



## IMPLEMENTATION OF A TIME TABLE GENERATOR USING VISUAL BASIC.NET

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### ABSTRACT

A lecture and examination Timetable Generator (TTGen) for the Department of Electrical and Electronics Engineering, University of Agriculture, Makurdi-Nigeria was designed and implemented using Microsoft's Visual Basic.Net and MySQL database server as a backend. The application has the ability to manage Students, Lecturers, Venues, Periods, and Courses of the Department. It also features an image handling module for the lecturer, student and venue objects. The data from the application is saved in a MySQL database using a configurable database module and a randomizer module to generate the best combination of courses and periods for an efficient time table. Using the TTGen, lecture and examination timetables with no infringements for the first semester of the 2009/2010 academic session were generated after only eight iteration steps. The timetable generator is capable of arranging timetable schedules for many departments and faculties of universities and similar institutions where course units are offered.

**Keywords:** timetable generator, visual basic.net, MySQL server, randomizer, database.

### INTRODUCTION

A timetable is an organized list usually set out in a tabular form, providing information about a series of arranged events and the time at which it is planned for these events to take place. The essence of timetables is the management of mostly time resources which are scarce in relation to the aims they are to fulfill. Several versions of timetables have been designed and implemented at various times. The Time Table Mate developed by KTS InfoTech, is a program for creating timetables [1]. It can be really helpful for people who are responsible for this part of educational process in schools and colleges. It can swiftly create small database of subjects, rooms, tutors and classes.

TTMaker, which is the Root Software's advanced scheduling software, provides several functions needed to create a perfect timetable [2]. Its 1.8 version is free but caters to groups which are to be scheduled and facilitates when groups can be scheduled, how often they can be scheduled, when participants can be scheduled and the number of consecutive timeslots to allocate when a group is scheduled and travel time between timeslots for participants. This makes this solution not to fit exactly in the educational sector.

ASTICE Time Table, made by Astice Srl, is a smart diary and personal organizer designed as a universal tool for resource management, appointment booking, time managing and scheduling [3]. It can manage physical resources like equipment, machines, rooms or premises. It caters to mainly human resource management such as the setting up of a duty roster for the employees or managing appointments for a veterinary surgeon. iMagic Timetable Master, developed by iMagic, is a scheduling application for Windows [4].

Other solutions include web applications like My Class Schedule!™ created by Chris Huang [5] and Rectangles by Nik Youdale (Frontend) and Matthew M J Conolly (Backend) of the University of New South Wales.

Though offering portability with continuous presence on the web, they are quite rigid and lack documentation or manuals for their use [6].

The focus of this paper is to design and implement a cheap and affordable timetable generator suitable for use in an academic institution. This becomes very advantageous since at the beginning of every semester there is need for a framework that would guide the learning process for the students and staff members throughout its duration. In creating the timetable, several factors such as minimum number of hours per week, availability of course lecturer, dropped or carry over courses, availability of lecture halls or venues, and study hours approved by the institution were put into consideration. These factors are many and they form the limitations or problems inherent in manually creating an effective and time economizing timetable. The timetable generator software was developed with the aid of the Microsoft Visual Basic.Net and MySQL database server. The use of the computer based solution is better suited for this purpose due to the number of iterations needed to adequately satisfy the various variables. The TTGen will be able to generate timetables for several levels of study, and a visual representation of the timetable can be viewed and simplified by filtering some properties such as level, days of the week or hours. The timetable representation can be exported as Hypertext Markup Language (HTML) and Microsoft Excel as desired.

### MATERIALS AND METHODS

#### Classes

The major driving force behind object-oriented programming is the use of Classes that allows for writing of code that can be reused in multiple projects [7]. Classes are defined which include Period, Venue, Course, lecturer, Student, Tag, and Timetable. Each of these classes has a



unique string identifier ID and defined properties based on specific characteristics of the class.

### Modules

The modules which represent separate units of functionality are helper classes which handle the utilities of the application. The TTGen includes the following modules:

- Database:** The database module handles all Input and Output (IO) operations to the MySQL database backend such as read, write and delete.
- Image:** The image module manages all picture data based on the ID of the parent in a repository.
- Input and Output (IO):** The IO module handles files with the HTML and Microsoft Excel formats and provides methods for reading and writing to these files.
- Randomizer:** The randomizer module handles the generation of a random integer when given the minimum and maximum bounds. This module is used in the iteration functions of the time table.

