

Research Article

Table Tennis Tracker Web Application for Tournament Statistics Analysis

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ABSTRACT

The aim of this project is to amplify the table tennis tournament analysis via Web-Based application. Typically, the tournament scores used to be collected and displayed manually. All the information used to be captured by the referees during the matches, while most of the competitors provided only basic information and real-time scores online. Over the years of technological advancements, the modern development of software applications has helped users perform useful tasks and retrieve useful data based on the requests. The objective of this project is to develop a functional web application that will retrieve or store table tennis tournament statistical data and visualize them using tables, bar charts, pie charts, histograms as a medium of demonstration for the user. Moreover, the application will perform specific analysis on the scores and display insightful data about the tournament for league structures investigation. The developed system will include a database to store and retrieve data for display on the user interface. The development of the project is fully stacked (front-end and back-end), so it is built with the appropriate web technologies to function in the background (PHP, MySQL, Apache) while displaying results (HTML, CSS, JavaScript) on the page for the user. The project is managed using effective project management methods to plan, design, implement, develop, and maintain the application.

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1. Introduction

By scrutinizing tournament scores in ping pong, analysts can extract meaningful information about various aspects of the game. In this regard there are some key areas where tournament score analysis plays a crucial role. For instance, performance evaluation in which the player's consistency and the skill level analysis are considered by analyzing the match outcome in previous tournaments, can help to predict the likelihood of a player winning future matches [1]. Hence, considering the main factors such as number of wins/losses, scored points, and player strengths direction in hitting the ball in the analysis, leads to a better coaching of the athlete.

By studying historical scores, analysts can identify patterns, playing styles, and strategies that contribute to a player's success or failure [2]. This information can be used to make informed predictions and evaluate the potential outcome of upcoming matches. On the other hand, analyzing tournament scores provides insights into the overall dynamics of a ping pong tournament. It helps identify trends, such as upsets, underdog victories, or dominant performances by certain players. This analysis aids in understanding the competitiveness of the tournament, the level of skill among participants, and the potential for surprises or upsets. Tournament score analysis involves a range of statistical techniques to uncover meaningful patterns and trends. Analysts can

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employ methods such as calculating averages, standard deviations, win-loss ratios, and point differentials to gain a quantitative understanding of player and tournament performance. These statistical insights can be used to compare players, assess their progress over time, and make data-driven decisions. Lastly, by delving into tournament scores, players and coaches can identify areas for improvement and refine their strategies. Analyzing scores allows players to understand their opponents' strengths and weaknesses, enabling them to devise effective game plans. It also helps players identify their own shortcomings, such as weak shots or vulnerabilities, and work on rectifying them.

The primary objective of this project is to develop a web-based application that provides statistical insights of table tennis tournaments scores by utilizing score values and converting them into useful data for the user. When users launch the application, the system will display tabulated data that are retrieved from the database. The application contains a built-in control panel for which administrators can log in and input tournament and match details such as their name, scores and the players who were involved. When browsing the application, there are several pages that perform specific functions. For instance, when navigated to a "tournaments" page, the system will display all tournaments that are held in the current year and in the previous years. On the tabulated results being displayed, the user can click on available hyperlinks located in each row of data to be redirected to another page that will show detailed results of the tournament. The results will include the date for which it was held, the tournament's name, the players involved and the scores of each match.

Every table tennis match consists of variables that can be considered as data [1]. The web application utilizes MySQL database to store them as records which then can be added, modified, or deleted. The system is dynamic so the data being displayed on the web application will be updated automatically. The application uses PHP to communicate with the database. The functional requirements of the system can help users view tournament statistics in an organized manner. They will also be able to modify their criteria to view data that have been previously posted. With the search function implemented, the user can also create custom searches for tournaments, matches and players.

