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# Smart Grounds

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**Abstract:** Institutions like colleges and universities having grounds, indoor and outdoor stadiums, gyms. Maintaining and providing a good environment is a major task for institutions. To make them easy we use IoT and mobile applications. In this project, we use IoT to control the electrical devices in the grounds, stadium, and gyms. We control all the equipment with mobile applications. Like controlling the lights and ACs in the gym and indoor stadiums then accessing fed lights and water sprinklers in the grounds and automatic door systems.

Maintaining the records of the individual who is accessing the gyms and stadium. The user will get the stats of the equipment which is assessed by them like, If the person is using the treadmill they will get the details stats of total time spent, total distance covered and speed, etc within the application. For providing these details we use check-in and check-out in the equipment. We update the events that going to be conducted on the campus and the detailed status of the event that's completed. User can pre-book grounds to conduct events.

**Keywords:** Mobile Application, Flutter, IoT, Google Firebase, Google Authentication, Google Firestore.

## I. INTRODUCTION

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Embedded with electronics Internet connectivity, and other forms of hardware (such as sensors), these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled. The goal of this interconnection is to make all these devices to communicate with each other and therefore, be more intelligent and independent. One of the characteristics of IoT devices is that they are able to produce large amounts of data. This data can be particularly used in applications such as Artificial Intelligence and Machine Learning. So with help of IoT, we made them easily accessible. Smart grounds not only incorporate IoT and also having features like events handling, record management, and user management. So we developed the applications which contain all the above-mentioned features.

General objectives are:

- 1) Accessing devices with IoT
- 2) Gets Events details in the University
- 3) Pre-Booking of Grounds
- 4) Provide the Gym workout details

It will calculate the total time of workouts and calculate the total calories burnt on that day. And provide the user to get the records of sports items in university.

## II. EXISTING AND PROPOSED SYSTEM

### A. Existing System

There a lot of cross-platform application software are available like Ionic, React Native, and Xamarin. In this Ionic and React Native uses JavaScript to code and, Xamarin uses DotNetFramework. In these systems, there are only fewer prebuild frameworks. Here the codes are compiled to native codes and it will take a longer time to build the Gradle file for the project. If we add any changes to the applications need to restart the application. Every time we restart the application the Gradle file will be created for each time. So, it increases the productivity time of the application. We are developing the Smart Grounds application with Flutter Framework. The existing systems are Smart Homes, Smart Cities, Smart Stadiums. All these applications are used IoT to connect all the electrical devices and access them. These Smart Stadiums applications not only use IoT and sales merchandise, match videos but. We taking Smart Stadium as a model and adding some new features to that.

### B. Proposed System

With the help of the Smart Grounds application, collect the student gym activities by scanning the Id card technique and also can update the upcoming events going to conduct by University by the help of staffs. The most important thing is only staffs can be able to update the data and able to see the student data. This is done by confirming whether the mail ID is staffs or not. The most important thing is that the students are must to login in college mail id. If they don't have college mail ID, then they can't able to use the app.

The collected details will be stored in the database for later use. In this project, we include some user interaction/communication modules for good user experiences.

## III. IMPLEMENTATION

### A. Design Work

Designing the software is a vital thing in development. The design of the software will decide the flow of execution. In our application, the user needs to register first with their respective college mail id and password. Then the user will get a verification mail to verify their mail. Then the user gets into the application home screen based on the user's type tabs will be displayed. The type will be taken from the user's mail id during the registration process. The "Student" type user can only view the events and their gym data. And "Staff" type user can get records and get control to access the IoT devices.

### B. Login and Registration Page

The user first needs to sign up and create an account using a university mail id and with their password, then verification mail will be sent to the given mail id, After clicking the verification link on the mail, then the user will be redirected to the application home page.