### Interface

The Graphical User Interface (GUI) is closely tied to the TTGen classes and is divided into three levels:

- Form:** the form is the base of the GUI. There is a home or parent form under which all other forms fall (child forms) which handles the classes. A child form contains a control, lists and menus.
- Control:** Every child form has a control which displays the class which the form handles.
- List:** Every child form has a list which displays all instances of a particular class as icons with an identifying text. The child form also contains another list showing the dependant items of objects in the main list.

### Implementation flow chart

The TTGen was compiled and implemented using the flow chart and block diagram shown in Figures 1 and 2, respectively.

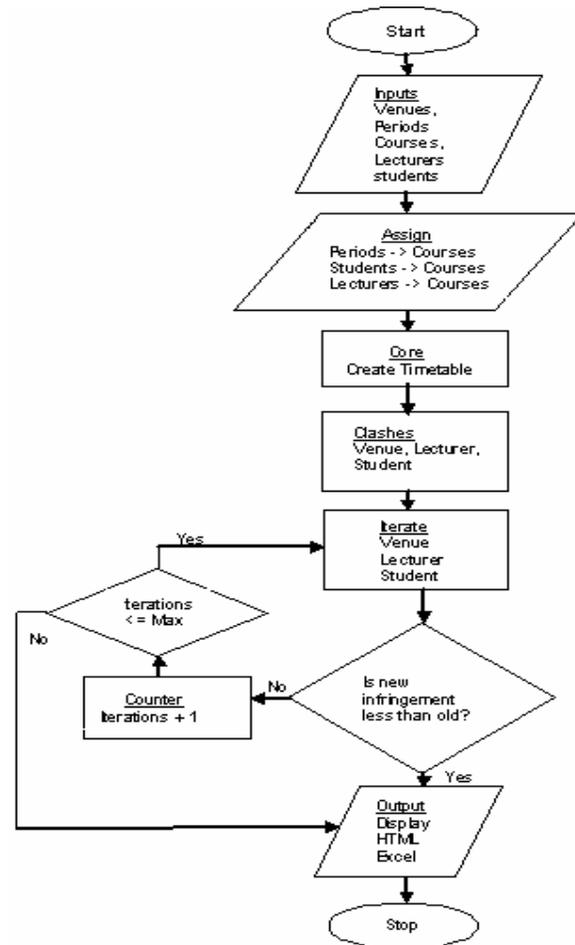


Figure-1. Flow chart for the TTGen.

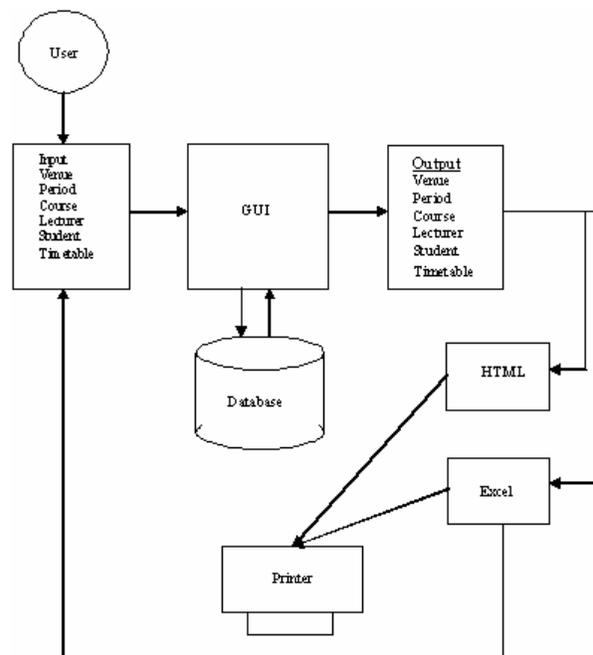


Figure-2. Block diagram of the TTGen.



## RESULTS AND DISCUSSIONS

After successful debugging and compilation of the program, the TTGen software was installed on a computer. Figure-3 shows the opening screen of a successful TTGen installation. The array of objects that the TTGen manages has different properties which are collectively used to implement the program. A click on each of sub menu classes will fire a subroutine which will give options to add, edit, delete, save, cancel, refresh, search, export or import. With these options all the various classes can be modified as necessary. In the Settings tab, (Figure-3), are 5 important variables that may affect the performance of generation of a timetable and determine the efficiency and accuracy of the program.

### The server: port

This is a value pair of which 'server' represents computer name or Internet Protocol (IP) address and 'port' is the port number MySQL server listens for requests.

### The Database

This contains all the tables used by the TTGen for the storage and retrieval of courses, lecturers, venues and other necessary data.