With every search, the user can click an icon that will redirect them to another page that will view the details of the player in-depth. This is applicable for tournaments and matches as well. Another key component to note is the control panel that is implemented where the user can login and make amendments to database records using the web application. Each user that is logged in will be declared an administrator by default. When successfully logged in, match records, player records, and tournament records can be added, altered and deleted in real-time. After successfully executing administrative operations, the user will be able to view the updated database records on the corresponding pages of the web application. The system is versatile since their several in-built error-handling functionalities. For example, when adding a new player to the database – if the input fields are incompletely filled, the web application will display an error. Therefore, every administrative operation is monitored before execution to ensure that no errors are encountered when performing them. Another handy feature functionality is the sorting of data when being viewed in the page. When the user views a table of data from the system, they will be able to sort data based on the name, date, number of wins, score values in an ascending or descending order. By using the newly developed system, the efficiency for the user can be greatly increased by reducing time consumption in viewing relevant data to their criteria. This will eliminate most manual work handled by the user and increase their accuracy in analyzing tournament statistics. This will also reduce the number of non-digitized papers that statisticians would normally use daily which helps in keeping the environment economical and green. Rather than writing the scores down, they can easily input the values on the web application and save the records on a database. These records also encourage organization of data that can help prevent confusion when it is required to search them. The system will overall, provide critical conveniences to view statistical data directly using the system because the retrieval of data is easier, and data can also be printed directly from the web browser. Since the system is multi-cross platform based, it can be used on almost any device using any browser in the market. From desktops to laptops and phones using Internet Explorer, Google Chrome or Firefox, viewing statistics is seamlessly easy and convenient.

In this project, an opensource software called “phpMyAdmin” will be used to help create the database and its corresponding tables [3]. It will also allow developers to execute MySQL operations such as importing data into the database [4].-Fig. 1 shows a sample of phpMyAdmin interface.

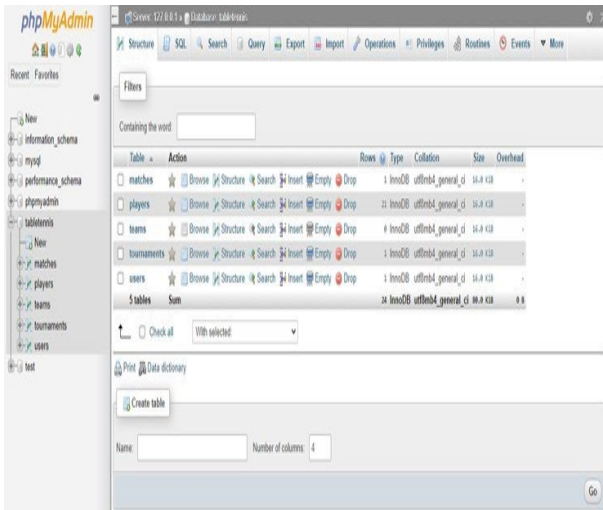


Fig. 1. phpMyAdmin Interface

HTML is used as a markup language to setup the layout of the web page and CSS was used for styling each web component of the page. By using a combination of these web technologies, a table can be created to display the retrieved data to the user. While HTML and CSS are responsible for the front-end development, PHP facilitates in executing back-end operations by communicating with the database.

2. Methodology

The importance in the usage of methodology in this project is the identification of dependent and independent variables based on the requirement of the user and the system.

2.1. Developer Tools

For the ability to run the web application on a device (desktop/laptop), a software called “XAMPP” is utilized [5]. XAMPP is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MySQL database, and interpreters for scripts written in the PHP and Perl programming languages [3]. XAMPP contains necessary packages and dependencies that will make the system operational. It consists of Apache which

will be used as a web server. A web server is a computer that stores web server software and a website’s component files [6]. (For example: HTML documents, images, CSS stylesheets, and JavaScript files). A web server connects to the Internet and supports physical data interchange with other devices connected to the web. Fig. 2 shows a sample of XAMPP control panel that will allow the developer to activate the Apache server and MySQL database.

