Unit 10 "Multimedia and E-learning techniques and materials"

Project architecture and data model for AR application development

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Abstract

Augmented reality is an intuitive approach to displaying models. Instead of controlling the position and rotation of virtual cameras with primitive controls, users can look at the model by inspecting them through the cameras of their devices. Since this project represents an SDK, the project structure appears as a set of files and instructions on how to use them. In order to implement the architecture that is easy to use and maintain, separation of concerns principle should be used during architecture planning. This will enable users of this library to use only the functionality they need, which also corresponds to Single-responsibility principle.

Introduction

The correct approach to this problem would be splitting the implied workflow into indivisible phases, select phases that are supported by the BluePrint SDK, and create corresponding sub-folders for each phase. The implied workflow is displayed in Figure 1:

Fig. 1. Implied worrkflow for SDK usage

Considering this workflow, the preferred project structure can be represented as a set of communicating layers. Input data for the BluePrint SDK is simply an image containing an augmented reality marker. This image might be used for model creation only, or it could also be used as an augmented reality marker. The image used as a reality marker should be easy to print and contain fewer minor details. For an augmented reality marker, all text notations, thin lines, arrows and labels are recommended to be removed. The example of the input image that would fit to create 3D, but would not represent a good augmented reality marker, is shown in Figure 2:

As you can see, the following example contains all sorts of possible information about the building: room types, staircases, windows, doors, and furniture. This image contains too many details to be tracked by computer vision in real-time. Nevertheless, this image would be good to base a 3D model on because it contains much useful information that could be used to create a more detailed model.

Each sub-folder should contain a text file with usage instructions. Library root should also contain a text file that contains SDK description, expected workflow, SDK modules and a brief description of each of these modules. Considering the implied workflow, the following project structure will be used. Each sub-folder should contain a recognizable structure: source directory, containing source code for SDK module, binaries directory, containing executable binary files, precompiled for out-of-the-box usage, and instructions text file.

The first module is called "modelling-assistance", which represents an addon for 3D modeling software. Addons can not be run by themselves, they need to be imported into the software, and thus, this module does not contain a binaries directory. It only contains a source code

directory, a module package and a text file with instructions on how to import this module into modeling software and how to package the module from the source if needed.
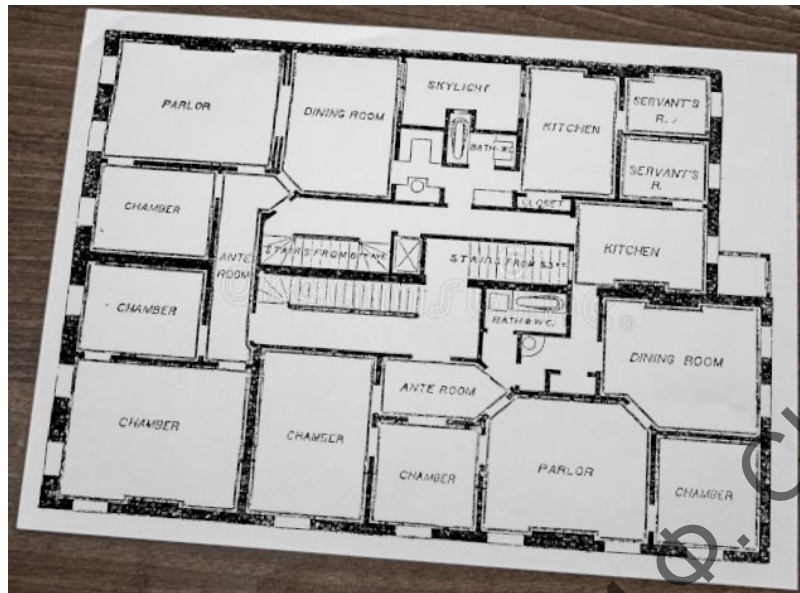

