E-College: An Aid For E-Learning

Vanita Jain, Monu Gupta, Neeraj Joshi, Anubhav Mishra*, Vishakha Bansal

Bharati Vidyapeeth's College of Engineering, INDIA
Emails: vanita.jain@bharatividyapeeth.edu; gmonu1999@gmail.com; neerajjoshi2308@gmail.com; anubhavmishram@gmail.com; bansalvishakha519@gmail.com

*Correspondence: anubhavmishram@gmail.com

Abstract

The use of Android apps has significantly increased over the past few years, making Android the most accepted and trusted operating system for smart devices. According to a survey, in 2020, over 30.5 billion Android mobile apps were downloaded compared to merely 6 billion in 2016, which is quite noteworthy. People worldwide are also becoming habitual to the use of android apps such that they want everything to be available on their mobile devices. The authors have developed 'E-College' - an android-based mobile learning application that helps users grasp various programming languages like C++, Java, and Python and help them with their undergraduate computer engineering course curriculum-related resources. The proposed application allows the learner to access a particular programming language's tutorials and explains it with an example and the required code snippet. UsingIn this application, users can also assess themselves by utilizing the provided quiz section, which has various questions. The proposed mobile application also has a recommendation system section that uses machine learning techniques to intelligently serve the most relevant and suitable content for each user. It considers the user's previous learnings on the application and suggests new and relevant learning content for that particular user. During the ongoing global pandemic situation, E-college application is the most effective way to learn and acquire technical skills without stepping out of their home and free of cost.

Keywords: E-learning, E-college; Smart Education; Android Applications

1. Introduction

In today's world, smart devices and phones have become so popular and easily accessible that they have acquired a huge economic market share along with quite a large number of users all across the world, each using it differently with varying features [1]. With the growth and usage of mobile phones, Android has become one of the most trusted and popular smart device operating systems. It is expected to increase continually and significantly in the forthcoming years also. Day by day, new advancements are being made to make Android more reliable and user-friendly. With the increase in smartphones, mobile applications have been developed in almost all sectors such as healthcare, educational institutions, banks, social media, music, marketing, grocery, etc. [2]-[3]. Nowadays, e-learning methods are taking over traditional classroom learning, and the ongoing global pandemic justifies it. As the whole world is going online, professionals are working from home, doctors are consulting online, and students are

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studying from home; E-learning platforms are the need of the hour, which is the primary motivation behind the development of this application.

E-learning provides a flexible way of studying without depending on and relying on someone. The most crucial advantage of e-learning is that it is self-paced [4]. Anyone who studies online can plan their schedule without making personal sacrifices to meet the class attendance requirements of teachers and traditional universities. It also considers the differences of individual learners, and it allows the users to apply their learning styles. Many studies and surveys have concluded that learners learn more effectively through computers than through traditional classroom methods[5].

To facilitate e-learning, we have developed 'E-College.' This android-based mobile learning application helps the users grasp various programming languages like C++, Java, and Python and help them with their undergraduate computer engineering course curriculum-related resources. The proposed application allows the learner to access a particular programming language's tutorials and explains it with an example and the required code snippet. UsingIn this application, users can also assess themselves by utilizing the provided quiz section, which has various questions. The proposed mobile application also has a recommendation system section that uses machine learning techniques to intelligently serve the most relevant and suitable content for each user. It considers the user's previous learnings on the application and suggests new and relevant learning content for that particular user. The application also accommodates various learning resources for undergraduate computer engineering students, like subject notes, lab files, e-books, and question banks, to help them with their academic subjects. In short, this application is a complete study package for undergraduate engineering students or any curious learner serving them with the best quality academic resources and helping them develop their technical skills. Especially during these times of global crisis where the students can't attend their colleges or universities, this application will serve the exact purpose of e-learning and prove to be of great value.

This paper is organized as follows; section II comprises the literature survey, and sections III and IV explain the methodology and proposed work- the technologies used in this study. Section V discusses the result obtained, and finally, section VI concludes.

2. Literature Survey

India has the most extensive education system, and there has been a large increase in Educational institutions having around 4000 engineering colleges over the past two decades. Education in India mainly focuses on traditional approaches that consist of a one-way delivery system by the teachers to the students in the suitably possible way. Students need to visit the classes in person, and interaction is established between students and teachers face to face [6]. In comparison, M-learning is considered the new form of e-learning using mobile technologies to allow students to manage their education process anywhere and anytime at their ease [7]-[8]. Traditional e-learning systems provide services that are related to learning materials and information services.