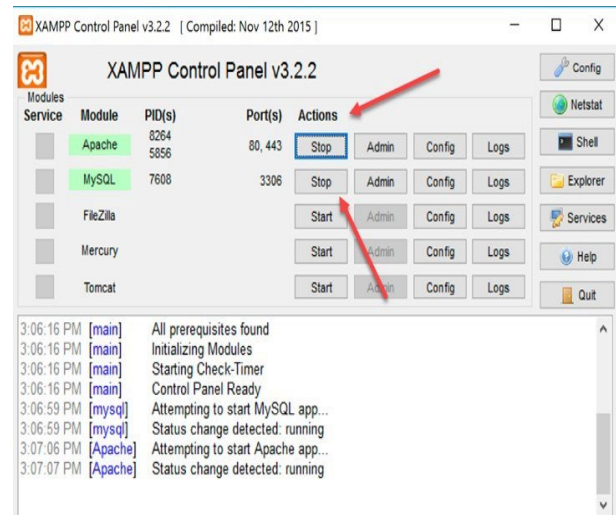


Fig. 2. XAMPP Control Panel

An additional tool that will aid in the programming process is the installation of an integrated development environment software. For this project, we will be using Visual Studio Code since it supports code auto-completion, proper indentation, and software debugging. Visual Studio Code, like Visual Studio software, is essentially a text editor with pre-installed plugins to aid in application development [7]. Fig. 3 illustrates an example of how the IDE organizes code and indents them properly to aid developers.

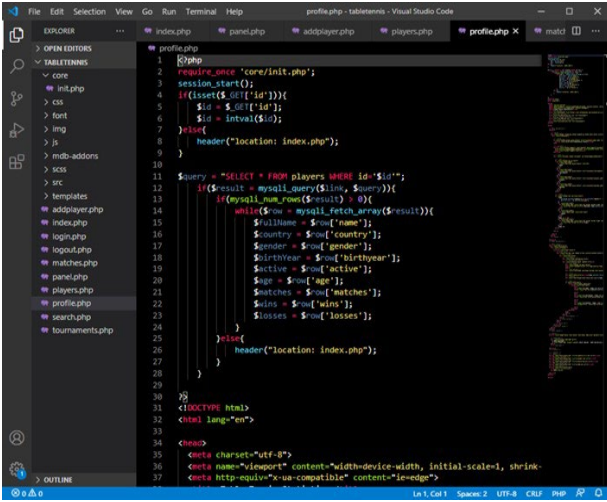


Fig. 3. Visual Studio Code Editor

2.2. Selected Development Methodology

The Agile Model of Systematic & Iterative Development is applied in our web design. The primary reason for selecting this approach is because of the complexity of the framework that will be developed. The Agile model provides a great connection between software developers, analysts, and designers, where flexibility, collaboration, and continuous improvement take center stage. The Agile model allows for an efficient and dynamic software development process and hence it is used in this project. The process focuses on breadth rather than depth. We will not concentrate on the complexity of the feature because of the significance of providing few functional features that the user could utilize until the initial version of the framework has been created. This will ensure that the system operations are designed so that users can use them [7]. There are 7 phases in the Incremental & Iterative Development Model, which include Planning, System Analysis, Design, Implementation, Application Testing, Assessment and Delivery [5].-Fig. 4 illustrates the title of each stage in the development. In planning phase, the project goals, requirements, and scope are defined.

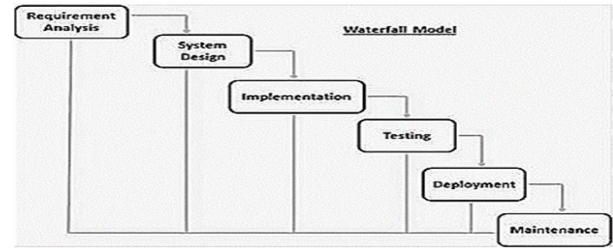


Fig. 4. Incremental & Iterative Development Stages

In the second phase or system analysis phase, it is necessary to analyze the existing system or requirements to determine the necessary changes and improvements. It includes gathering user feedback, conducting feasibility studies, and identifying system constraints.

2.3. Selected Hardware and Software Settings

The general hardware requirements, software specifications, and microcapsules physical properties for both the user and the developer are tabulated in Table 1, Table 2, and Table 3 respectively.

