Topic Selection of Final Year Project for Computer Science Programme

Peng-bo BO and Xiao-miao ZHANG*
Harbin Institute of Technology, Weihai, China
*Corresponding author

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Abstract. Final Year Project (FYP) is an essential component in various programmes of college education. Topic selection for Final Year Project is one of the most important factors which have significant impacts on student training. In this paper, we discuss topic selection of Final Year Project in the discipline of computer science and computer software. We provide several typical topics in which an application software is designed and developed which make use of knowledges in image processing, computer graphics and data visualization. Software developing toolkits employed in these projects are discussed. The main points of these projects are explained in details and results are shown by pictures as well.

Introduction

For students who major in computer science, it is a common requirement for a Final Year Project that a software should be developed which is useful for specific applications. Final Year Project (FYP), as an important component in the student training system in colleges, gives students a chance to master fundamental knowledge more deeply, as well as perform more programming practice [1]. Most essential knowledge which has been passed on to students in the first three years of college education is necessary for completing a Final Year Project. Therefore, carrying on a Final Year Project is a good chance to strengthen the mastering of professional knowledge for a student. Moreover, topics covered in a typical course in college are often classical knowledge which is not up to date [2]. Therefore, a student has to learn quite a few state-of-the-art technologies in order to accomplish a novel and practical project. This is especially true for the discipline of computer science & technology where new techniques are emerging every day and are developing very fast.

The good effect of Final Year Project in the sense of student training depends on many factors, in which one of the most important ones is the topic selection. In this paper, we discuss the topic selection of Final Year Project for students who major in computer science. We focus on the discipline of computer software and provide several typical topics which make use of knowledge in image processing and graphics computing. The main points of these projects are given and the results of this software are shown as well.

Topic Selection for Final Year Project

A student who majors in Computer Science is required to develop a software system for his/her Final Year Project which usually takes a period of 6 months. Essential requirements for a Final Year Project include the followings: 1) The software should be application oriented and a careful requirement analysis should be carried on to identify main functions of the software. 2) A specific technology beyond the scope taught in classes should be employed in the project. Such technologies include algorithms in image processing, pattern recognition, computer graphics etc. A topic such as a library management system which involves only database techniques is commonly regarded as an inappropriate topic for a Final Year Project because data querying and management with a database is relatively easy. A topic which covers image processing or computer graphics techniques is more appropriate.
Nowadays with the rapid developing of technologies in artificial intelligence and virtual reality, an interesting practical project often involves in algorithms from these hot research areas. On the one hand, the implementation of an algorithm in these areas is non-trivial for a student with an average level of ability. On the other hand, there are a lot of libraries available which has already implemented some well-known and efficient algorithms which can be easily called in one’s own software. Therefore, a topic for a Final Year Project should focus on the system analysis and system design, other than the design and implementation of specific algorithms.

In the following, we will introduce several final project topics which have been carried on by students who major in computer software, at the school of computer science and technology in Harbin Institute of Technology, Weihai. For each project, we explain system design of the software and main functions of it. The libraries which provide specific functions for image or graphics processing are also presented. Screen captures of interfaces of this software are illustrated as well.

An E-commerce Platform with a Virtual Fitting Room

Nowadays, there are many e-commerce platforms for selling a variety of products online. The most famous ones include Taobao and Jingdong. Garments occupy a large body of products sold in these e-commerce platforms. Finding a garment and paying for it online looks very attractive because it is a tiring experience to walk on foot from one shop to another shop to look for a beloved garment. However, buying a garment online is often not a pleasing experience because one cannot try it on to make sure the garment size fits one’s body well.

In this project, a student plans to develop an e-commerce platform for garments selling. In addition to traditional functions that existing e-commerce platforms possess, a virtual fitting room is developed in our platform, which provides a consumer with the ability to try the garment on one’s body. This fitting room is based on techniques in Computer Graphics. Specifically, it is developed with a library called WebGL [3]. WebGL is a variant version of Open Graphics Library (OpenGL) which works for Web-based applications. It provides fundamental functions for 3D modelling, processing and realistic rendering with which one can manipulate 3D models with a realistic appearance. Direct use of WebGL is a bit complicated. Three.js is a library which high-level programming interfaces by packaging basic functions of WebGL [4].

Figure 1. Virtual fitting room.

Figure 1 shows an interface of our virtual fitting room. It consists of three regions. The left region is parameter control panel with which one can select parameters which fit his/her body size. These parameters include height, weight, waistline size, bustline size and hipline size. After the parameters are set, the 3D human body changes its shape accordingly. On the right part, a set of garments with different style and colours are shown. A user clicks on a garment he wants to try on and a realistic rendering human with a selected garment on his body is shown. This virtual fitting room is a great help to a consumer for looking for a beloved garment. The left figure and right figure in Figure 1 show different sizes of a female body.