Fig. 2. Example of input image

The second module is called "application-generation" and is the most complicated module among others. Since it will be based on top of the augmented reality library that implies its own application generation workflow, this module will have the most detailed instruction file than those from other modules. These instructions will contain a specific augmented reality library usage guide, a subset of generic library usage instruction that implies the workflow of the BluePrint SDK. It will also contain a set of scripts that may automate some steps of this guide or run a health check in order to alert if additional configuration is required. The scheme of the project layers is displayed in picture 3:
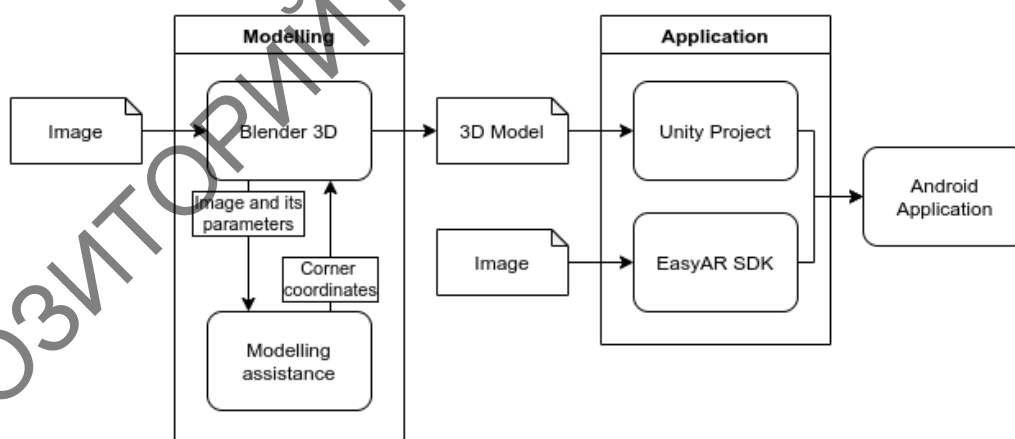

Fig. 3. Project structure represented as layers

Conclusion

In order to install the application on an Android device, the generated file needs to b packaged into an installation file. "Android Package" is the package file format used by the Android operating system, and a number of other Android-based operating systems for the distribution and installation of mobile apps, mobile games and middleware. To make an APK file, a program for Android is first compiled using Android Studio, and then all of its parts are

packaged into one container file. An APK file contains a program's code, resources, assets, certificates, and manifest file. As is the case with many file formats, APK files can have any name needed, but it may be required that the file name ends in the file extension for being recognized as such.

References

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Online lesson "Academic English I" for students

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Abstract

Since 2019, I have been providing technical support for the required third-year students' class "Academic English I" in the Department of Electrical and Electronic Engineering, Faculty of Engineering, Shizuoka University. The teaching team includes Professor Damon M. Chandler (Now Ritsumeikan University) of the Department of Electrical and Electronic Engineering and Professor Emerita Valerie A. Wilkinson of the Faculty of Informatics, Shizuoka University. It was a face-to-face lecture in 2019, but an online lecture was held in 2020 and 2021 due to the spread of the new coronavirus infection (COVID-19). I report on the results of questionnaires to students and faculty members from the preparation for the online lecture to the implementation as well as post-lecture feedback. We used Moodle system "LecShizu" to check student's attendance and so on.

Introduction

The goal of Academic English I is to create an intensive 15-week course in which students are immersed in an international-style conference setting, where they must regularly participate in mini-poster presentations on various technical topics. This department consists of two programs: the Course of Information Electronics and the Course of Energy and Electronic Control. In 2019, the class was offered on Wednesday and Friday, with EE Control group on Wednesday and E Information group on Friday. The note: students in both classes were divided into teams of three or four. In 2020, two groups were combined for the registration of one hundred and fifteen students. Our hybrid online class used Zoom software (Zoom Video Communications, Inc.) and Moodle. The class system includes the professional staff, i.e., Professors, Technical Support and Mentor (senior student). A team of volunteer citizen coaches provided the audience and feedback. "Team learning starts with 'dialogue'" (citation) and trains the capacity of members of a team to suspend assumptions and enter into genuine 'thinking together'.

Class in 2020

We started the class on May 4th and announced that as a Course overview. The following week was the assessment of English (May 10th). Students began the presentation (Theme: About online meeting software). The next theme was "About drones to solve social problems". The last theme was to chose one academic article and free robotics contents. All teams were