Table 1. Basic hardware requirements

Component	Minimum Requirements
Processor	1.5GHz and above
Memory (RAM)	512MB
Hard-disk Space	5GB
Video Graphics Card	DirectX 9 and above
Screen Resolution	1024 x 768 or higher

Table 2. User software requirements

Component	Minimum Requirements
Operating System	Windows XP/7/8/10
Web Browser	Chrome/Firefox

Table 3. The process yield and physical properties of the microcapsules

Component	Minimum Requirements
Operating System	Windows XP/7/8/10
Web Browser	Chrome/Firefox
Server Software	Apache 2.x or above
Database Software	MySQL 5.0 or above
Integrated Development Environment	Visual Studio Code
PHP Editor	Visual Studio Code
Web Server	XAMPP

The process flow of this module is shown in Fig. 5. The user will open the web application and will find that the homepage displays basic table tennis player statistics that can be sorted in ascending or descending order based on the category of sorting that was selected. The categories can be defined as the player's name, player's score or player's country of association.

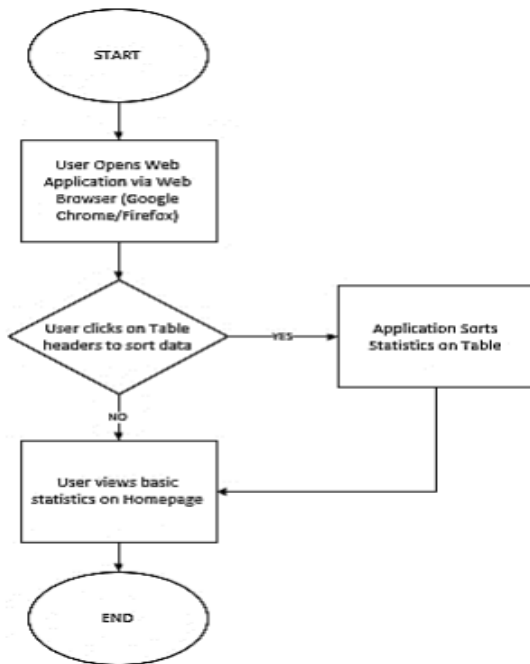


Fig. 5. Module Process Flow

3. Results and Discussion

The following demonstrations were results obtained from the web application when launched by the user. As per depicted in Fig. 6, the web application home page includes the Id, name, Country name, number of winning cases and the last but not the least, information search has been provided to cover the in-depth information of the athlete.

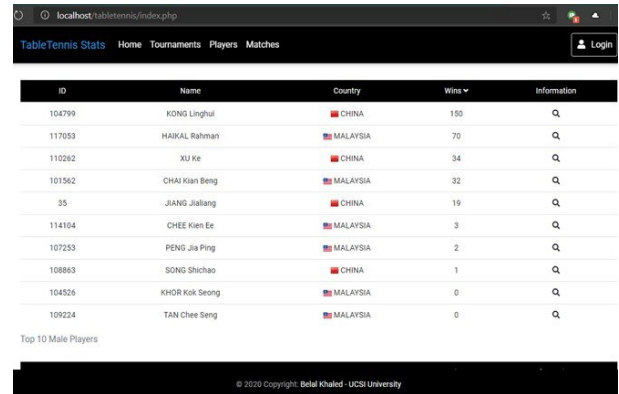


Fig. 6. Web Application Homepage

The homepage of the web application demonstrated in Fig. 6, displays basic statistics of the top 10 table tennis players of the year for both men and women separated into two tables. Each table will contain the unique identification number of the player for which can be used to retrieve their designated records from the database using PHP and MySQLv. Additionally, the name of the player described in the second column of the table. The table will also display the player's association as well as their total scores for the year. All data are sorted by the players' total scores in descending order. The table will also contain a final column which represents a magnifying glass that will redirect the user to a separate profile page which will describe the information of the player in detail when clicked.