Mobile learning provides resources that can be obtained anywhere, has interaction, and provides adequate support for effective learning and assessment. It has the characteristic of not being conditioned on time and place. The importance of mobile learning can be used by the android operating system [9]-[10], which is chosen in this paper. Android has been controlling the Smartphone business and is an open-source operating system. M-learning [11]-[13] has the potential to support education as a suitable venue for the integration of m-learning because the availability of mobile devices has become very popular among college students. Different M-learning efforts have been practiced in education like college students can obtain academic evaluation and feedback from their professors via a mobile device [14]. A course can be given by an Internet link to provide resources. Departmental responsibilities, such as monitoring attendance and learning course, can also be executed using mobile devices. To facilitate users' access M-Learning, the mobile framework is applied to provide attractive features and mobile equipment responsiveness. The use of m-learning is growing fast in education due to the growth in technologies. E-education is a new concept that provides benefits like online methods work all time, assuring connectivity anywhere and anytime. Students can learn at their suitable time; they require a device and internet connectivity to learn [15]-[16].

In the study [17], the authors have suggested a proposal for maintaining the college's scholarly activities with a mobile application that includes portability as a mobile phone. They have deployed an effective system for college

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management wherein both teacher and student use a central repository for storing purposes. There is an administrator who has the right to validate the records of teachers or students. A unique identification code is generated using the automated registration system. With this code, a teacher can log in to their account. Teachers can access all the information of any college student in the chat room for any query or doubt clearing. Every data shared by the teacher is presented on a central server that is open to the respective students and teachers only.

In contrast, the paper [18] discusses the process of student management information in education by adopting information technology and building the student management information platform. The proposed system allows reliability, time savings, and easy control that the student can access, and their parents can view assessment reports, attendance, and course curriculum details anywhere and anytime. The application is designed with a responsive and attractive user interface and is implemented in such a way as to provide high security and reduce the workload and resources required in the conventional process. The system has good compatibility, easy to use, and is suitable for applications on the Android platform. The authors have deployed a Chatbot application [19], which aims to communicate between humans and computers. The computer has been installed to recognize the query and produce a judgment itself as a response to solving the query. The application develops an expert system for college-related work using an android-based platform through Artificial Intelligence technology and Natural Transmitting Language. Their application tries to bridge the gap among the students, teachers, and college officials. Therefore, in the present scenario, such as university, the information in the form of notices and verbal communication can be immediately notified through android devices and can be obtained available for the students and teachers soon for their mobile devices.

3. Methodology

This application provides a complete guide for learning different programming languages and an undergraduate computer engineering course curriculum. The application is accessible by all the proposed users as the application does not have a form of security.

This application is mainly divided into four sections:

3.1. Programming Practice and Tutorials

In this programming practice and tutorials tab, the user would access the theoretical concepts and practical questions about the different programming languages such as C, C++, Java, Python, JavaScript, etc. It starts from an introduction to a particular programming language to covering even specific advanced topics. Users can learn as many languages as they want and can practice question-related to them. There is a practice section in which the user can see the source codes for various programming questions. This Tutorial and Practice section is connected with the database and updates itself at regular time intervals.

3.2. Quiz Assessment

This Quiz Assessment section of the app assesses a user's learning for the topics he has studied. According to the user's profile and learning ability, this quiz assessment section provides daily quizzes and assessments. The quiz assessment section comprises many multiple-choice questions that need to be answered within a stipulated time. The score is increased by one for each correct answer, and the same gets updated in the rating bar. Also, there is a hint section to help the user, which the user could use as and when required.

3.3. Recommendation System

The Recommendations [20]-[21] system section uses machine learning to serve every user's most relevant content intelligently. It takes into account the previous learnings of the user on the app to suggest new and relevant content the user might like to interact with in the future. Our application uses a model trained on the aggregate user's learning.

3.4. Scan and Search

The scan and Search feature of our app help users to scan their query from their mobile phone's camera and search for the answer to that particular question. We are using Optical Character Recognition (OCR) [22]-[24] to recognize text in scanned documents and images. Users can scan a paper document or photograph with the help of a mobile

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phone, then upload this scanned electronic document on the application, and using the OCR technique, the application finds the appropriate answer to that question.

4. Working on the Application

To access the content of this app, users need to register themselves to this app. Once the user registers, the app sends a verification email to the user to confirm the email-id. The user needs to confirm by clicking the link given in the email, and for this authentication process, the application uses a firebase authentication system. Once the verification is done, the user can log in to the app. Users need to fill in the proper credentials to log in successfully. The overall architecture of the application is shown in Fig. 1.