During the registration process, the users will be separated into three categories "Student", "Staff" and 'Others'. The type will be assigned based on the users' mail id. The user should use only a university mail id. With another mail id, a user can't register to the application. Fig 1, Fig 2

### C. Home Page

After Logging in, the home page will be categorized based on the type of the User, the UI and the tab access will be arranged accordingly. For the Faculty user, there will be consisting of four tabs namely **Controls**, **Records**, **Data**, and **Events**. The faculty can add/delete events and students record anytime, anywhere. For the student user, they can access only two tabs namely **Data** and **Events**. They can't manipulate any data in the application.

### D. Controls Page

On this page, the faculty user can access all the IoT devices fitted in the university. This page will have a list of the expansion panel of different locations in the university. The user can click on the expansion button to view the IoT devices in that location. If the user finds the desired device from the list, then the user can toggle the switch to "ON" or "OFF" the device. Once the user toggles the switch the corresponding value will be updated to the google firebase real-time database. Then the IoT devices connected with the database will receive the value, and perform the respective action. For, IoT we used "Arduino Uno Rev 3 and Esp8266 Wifi Module". Arduino board will contain the code for execution. Esp8266 wifi module will connect to the wifi and connect to the google firebase real-time database. To get the value and passes the value to Arduino and operate. Fig 6.

### E. Records Page

On this page, the faculty user can add records of the gym and sports items. There will be a list of expansion list contains a gym and available sports. The gym expansion list has equipment name, condition, and installed date. The sports expansion list has the name of the sports item and the number of items available. Fig 3, Fig 4.

### F. Data Page

On this page, the user will get their gym data. This page will contain the user's gym records like the date of accessing the gym, In-time, and Out-time. With the help of gym time differences, we get the total time of workout and calculate the total calories burnt on that day. Fig 5.

### G. Events Page

On this page, the user will get the events that are currently going, completed events and their scores, and events that are to be conducted at which place and time. The faculty user can add the events and update the scores of the events after the events get completed. Fig 7, Fig 8.

### H. Pre – Booking

Other institutions can use the university ground. For that, they can pre-book the court or ground. This feature is only for the users not belong to the institutions. So, while registering the user need to check the 'If you are not belong to the SCSVMV University' check box then only they register to the application with email ids. Otherwise they cannot able to register with their email ids. Once the registration is successful it will take to the booking screen Fig 9. There they can book the available ground slots. The Next time user will directly login to application with their respective credentials.

### I. Logout Option

After viewing all the tabs, if the user wishes to log out, then he/she can proceed to log out by clicking the logout button in the app bar. After pressing the button alert dialog will appear if they want to log out, press the "Yes" button otherwise, press the "No" button.

### J. Closing the Application

If the user needs to close the application without log out, then he/she can do it by simply clicking the back on their device. After press the back button the alert dialog will appear if they need to close, then proceed with "Yes" otherwise simply press "No" and continue their work. Fig 10.