An administrator can log into the system by using the login form as shown in Fig. 7. The form includes two input fields: username and password. Once the user enters their credentials, the web application will cross-check the details with the user records stored in the database. If the credentials are correct, the user will be redirected to the homepage where the navigation bar will display the full name of the user. If the input values are invalid, the application will display an error message to

the user. Once logged in, the user can click on their full name located at the top right corner of the application and they will be redirected to the control panel. The control panel will allow the user to execute administrative operations such as adding, modifying, or deleting players.

ID	Tournament	Year	Month	Matches
1003524	2019 - ITTF Junior Circuit Golden Thailand Junior and Cadet Open, Bangkok (THA)	2019	January	168
1001169	World Table Tennis Championships, London (ENG)	2019	April	412
1138462	2018 - Latin American Championships, Havana (CUB)	2018	March	328
1413476	2017 - European U21 Championships, Sochi (RUS)	2017	January	127
1002248	2017 - ITTF Challenge Belarus Open, Minsk (BLR)	2017	October	229

Fig. 7. Tournaments List Page


This is applicable to table tennis matches and tournaments as well. The administrative operations are essentially handled at the back end where PHP will validate the user’s input and make changes to the database accordingly. Fig. 7 is an illustration of the web application that will display a list of tournaments sorted in descending order by time (in years). For each row of data, the table contains a unique identification number for reference with the database followed by the name of the tournament being held. The user will be able to see the number of total matches that was held during the tournament which can be viewed in detail when the user clicks on the identification number. They will be redirected to a separate page that will list all matches and their details as shown in Fig. 8.

When viewing the list of matches in a tabulated form, the user is expected to find the name of players who were involved including the number of points each player has allocated. The total rounds displayed is calculated based on the total number of points collected by the match’s corresponding players. There is always a need for the exact information of the competition lists to have a better understanding and more reliable analysis in each tournament and hence, in this web app, the matches list page has been introduced in which, the tournament, players name and the result of the game has been stated clearly. This webpage is shown in Fig. 8.

Tournament	Player A	Player B	Rounds	Results A	Results B	Winner
2019 - ITTF Junior Circuit Golden Thailand Junior and Cadet Open, Bangkok (THA)	CHEN Qing (CHINA)	PENG Jia Ping (MALAYSIA)	3	1	2	CHEN Qing (CHINA)
2019 - ITTF Junior Circuit Golden Thailand Junior and Cadet Open, Bangkok (THA)	ANG Guat Huoy (MALAYSIA)	HOU Xiaoxu (CHINA)	4	3	1	ANG Guat Huoy (MALAYSIA)
2019 - ITTF Junior Circuit Golden Thailand Junior and Cadet Open, Bangkok (THA)	DING Ning (CHINA)	KHGR Kok Seong (MALAYSIA)	3	2	1	DING Ning (CHINA)

Fig. 8. Matches List Page

To have a clear analysis on the athletes, the player profile page is also considered in this web page. The athlete’s name, gender, age, number of wins and loses followed by the status of the player as either active or retired is determined, as shown in Fig. 9.



ANG Guat Huoy
Female | MALAYSIA

Age: 40 Matches: 0
 Birthyear: 1980 Wins: 0 (%)
 Status: Active Losses: 0 (%)

Fig. 9. Player Profile Page

4. Conclusion

This paper summarizes the development of a web application for managing and viewing table tennis tournament scores and statistics. It is a demonstration of applying efficient methodologies to implement the system based on the user requirements as well setting up the developer’s workspace for application development. Minimum specifications were stipulated to ensure that the system is optimal for development, implementation, and execution to the developer as well as the user. The objective of this paper was to map out the guidance for setting up a web server and install the necessary components to successfully run the software.

The application is usable in any device across several platforms and to promote responsiveness and flexibility, the application can also run on mobile devices with the ability to work in almost any web browser.

By running the web application, the user can view valuable statistical insights about table tennis tournament scores as well as view additional information about the players involved in matches that were held in those tournaments. Additionally, this paper also describes the other features that was built in the web application including the dedicated user control panel for executing administrative operations with the records stored in the database.

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Authors Introduction

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