The application starts with a splash screen; the splash screen remains on the screen for a few seconds to interact with the user and show what kind of app this is. After the splash screen disappears, the sliders come into play; these sliders have multiple pages with more information about the app. Also, the user can skip these sliders and directly go to the login/signup page. On the login/signup page, the user can directly log in with a Google account or manually register themselves with their email-id and then log in to the main activity page. On this login/signup page, there is forgot password feature; in case the user forgets the password, the user can reset the password using the registered email-id. Once the user successfully logs into the app, the user has complete access to the app's content.

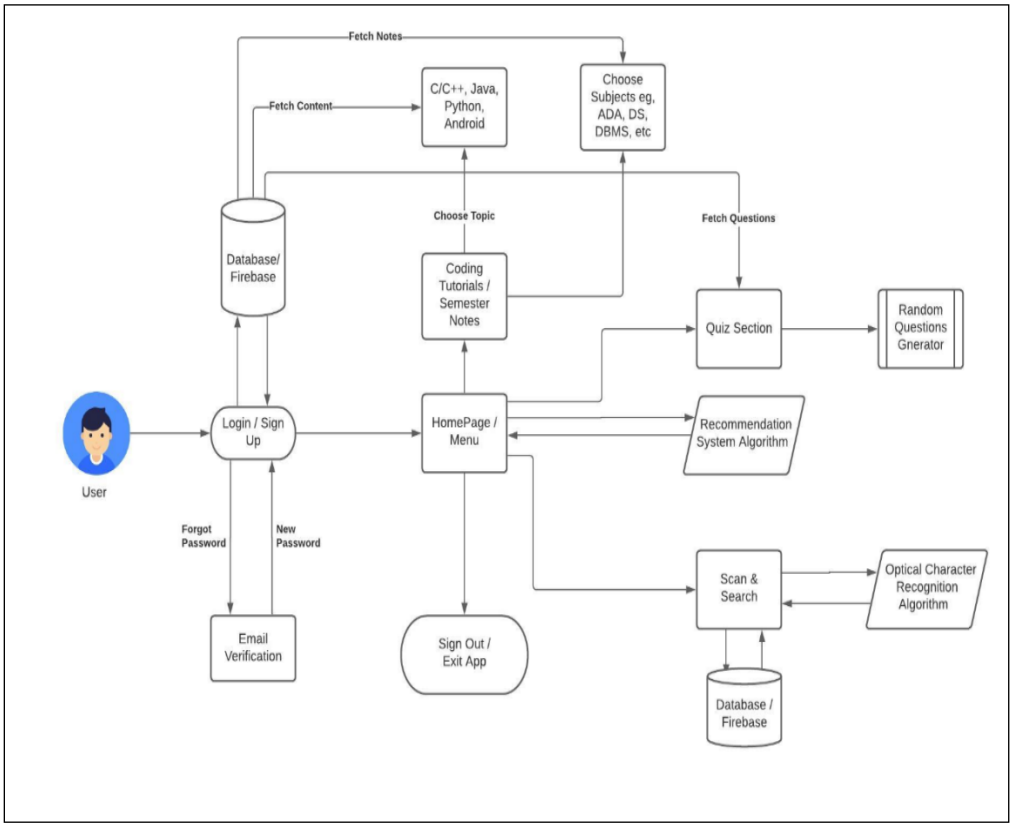

Figure 1: The architecture of the Android Application

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The first activity page has all the four sections that have already been mentioned above. All of these sections are connected with the database/firebase. The first section has tutorials and a practical coding arena; the user can click on the button and access the tutorials and the practical coding questions along with their solutions. The second section has a quiz system, which is connected to a random question generator system. Every time the user uses this quiz section, they will be displayed with new questions randomly fetched. The third section is a recommendation system section in which this app asks some questions to the user, and according to the user's answers, this recommendation system suggests to the user what kind of tutorials, coding language, books, etc. they could have an interest in and can use for their better learning. The fourth and final section of this app is Scan and Search feature, and it is a feature by which the user can scan the questions through a mobile phone's camera or directly fetch the document from the file manager and upload it to this app. An OCR system extracts that text/data from the uploaded image; this section then finds the data similar to this text from the database and displays similar results. The user can select the result he feels to be the closest one to his question.

