LEARNING THE GREENHOUSE TEMPERATURE AND WIND RATES VIA MOBILE PHONES

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ABSTRACT

Developments in the information technologies made the farmers' work easier as it did to the sector employees. Frost in the cold weather, closing the ventilation in the windy weather and tracking these works in the team are among the difficulties that the farmers who grow crops in the greenhouses face. In this work, the analyzing, designing and coding stages of the mobile app that meets the farmers' needs and supports android, ios and Windows phone operating systems are explained in details.
Keywords: firebase, greenhouse, mobile app, temperature and wind rate notification

1. INTRODUCTION

Smart phones and internet became easily reachable for every sector and user from every walk of life with the rapid development of technology in recent years.[1,2,3] Smart devices can be defined as the devices that are non-spatial, and have the features of improved processor power and internet connection[4]. When the number of the apps on the markets and the operating systems of the most preferred smart phones by the users are analyzed, iOs and Android stand out. [5]. App developers have difficulties while developing apps for different smart phones because of the various devices and operating systems on the market as the obligation of using different application development platforms and different programming languages for the mobile devices that have different operating systems is the prominent one. This is why only iOs or Android version has been developed for some apps. As an app which will enable the greenhouse employees to learn temperature and wind data in the greenhouses through their mobile devices can be very useful, the purpose of this work is developing this app in a way that it will be supported by all mobile devices. When the rates of temperature or wind in the greenhouse reach to a critical level, the authorities will be warned by a notification. With the developed mobile app, data such as status, which user took the required precautions and when, are stored with the base of firebase.com. Greenhouse employees can reach the temperature, wind data through their mobile phones by logging in to their social media accounts or using their own system user names and passwords. With tracking the emergency status of the greenhouse, overlapping can be avoided, and job sharing can be easily practiced. Mentioned mobile app is told in details with its development process.

2. ANALYZING STAGE

This is the process in which the real needs of the users are determined. With the exploration techniques, not only the needs but also new opportunities and different solutions can emerge [6]. Farmers, in user meetings and surveys, expressed that they feel apprehension when there is a temperature drop and danger of frost emerges in cold weather or wind rate goes above critical point, and want to be notified. As a result of the meetings, considering the age and the farmers' suitability of using technology, the interface of the app will be designed in a user friendly way that will enable the users to reach the content with maximum three taps [7].

3. MOBILE APP INTERFACE DESIGNING STAGE

Before starting the app's coding, interface designing process must be considered. Since it is not possible for the users to evaluate the written codes, they evaluate the app in view of the interface [8]. Therefore, stages of preparing the interface are extremely important.

7.1. Sketching

This step stands for the design that is easy to make, and produces many ideas appropriate for the works made in the analyzing stage without any costs and consuming too much time as well as reflects the requests of the users.

7.2. Wireframing

In this step, handmade sketches are computerized. With Balsamiq Mockups software, the outline of our app allows us to use hand writing effects and enables us to have practical works very close to sense of reality [10].

3.3 Presentation and Critique

Practically prepared drafts and digital drawings are discussed and evaluated with the farmers one by one to see if they meet the needs. Presentation is a very important phase in the sense that the best design is determined in this stage. Presentation is made, discussed and evaluated for the best result [11]. In case of the draft does not meet the needs of the farmers, it is revised until reaching the point that an acceptable interface is designed.

3.4 Mockup

After the draft of the interface is practically prepared, the final structure of the interface is designed visually in this phase. Adobe Photoshop software was preferred in the mockup stage of our app. Although the app took its final form, it is still not functional.
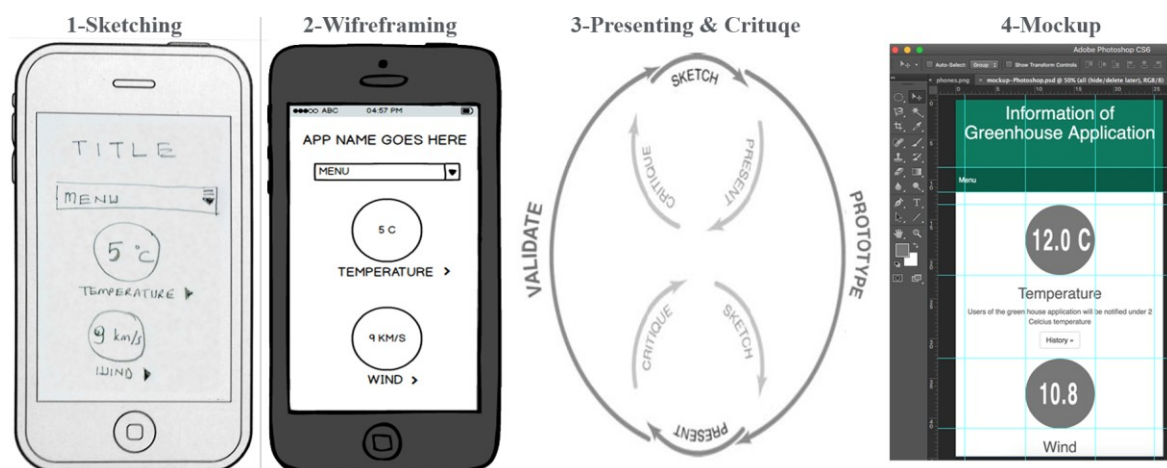

Figure 1. Stages of Interface Designing

4. MOBILE APP CODING STAGE

In order to develop an app for mobile devices that have different operating systems, different development platforms and programming languages are needed. This need causes a big problem for

preparing and updating the app. There are multi-platform app developing tools to solve this problem such as ionic, xamarin, phonegap. Designed interface is converted into an app by using HTML5, CSS3, bootstrap framework, firebase and phonegap.