## IV. RESULT

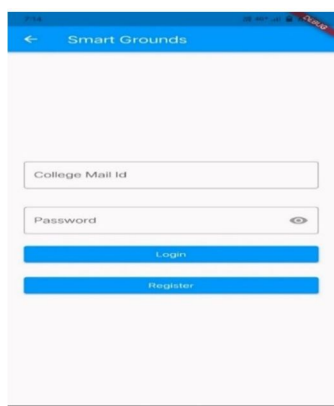


Fig 1. Login Page

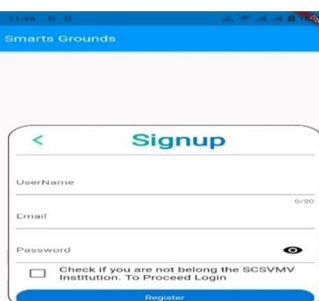


Fig 2. Register Screen

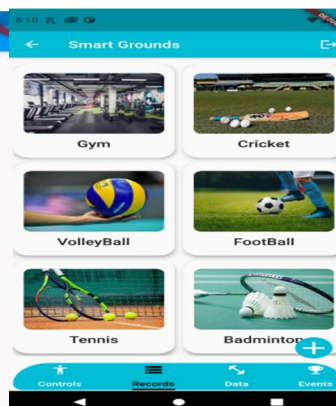


Fig 3. Record Screen



Fig 4. Record Detail Screen

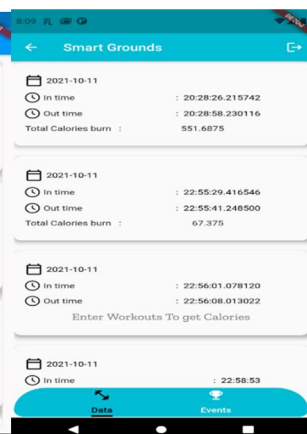


Fig 5. Data Screen

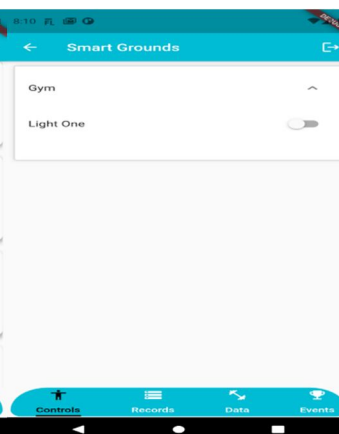


Fig 6. Control Screen

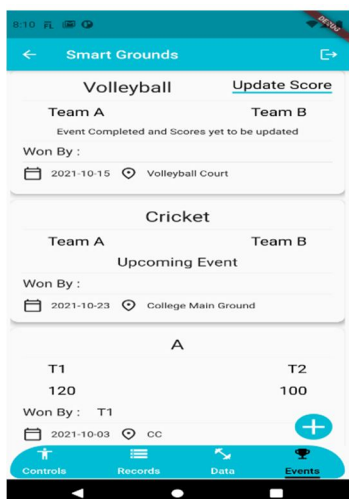


Fig 7. Events Screen

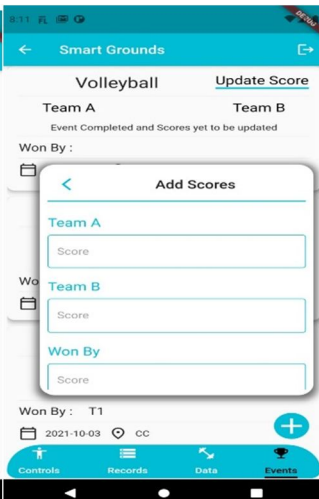


Fig 8. Update Screen

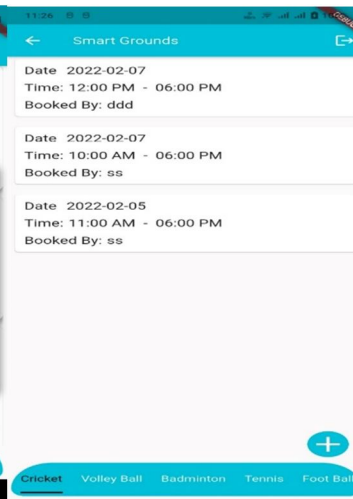


Fig 9. Booking Screen

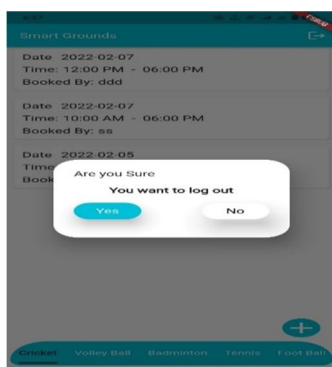


Fig 10. Logout Pop-up

## V. CONCLUSION

The application development process is complex. We need to develop an application for different OS in different environments. It includes a lot of development time, manpower, and cost. So, to avoid this, cross-platform application development software is used. Here we did a project in Flutter. It is cross-platform development software. With that, we developed the Smart Ground application. A countable number of applications are already available in different institution. But those apps are not able to offer the accessing of the IOT devices. The application that we developed using Flutter software offers accessing of scheduling events, accessing IOT devices which are placed in the Grounds and provide a better user experience. Our future aim to make our application for the complete university to run them through IOT devices to make our university as Smart University.

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