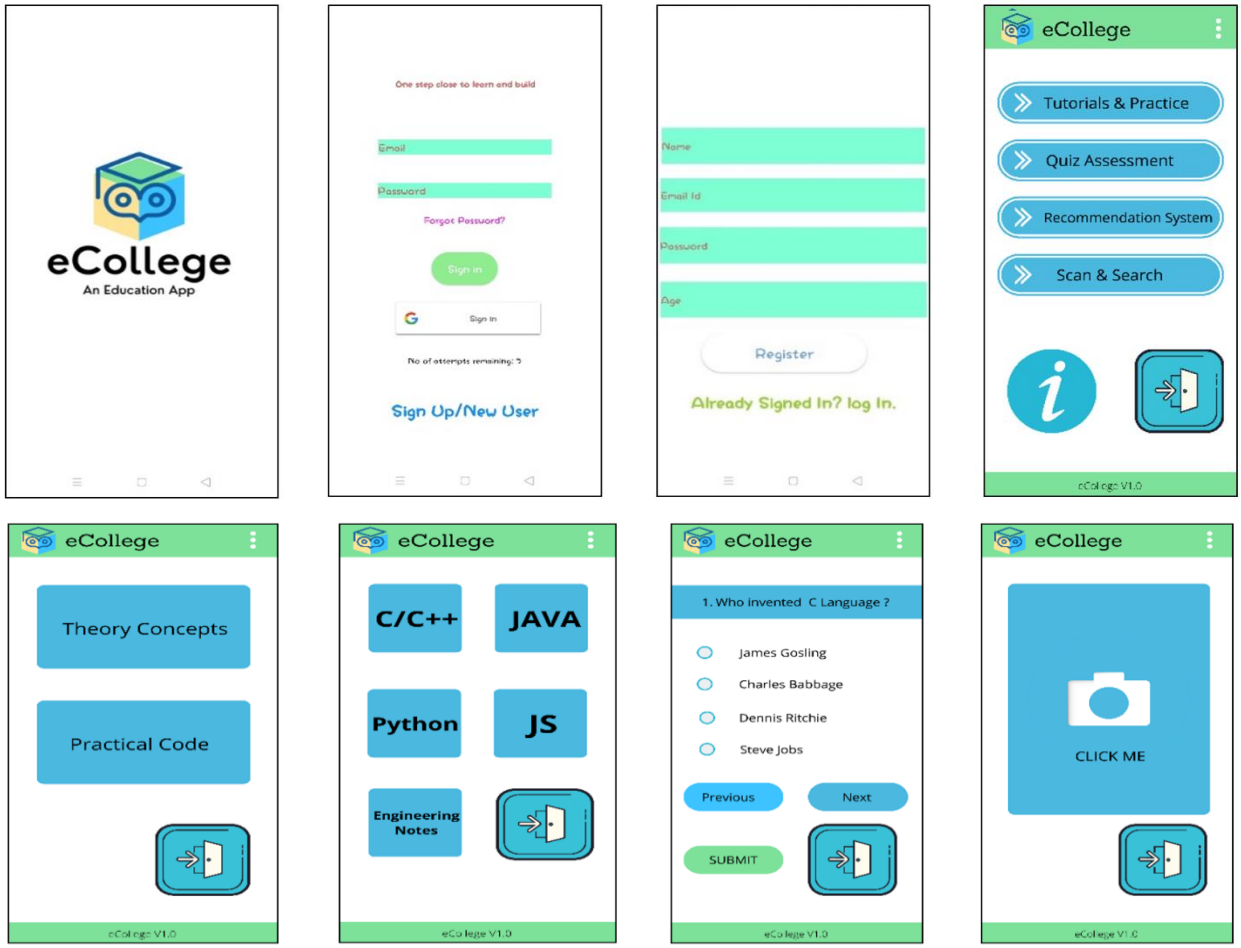

Figure 2: Various Activities in Application

5. Results

Developing an e-learning application is not that easy; it takes time to get the integrated resources to update those resources on the server. In this paper, we have presented the features and functionalities of our app, which have been

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tested to a great extent and have been found to work correctly. The transactions of data between the clientside application and the server-side database take place smoothly. The backward compatibility of our app even goes to the old android version 5.0 from the latest android version 11.

We can cover almost 100% of the android devices currently in use today. The application is performed and executed under the Android version 10 environment in a MediatekHelioP70Octa core processor with 4 GB primary memory. The application fulfills all requirements, also providing a scalable system for college students and professors. It provides relevant features like a login system, dynamic data, college material section, students quiz assessment report, etc. Some of the simulation results have been shown in Fig.2.

6. Conclusion

People worldwide are becoming so habitual with the use of android apps that they want everything to be available on their mobile devices. Therefore, 'E-learning' supports the extensive use of the educational practice and is also very effective compared to the traditional techniques of education. The proposed 'E-College' application is an Android application that aims to provide good quality notes for undergraduate computer engineering students and computer programming tutorials even for engineering students and for general users. The application provides the users with the subject notes, question bank, e-books, and lab file-based. It helps the learners grasp the fundamentals and advanced concepts of various programming languages like C++, JAVA, and Python. Furthermore, with a few more modifications, the application can expand to include tutorials of various development frameworks and other technologies.

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