4.1 Backend Processes with Firebase

Firebase.com is preferred for the app's needs of database and backend server. All data writing and reading processes with firebase for small-scaled apps can be made for free. Greenhouse users can connect to the system with social network accounts such as Facebook, Google as well signing up to it. Temperature and wind data gotten from the censors are entered to the database at regular intervals. When the temperature or the wind reaches at a critical level, the users are notified with a push notification. So, while the available user solves the problem, other users can get the information about the case.

4.2 HTML5 Markup and CSS3 Visualization Processes

The final design which is given in Photoshop is tagged by using the new tags (header, section, etc.) of HTML5. With HTML5, many advanced features such as local storage, camera, accelerometer, navigation, notification can be easily used, and the content that was tagged with HTML5 is given visuality by using CSS3 and bootstrap framework.

Figure 2. Structure of HTML5, CSS3 and Firebase

4.3 App Converting Processes with Phonegap

After the completion of tagging with HTML, visualization with CSS3, database processes with firebase, files of android (.apk), iPhone (.ipa) and Windows phone (.xap) are generated by using phonegap.
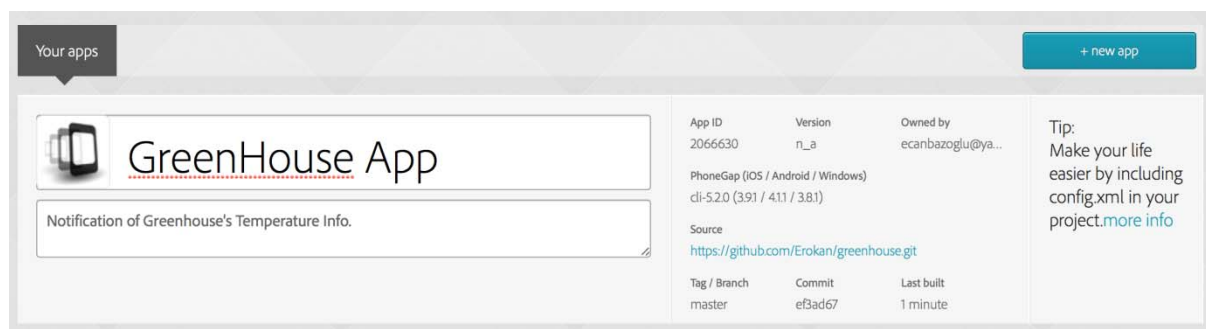

Figure 3. "build.phonegap.com" screen

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5. CONCLUSION

It is shown in this work that, with the integrated work of today's technology, software and services, a mobile app which comprises different platforms can easily be developed. With this mobile app, users are notified when the greenhouse has the desired temperature and wind rates or at regular intervals. The possibility of managing the design and coding through one source and updating them as well as making the app usable for multiple mobile platforms is stated. In further stages, remote ventilation and heating operations can be made by improving the greenhouse base.
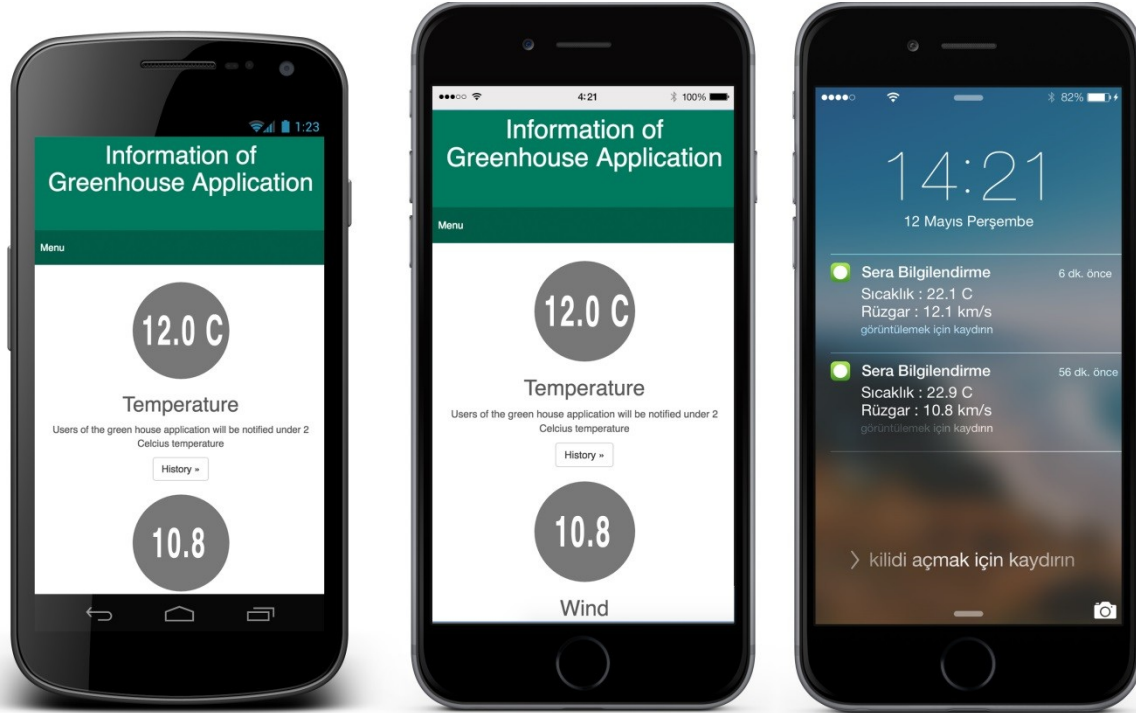

Figure 4. Stages of Developing App Interface and Notification Screens

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