### The user: password

The 'user: password' pair is the identification and authentication token. The database requires a user identity and a password for all Input/output operations performed on the database.

### The image repository

This a full path to a folder, located either locally or remotely on a network or computer, where all images such as lecturer, student or venues pictures are stored. A typical value could be 'C:\users\Public\Pictures'.

### The iteration maximum

This is an integer value which sets the maximum number of possible iterations needed for efficient generation of a timetable with minimal infringements or clashes. This value is an important factor in the duration of timetable iterations.

The values of these settings can be viewed and set by right-clicking on their icons, which displays a menu consisting of Edit and Refresh. An efficient TTgen using this application can be created by following 3 basic steps; independent object definition, dependency definition, and proper iteration. The results of using the various variables such as lecturer, student's details and courses offered to generate lecture and examination timetables are shown in Figures 6 to 9.

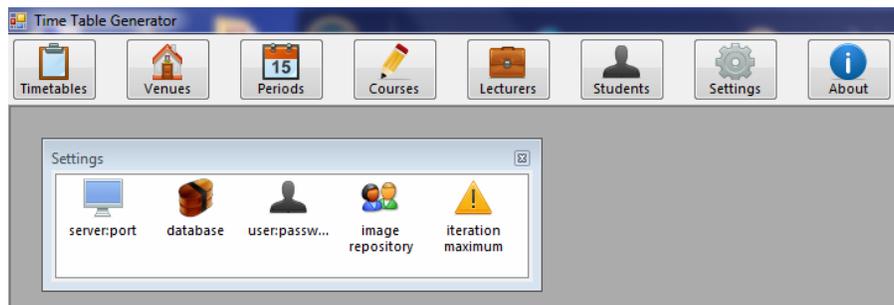


Figure-3. Menu tabs of the TTGen.

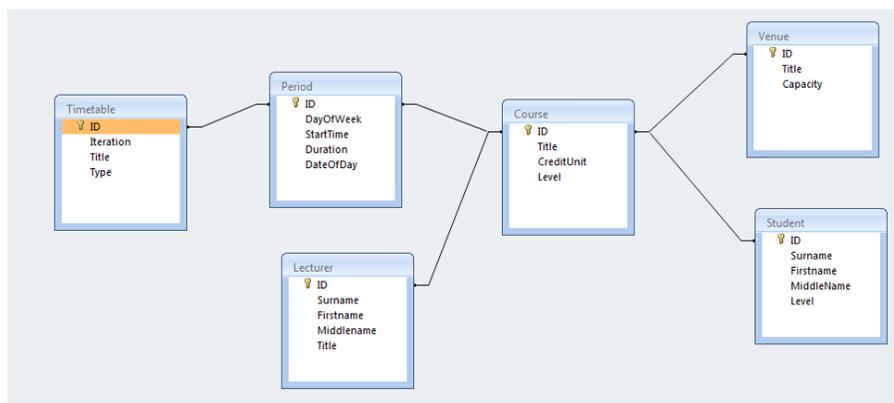


Figure-4. Links between timetable objects.



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Figure-5. Selecting lecturer.

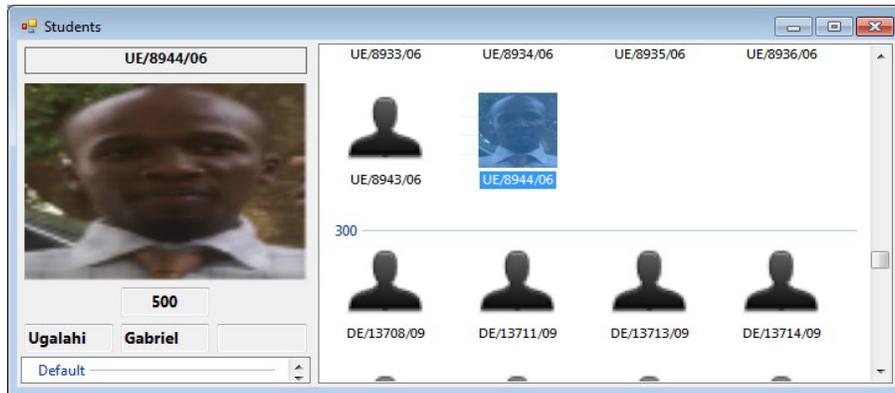


Figure-6. Selecting student.

TTGen Student

file:///C:/Documents and Settings/FAVOUR-ADMIN/Desktop/ttgen/Oth...

