

DEVELOPMENT OF TIMETABLING PROGRAM

FONG WOON KEAT

This report is submitted in partial fulfillment of the requirements for the award of
Bachelor of Electronic Engineering and Computer Engineering With Honours

Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

April 2010



UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : Development Of Timetabling Program

Sesi Pengajian : 2 / 2009/2010

SayaFONG WOON KEAT.....
 (HURUF BESAR)

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To my family, friends and supervisor

ACKNOWLEDGEMENT

First and foremost, I'm very grateful and deep gratitude to all those who contributed their time, concern and money in this project especially my supervisor, Pn Zaiton Bt. Abdul Mutalip, because her comments, critiques, and suggestion were intended to nurture my engineering practices in completing this project. I would like to show my appreciation to the flagging support of my friends who had providing lots of constructive criticism and shared their suggestions and evaluations in my works all the time. It would not have been possible to complete a report of this magnitude without the support from them.

ABSTRACT

This report documents the progress and information about development of FKEKK clash free time table from initial development to current date. Initial objective is designing a reliable clash free timetable and be able to generate the timetable for courses and lecturers. The development halted at basic functionality timetable software which same like most of market available software; Free Evolutionary Timetable (FET), iMagic Timetable and ASC timetable. The development continues with the research of other development of timetable in other universities and the resulting new theory of handling timetable. Apart from having a simple function of time management software, others are seeking solution for organizing timetable in a much more efficient and resourceful way. In this way, UTeM resources can be harnessed to provide quality education and curriculum.

ABSTRAK

Laporan ini mengandungi maklumat tentang penghasilan program jadual waktu yang tidak bertindih dari awal penghasilan hingga masa kini. Pada permulaan, objektif projek adalah untuk menghasilkan jadual waktu yang tidak bertindih dari segi subjek dan pensyarah, dan menerbitkan jadual waktu untuk kursus dan pensyarah. Pengkajian projek berhenti pada tahap yang sama dengan perisian komputer yang digunakan untuk menghasilkan program jadual waktu seperti 'Free Evolutionary Timetable (FET)', 'iMagic Timetable Software' dan 'ASC timetable Software'. Pengkajian program jadual waktu ini diperkembang dengan hasil pengkajian yang sama dari universiti lain dan hasilnya konsep yang baru akan diguna dalam program jadual waktu ini. Selain fungsi yang ringkas dalam program jadual waktu ini, cara lain dieksploitasi untuk mencari cara untuk menghasilkan penghasilan jadual waktu yang lebih efektif. Dengan penemuan kaedah ini akan memajukan activity pembelajaran dan ko-kurikulum UTeM.

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LIST OF ABBREVIATIONS

ADO	-	ActiveX Data Objects
DAO	-	Data Access Objects
DBMS	-	Database Management System
FET	-	Free Evolutionary Software
GUI	-	Graphic User Interface
SQL	-	Structured Query Language
HTML	-	HyperText Markup Language
RDO	-	Remote Data Object
UTeM	-	Universiti Teknikal Malaysia Melaka
URL	-	Uniform Resource Locator
VB	-	Visual Basic
VBA	-	Visual Basic Application
XML	-	Extensive Markup Language

CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

Timetable had being redefined in many way, generally it define as a schedule of the times certain things are to happen. Others define it as collective of occasion that plan to happen within a set of time on a place. In any definition, there are range of time, place, purpose and people that involve. The combination will of these entities will determine the feasibility of a timetable.

Education center such as college and university which involve hundreds of courses need a better management system. Such scenario where time, venue and human resources become an important issues for laying out an effective time table for students and lecturers. Management needs a system where data can be stored (lecture time, classroom and lecturer) and generation of time table that is easily accessible for student and lecturer. Therefore, web base time table is the ideal solution for this problem. Since the software is web base which mean Internet is the medium for management to distribute the time table and it be retrieved by using web browser which is compulsory software in every PC or laptop. Lecturer and student can retrieve the time table anywhere and anytime as long as there is an Internet connection.

1.2 OBJECTIVE

The project objectives has been outlined as follows:

- a) Enhance previously developed timetable with more features.
- b) Develop timetable software that assist administrator to produce a feasible timetable and fulfill as many constraints imposed.
- c) Assist lecturer for planning activities that involve university resources.
- d) Introduce new method of scheduling and sorting timetable.