A Social Networking Platform with Personal Picture Editing Function

Social networking platforms, such as Facebook and Wechat, are popular applications which provide new channels for strangers to communicate and make friends with each other. These applications make expressing feeling and presenting comments to social events in public very easy. In these
platforms, photo publishing is one of the most important functionalities. This is due to the rapid growth of intelligence mobile phones with which it is most convenient to take photos in daily life.

In this project, a student plans to develop a social networking platform which is specialized by its function for presenting pictures online. Different to existing platform of this kind, our platform allows a user to edit one’s own picture by searching interesting pictures on the internet. We provide a friendly interface for image searching by user sketching.

Figure 2 shows an example of searching for an image of a cat by a simple sketch which is drawn on a canvas in the platform. Our implementation is based on HTML5 with canvas object. Using this technique, our system allows a user to draw a sketch interactively with a virtual pen. On the left of Figure 2, we see a blank canvas with a line drawing of a cat head which is sketched by a user. This sketch picture will be uploaded to a server which is going to search in a database of pictures for some pictures which have high similarities to the guidance picture. On the right of Figure 2, there are 3 different images of cats are rendered, which are found in an image database using a content-based image comparison algorithm. These images, from the left side to right side, are ordered according to their similarity to the provide guidance image. In the next step, a user selects from candidate images the one he likes most and put the selected image on a background picture. The final image will be put on one’s social network web pages. This functionality provides a user with the ability to create personalized pictures.

Figure 2. Picture searching via user sketching.

A Visualization Platform for Occupation Datasets

Nowadays, with the rapid development of the internet, more and more datasets are easily available online. One example is job publishing system which is a platform which provides useful information for both companies and individuals who look for jobs. A company can publish information about job vacancies on such platforms and an individual can search on such platforms for a job which is suitable to him in the database of job vacancies with detailed information provided by companies. This kind of platforms makes it easier for one to find a job. However, due to the huge number of job publishing platforms, it is often a tedious work for someone to search for useful information.

In this project, a student plans to develop a web-based platform with which a user can get job information from more than one job publishing websites. This platform mainly consists of two parts. One part is for data collection which acquires job information on a set of job publishing websites and manages all dataset into a single database. This part depends on a web spider algorithm which fetches data from web pages of a website recursively. The web spider is implemented using a framework called scrapy which is implemented using python. MongoDB is used for data storage and management. The second part is a data visualization part which is in charge of translating datasets into graphics in a variety of types [5]. For data visualization, we make use of echart which is an opensource library providing a variety of patterns for data visualization.

The left figure in Figure 3 shows visualization result of the number of vacancies for the job of Java programming engineer. Dark colour means a large number of job vacancies and light colour means a small number of job vacancies. From this figure, we can tell that the provinces which have more chances for a java programming engineer include Beijing, Shanghai, Zhejiang, Sichuan and Guangdong. The right figure in Figure 3 shows the number of years of working experiences for qualified candidates required by recruitment companies. We can tell that most companies are looking
or java engineers with 3 to 5 years of working experiences. There are also many chances for engineers with 1 to 3 years of working experiences.

Other Final Year Topics

Image processing and computer graphics technologies are used in various applications. We list some other topics for Final Year Projects here. Virtual terrain design is important for 3D games or for simulation of geological prospecting. A virtual terrain is easily represented by a mesh. By manipulating vertex positions in a mesh, the shape of terrain is easily modified. In addition to geometry shape, the arrangement of road layouts and placement of ponds and houses are also important. Such a topic is appropriate for a Final Year Project for the college education.

Another topic is 3D object reconstruction using the RGB-D camera. RGB-D camera, such as Microsoft Kinect can be used to get images with deep information. Therefore, this kind of equipment is useful for 3D reconstruction. Our students have finished several projects on this topic, such as indoor scene reconstruction and small object reconstruction using Kinect.

Figure 3. Visualization of job opportunities for java engineers.

Summary

In this paper, we present several topics for Final Year Project of the college education. We mainly focus on the major of computer science and computer software. These project topics are interesting because hot technologies in image processing, computer graphics and data visualization are employed. In addition to these topics, we have also designed many other topics which involve knowledge beyond those taught in traditional college courses.

The topics provided in this paper have been carried on by students in Harbin Institute of Technology at Weihai. It has been demonstrated that these projects have a remarkable impact on improving students’ programming skills and the ability for system analysis and design.

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