## TTGen

Supervisor; Engr. Mom J. | Developers; Acheme C.A, Igyvue S.O., Ugalahi G.

### Student Details

<b>ID</b>	UE/8919/06
<b>Name</b>	Igyvue, S. O.
<b>Level</b>	500



### Courses

S/N	ID	Title	CU	Level
1	EEE 503	ENGINEERING MANAGEMENT I	2	500
2	EEE 511	RELIABILITY AND MAINTAINABILITY OF SYSTEMS	3	500
3	EEE 513	ADVANCED CIRCUIT TECHNIQUES	3	500
4	EEE 521	SOLID STATE ELECTRONICS	2	500
5	EEE 541	CONTROL SYSTEMS ENGINEERING II	3	500
6	EEE 571	ELECTRIC POWER SYSTEM I	3	500
7	EEE 573	ELECTRIC SERVICES DESIGN	2	500
8	EEE 575	SWITCH GEAR AND HIGH VOLTAGE ENGINEERING	2	500
9	EEE 599A	Project A	3	500
10	EEE 453	LOGIC CIRCUITS	2	400
11	EGS 301	TECHNOLOGY AND NATIONAL DEVELOPMENT	2	300

Figure-7. Student course registration.



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TTGen Timetable

file:///C:/Documents and Settings/FAVOUR-ADMIN/Desktop/ttgen/500/...

# TTGen

Supervisor; Engr. Mom J. | Developers; Acheme C.A, Ignue S.O., Ugalahi G.

## Timetable Details

<b>ID</b>	TTG_TT_1
<b>Iteration</b>	8
<b>Title</b>	EEE Lecture Timetable 2009/2010 1st
<b>Type</b>	Normal

## Periods and Courses

Periods	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
08:00	-	-	-	-	EEE 573*1	-	-
09:00	-	-	-	EEE 521*1	EEE 573*1	-	-
10:00	-	-	-	EEE 521*1	-	-	-
11:00	-	EEE 571*1	EEE 511*1	-	-	EEE 599A*1	-
12:00	-	EEE 571*1	EEE 511*1	-	EEE 575*1	EEE 599A*1	-
13:00	-	EEE 571*1	EEE 511*1	-	EEE 575*1	EEE 599A*1	-
14:00	-	-	-	EEE 513*1	-	-	-
15:00	-	-	EEE 541*1	EEE 513*1	-	EEE 503*1	-
16:00	-	-	-	EEE 513*1	-	-	-
17:00	-	-	EEE 541*1	-	-	EEE 503*1	-

<b>Venue Infringements</b>	0
<b>Lecturer Infringements</b>	0
<b>Student Infringements</b>	0

Figure-8. Lecture timetable.

TTGen Timetable

file:///C:/Documents and Settings/FAVOUR-ADMIN/Desktop/ttgen/500/...

# TTGen

Supervisor; Engr. Mom J. | Developers; Acheme C.A, Ignue S.O., Ugalahi G.

## Timetable Details

<b>ID</b>	TTG_TT_2
<b>Iteration</b>	8
<b>Title</b>	EEE Examination 2009/2010 1st
<b>Type</b>	Examination

## Periods and Courses

Periods	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
08:00	-	EEE 571*3*03/01/2011	-	-	-	EEE 511*3*07/01/2011	-
09:00	-	-	-	-	-	-	-
10:00	-	-	-	-	-	-	-
11:00	-	-	-	-	-	-	-
12:00	-	EEE 521*2*03/01/2011	EEE 503*2*04/01/2011 EEE 513*3*11/01/2011	-	EEE 575*2*13/01/2011	-	-
13:00	-	-	-	-	-	-	-
14:00	-	-	-	-	-	-	-
15:00	-	-	EEE 541*3*11/01/2011	-	-	-	EEE 573*2*15/01/2011
16:00	-	-	-	-	-	-	-
17:00	-	-	-	-	-	-	-

<b>Venue Infringements</b>	0
<b>Lecturer Infringements</b>	0
<b>Student Infringements</b>	0

Figure-9. Examination timetable.



## CONCLUSIONS

The TTGen as an application for generating lecture and examination timetables has been effectively and successfully deployed. The efficiency of this easy to use software is shown to generate a zero clash timetable in only eight iterations. The data used in generating the timetable such as student's and lecturer's data can also be used for other purposes such as managing students in their respective course registration processes. The TTGen is equipped with explicit and easily interpreted output files (HTML and Excel). The Excel files aid in bulk import of data thus making this application user friendly.

## ACKNOWLEDGEMENTS

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