1.3 PROBLEM STATEMENT

A few problems has been identified prior to the development of the project as follows:

- FKEKK administrator use general purpose software, Microsoft Excel for managing time table which was prone to human error and low efficiency.
- Timetabling is complicated due to many programs, insufficient amount of lectures, lack of classes and the timetable changes due to many cases.
- There are many people involved in preparing the timetable. It's taking too much time and adjustment.
- Programming language of the legacy software is not efficient for high traffic browsing.
- Network security was ignored in the previous development. Therefore, implementing new framework for improved security.

1.4 SCOPE

The scope of this project is to improve the previous timetable developed. Most of the objective and problem statement had been redefined. This report will present the tools, the changes and the additional of function in the software. The scope had being widen compare to the previous development as this project will

accommodate a functionality that will be assisting administrator to create feasible timetable. This new functionality requires some case study and learning resources to develop it. Moreover, this report will show the early stage result which is an improvement from the previous timetable development.

1.5 METHODOLOGY

The software development for this project was adapted from waterfall software development model. There will be few stages in defining each of the success stage that carry the development to next level. The success for each stage is determined by users where the feedback will be analyzed and remodel the software until users are satisfied with it. There are two major development stage; user interface and data mining model. Both these stage define the purpose of this project, attaining the user interface success is the most important as there is no value for this software if there is no user while the data mining model is features that represent the brain of the software as all of the analyzing and sorting was done here. Detail method used will be discussed in chapter 3.

1.6 REPORT STRUCTURE

The first chapter is a short briefing of the project that introduced more detail about the previous timetable development in detail and comparison with the current development. This chapter will give clear understanding of the project before going much deeper into other chapters.

The second chapter is literature review for the technology and programming code that involved in this project. There will be comparison between the previous development coding and current development coding. This will clear all the queries for the transition of programming language.

The third chapter is the method that being used for the project development. It will show the strategy in achieving the objectives and result.

The fourth and fifth chapter is the result of the early stage of development in this project. Both of this chapter will concluded the early development progress after discussing the important issues.

CHAPTER II

LITERATURE REVIEW

2.1 BACKGROUND STUDY

The main factor that lead to the development of a timetable software for FKEKK is the absent of such tool in the faculty. The problems that often arisen are class clash with other course, poor management of time caused lecturer exhausted and resources are not fully utilize. Initial development had identified these issues and came out with a web base timetable software solution. The software is better than some timetable software on the market as most of them are not accessible through internet.

Further development is more focus on the intelligence of the timetable performs scheduling task with the purpose of utilizing the resourceful effectively without breaching human limitation. The main problem is the definition of good timetable and bad timetable. Everyone defines it differently based on the need and interest. For example, student prefer class schedule on beginning of the week because they can had flexible time to determine their own private time on the end of week but some lecturer do had research that requires them to scatter their teaching time. Therefore, many universities used Genetic Algorithm or Brute-force method as problem solving techniques applied in their timetable. This profound method is not an ideal solution as it requires large amount of data for analysis. For example, Genetic Algorithm need to populate a set of data for mutation then the mutated data

will be selected base on the performance. It takes some time before the timetable can act independently without human supervision.

Initial timetable is built by using Visual Basic Studio Software which is proprietary development where there is not much of code sharing for building a secure and fast web application. This causes a lot of debugging and possible security leak. Whereas the further development will be using open source programming language where there are many examples that can be referred and learned. For example, 'Wordpress' the famous blog CMS is built on PHP and MySQL. The proof of concept from open source development can be learned for building faster and secure web application.

2.2 LITERATURE REVIEW

Initial development programming language is Visual Basic for the Graphic User Interface (GUI) in webpage form and SQL as database. Since the emergence of Web 2.0, cloud computing and social media network, the timetable software will undergo revolution to utilize the fast moving technology and improved features that encourage the technology application.

