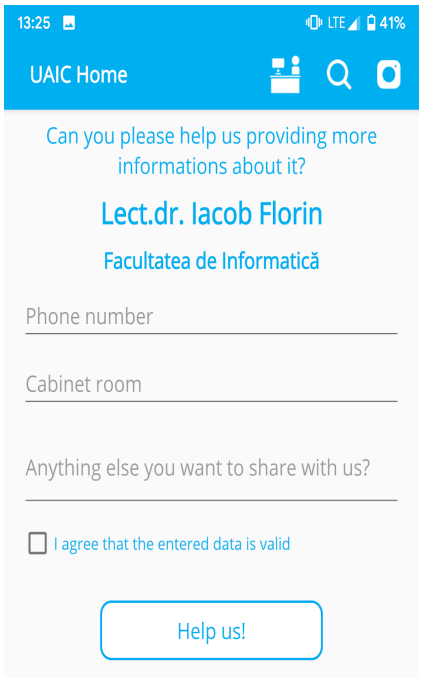

Fig. 11: Help Fragment

USABILITY TESTING

In order to truly analyze the performance, appearance and scaling of elements on any screen size and on different devices, we made a series of questions for which we made a Google Form. Within 4 weeks, once a week we have made a new build of the app we gave the 10 people who offered to help me with the test. At the end of the week, each of them answered the questions in the questionnaire we created (see Figure 12).

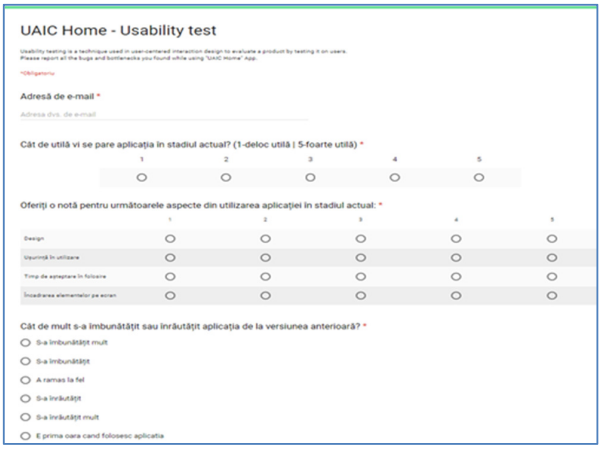

Fig. 12: Usability test for "UAIC Home"

Based on their responses over the course of the 4 weeks, we drew 3 suggestive charts to show the progress made using usability tests.

The first thing we was interested in was the experience of using, screen elements, design, ease of use and waiting times (see Figure 13).

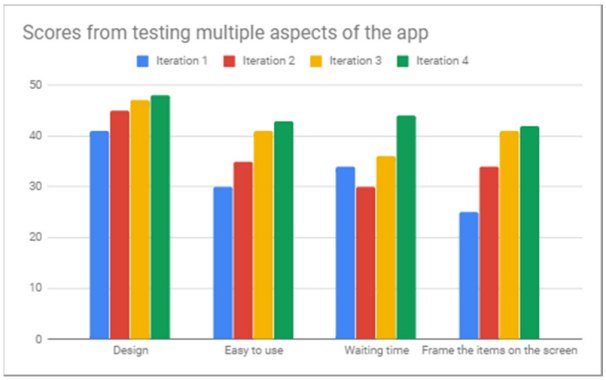

Fig. 13: The graph obtained by testing multiple aspects of the application

It can be seen that in almost all cases this test had better results from one iteration to the next (see Figures 14 and 15).

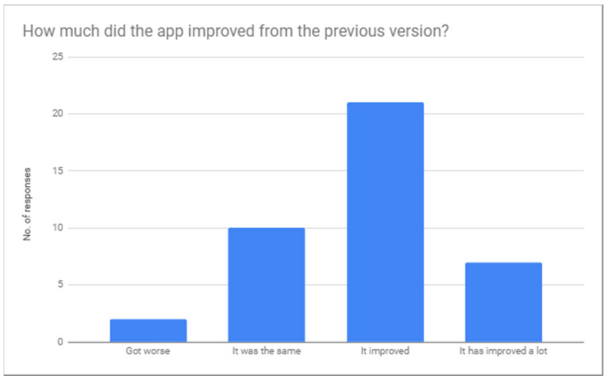

Fig. 14: The graph obtained by testing the progress of the application

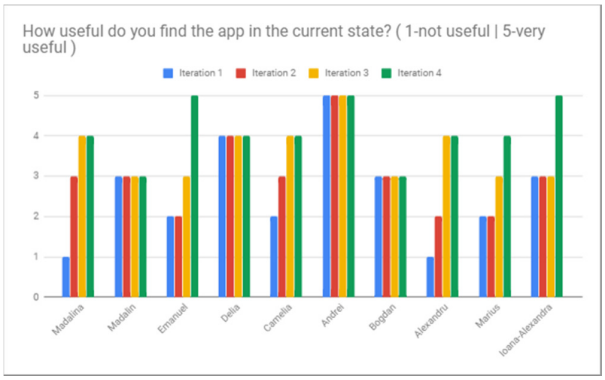

Fig. 15: The graph obtained by testing the utility of the application

CONCLUSION

In the future, we could integrate elements from e-Sims application into "UAIC Home" application, an email client for linking with faculty email, we could improve the timetable for all faculties, eliminate delays in news and updates from college administrative office and break the wall between students and teachers overall.

The application can be adapted for any University and for each Faculty after initialization of information about timetables, rooms' location, websites, etc.

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