The programming language and database had been changed to accommodate more advance features. Most of the software usability is not feature dependant anymore as users demand accessibility, interactive, performance and ease of use. Therefore, open source programming language such as HTML, PHP, CSS, Javascript and AJAX was introduced on the timetable development. PHP is a widely-used general-purpose scripting language that is especially suited for Web development and can be embedded into HTML while CSS and Javascript are language that enhanced graphic user interface. AJAX is a group of interrelated web development techniques used on the client-side to create interactive web applications [1]. The database had changed to MySQL which is a relational database management system that capable of handling millions of data [6]. By enhancing the legacy feature of the software, the new integration will require some research and study on new algorithm approach which will benefit timetable management apart of keeping the time table legacy, applying Genetic Algorithm, Logical Constraints Arithmetic

Approach and Brute-force method will increase the effectiveness of timetable scheduling process.

2.2.1 PHP and ASP.net

PHP is a relatively simple language to use than ASP.net. Initially, PHP was written in the C programming language to replace a set of scripts in Perl. That is the reason why coding in PHP remains simple even today [2]. Many developers find themselves to be more at ease with the user-friendly nature of PHP when it comes to coding.

PHP has much better support for the database management system, *MySQL*. In fact, the very popular blogging platform, WordPress uses the formidable combination of PHP coding on MySQL for its content management system, which includes about hundreds of thousands of blog posts every single day. Another very popular and frequently updated service that uses the combination of PHP and MySQL is Wikipedia. PHP is better for embedded support with another database management system. PHP can use the command line to perform many everyday activities. Some of the things that the PHP command line is useful for manipulating across many files and for putting files into multiple directories at once. Since PHP is older, there are many people who claim that it is much more secure than ASP.net where coding is concerned [3]. ASP.net is much new, and the security options may not be fully in place yet.

ASP.net is compiled into memory in binary code. So, when ASP.net is used for coding, it is evident that it takes much longer time to process since the codes need to be retrieved from memory. However, PHP is not compiled into memory like ASP.net is. It is interpreted at runtime. That is the reason why PHP coding leads to better speed and even efficiency.

2.2.2 HTML, CSS and Javascript

A web document consists of three layers which are content, presentation, and behavior. Separating web interface into 3 documents can modify or replace any of the layers without having to change the others [4].

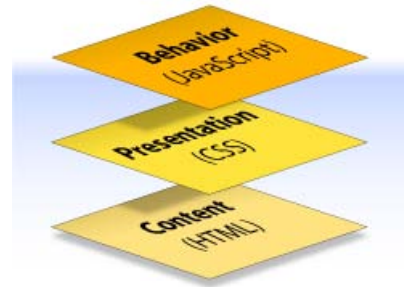


Figure 1: Web Document Structure

The content layer is always present. It comprises the information the author wishes to convey to the audience, and is embedded within HTML or XHTML markup that defines its structure and semantics [4]. Most of the content on the Web today is text, but content can also be provided through images, animations, sound, video, and whatever else an author wants to publish.

The presentation layer defines how the content will appear to a human being who accesses the document in one way or another. The main advantage of CSS over presentational HTML markup is that the styling can be kept entirely separated from the content. For example, it's possible to store all the presentational styles for a 10,000-page web site in a single CSS file. CSS also provides far better control over presentation than do presentational element types in HTML.

The behavior layer involves real-time user interaction with the document. This task is normally handled by JavaScript. The interaction can be anything from a trivial validation that ensures a required field is filled in before an order form can be submitted, to sophisticated web applications that work much like ordinary desktop programs.

2.2.3 AJAX

AJAX (Asynchronous JavaScript and XML) is a group of interrelated web development techniques used on the client-side to create interactive web applications. With AJAX, web applications can retrieve data from the server asynchronously in the background without interfering with the display and behavior of the existing page. The use of AJAX techniques has led to an increase in interactive or dynamic interfaces on web pages and better quality of Web services due to the asynchronous mode [1].

2.2.4 Data Mining

Data mining is the process of extracting patterns from data. Humans have been extracting patterns from data for centuries, but the increasing volume of data in modern times has called for more automatic approaches. Early methods of identifying patterns in data include Bayes' theorem (1700s) and Regression analysis (1800s). The proliferation, ubiquity and increasing power of computer technology has increased data collection and storage. As data sets have grown in size and complexity, direct hands-on data analysis has increasingly been augmented with indirect, automatic data processing. This has been aided by other discoveries in computer science, such as Neural Networks, Clustering, Genetic Algorithms (1950s), Decision Trees (1960s) and Support Vector Machines (1980s). Data mining is the process of applying these methods to data with the intention of uncovering hidden patterns. It has been used for many years by businesses, scientists and governments to sift through volumes of data such as airline passenger trip records, census data and supermarket scanner data to produce market research reports.

Data mining method such as Genetic Algorithm and Brute-force method are widely use in timetable research. In Universiti Malaya, Adilah binti Abdullah master thesis title Timetable Management System Using Genetic Algortithm had proposed Genetic Algorithm approach to obtain ideal timetable. Base on her timetable development, all the research information is gathering through interview and literature review method. The result of the research is the product of timetable

software which had 3 modules; Administrator Module, Lecturer Module and Student Module. The Lecturer Module will set individual lecturers timetable and the master timetable for all the lectures in the university. Similarly through the Student Module, students can set their own timetable for the whole semester. They can also do add and drop subject through this module. In the Administrator Module, the administrator can manage the student registration, class and subject registration by adding or deleting class or subjects. Adilah research show that Genetic Algorithm is the best solution for constructing a feasible timetable yet Genetic Algorithm had weakness in solving huge amount of data due to its heuristic character; shifting, crossover and mutation will take longer time and server capacity.

Another research on timetable did by Manu Bansal and Himanshu Prakash from University of Queensland, Australia; they had successfully improved the speed of the Genetic Algorithm by an extra input 'constraint'. They propose each timetable that generated from Genetic Algorithm has an associated cost value. The cost value is a measure of correctness of the solution, which is calculated by a cost model based on the constraints. The model assigns penalties to constraint violations and adds up the penalties for a given timetable. Thus, each timetable has a cost value, and the population has a minimum cost and an average cost associated with it. The algorithm works to minimize the average cost, and, in turn, the minimum cost. A zero minimum cost, considering all constraints, means that a solution has been found. Outcome of their project is the implementation effectively optimizes the constructed objective function for the modelled population, under sufficiently heavy constraints. The execution is reasonable for a large problem size, which would not be possible with conventional algorithms.

The research of timetable result a much better way of scheduling and organising event. The implementation of Genetic Algorithm in timetable had gone through changes to enhance the speed and number of data handling. Hence, this project is seeking a new way of data mining which could outperform Genetic Algorithm. Other data mining method such as Logical Constraints Arithmetic Approach and Brute-force Method had being highlighted as possible way of improving timetable scheduling process to higher level. Constraint programming will improve the legacy data mining method, the data will be sorted more effective.

2.2.5 jQuery

jQuery is a lightweight cross-browser JavaScript library that emphasizes interaction between JavaScript and HTML. It was released in January 2006 at BarCamp NYC by John Resig. Used by over 27% of the 10,000 most visited websites, jQuery is the most popular JavaScript library in use today.

jQuery is free, open source software, dual-licensed under the MIT License and the GNU General Public License, Version 2. jQuery's syntax is designed to make it easier to navigate a document, select DOM elements, create animations, handle events, and develop AJAX applications. jQuery also provides capabilities for developers to create plugins on top of the JavaScript library. Providing this option, developers are able to create abstractions for low-level interaction and animation, advanced effects and high-level, theme-able widgets. This contributes to the creation of powerful and dynamic web pages [1].

Working with RAW JavaScript or DOM Programming does bring-in its challenges while handling the browser-specific quirks. JQuery provides quite a few utilities to help working in browser agnostic environments. JQuery library strikes right balance between size, feature set and ease of use.

Why use jQuery? It is believed that this is the most prompt question that everyone will pop up as there are many Javascript libraries such as Mootools and Prototype. The first advantage is that jQuery would help bring-in considerable productivity gains and it's easy to learn and work apart from its progressive development. This tool has the potential to bring-about quite a change in client side development with complex UI with front end logic in JavaScript library. It has small library with Document Object Model (DOM), Quick access to AJAX, without a lot of bloat and some basic animations. The basic JQuery is just 15K and JQuery holds a strong and flexible mechanism for adding methods and functionalities which bundled as plug-ins. It supports CSS 1-3 and basic X-Path; works with Firefox 1+, Internet explorer 5.5+, Safari 1.3+ and Opera 8.5+. The other added advantage, jQuery is supported by Visual Studio .Net (Visual Studio .Net 2008 above) which mean that jQuery will be able integrate with ASP.net.