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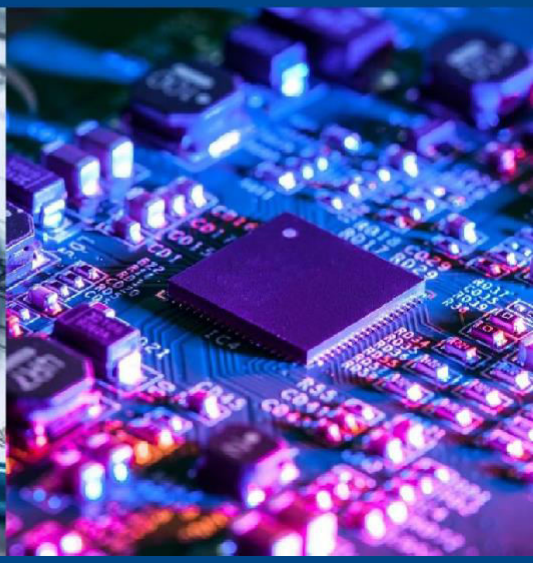

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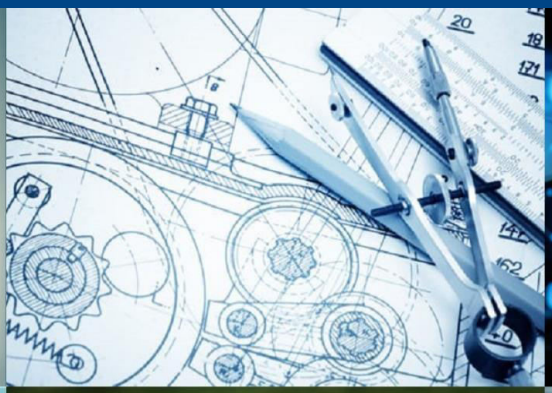

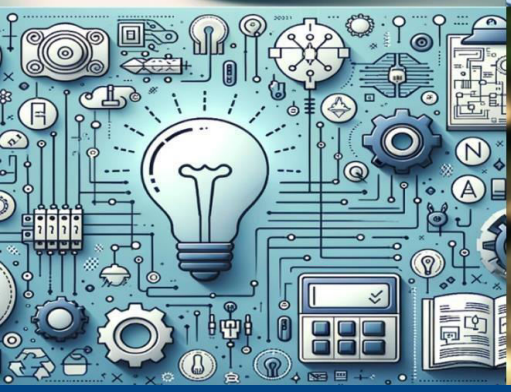

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"Zootomate: Digitizing Zoo Operations with a Role-Based PHP Web System and Embedded QR Codes using PHP QR Code"

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ABSTRACT: In a bid to bring in modernity in zoo management, this paper presents Zootomate-zoological software of role-based Web technology that combines PHP, MySQL, and dynamic QR codes. The processes get digitized in ticketing, sponsorship tracking, and animal profiling-and at the same time improve the visitor's interaction with QR code access through their smartphones. All activities can be performed through a dynamic interface that protects relevant access control using PHP sessions. Zootomate stands as an instance in the digitalization techniques that can improve operational efficiency and communication among zoological habitats.

KEYWORDS: Zoo management system, PHP QR Code, Role-Based Access Control, Web Application, QR Integration, Responsive UI, Sponsorship System.

I. INTROCUCTION

In this late entry into digital transformation, the toilets of nature have felt the need, whereas traditionally management style turned out to be ineffective, typo-prone, and sometimes merely uninspiring. Ticketing, staff coordination, event scheduling, sponsorship, recordkeeping regarding animals, and so on still lean toward manual work or schematic use of software. These legacy-oriented systems, there, do some harm to the whole visitor experience, create hurdles to accessibility, redundancy in the data, and operational delays. Web technology is just at the cusp of crossing, beckoning the very-well-timed reassessment of existing processes towards centralized intelligent platforms.

Zootomate, a complete web-based zoo management system, is being portrayed. It was built utilizing PHP, MySQL, and QR code technology. This offers a strong role-based access control (RBAC) system to ensure personalized access and tighter security by grouping individuals into categories such as administrators, zookeepers, sponsors, employees, and visitors. Aside from carrying out its regular administrative duties, the system also gives top priority to enhancing visitor engagement by tailoring QR codes for each animal profile. These QR codes enable visitors to quickly retrieve detailed information on their devices regarding diet, habitat, and behavior.

The dynamic JavaScript elements combined with the slick Bootstrap 5 interface allow Zootomate to be available panned over and compatible across diverse platforms and devices. Besides managing data in real time, the program allows scaling, which leads to the integration with newer digital initiatives. This study aims to prove that Zootomate is the right model romanticizing the processes of digitization and modernization of zoo operations for internal functioning improvements and changes in the visitor experience through modern, secure online technologies.

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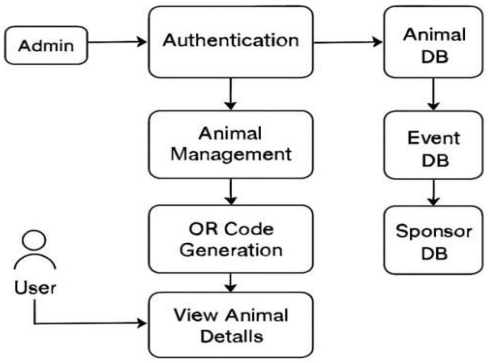

[Figure 1. QR Data Flow Diagram]

Objectives

The primary objectives include:

1.System Digitization:

- **Automate Core Processes**: Automate manual processes involved in recording animals, tracking sponsorships, and ticketing with the implementation of a centralized web-based system.
- **Avoid Redundancy**: Avoid duplication of data and speed up interdepartmental cooperation through linked modules.

2.Role-Based Access Control, or RBAC:

- **Create User Roles**: Setting permissions for administrators, zookeepers, sponsors, employees, and visitors.
- **Secure Access to Data**: Mechanisms like session-based security associated with user roles shall block unauthorized users from accessing restricted data.

3.Guest Engagement:

- **Interactive Animal Profiles**: Let mobile users use QR codes to reach thorough animal information and enhance their learning process.
- **Real-Time Feedback**: Allow users to share their digital feedback in real-time to improve communications and services.

4.Data management, and integrity:

- **Centralized Database**: Operational data be kept stored within the normalized MySQL environment to ensure data accuracy and consistency.
- **Error Handling and Validation**: Validation must be processed on the server-side to ensure high quality of the data.

5.Responsive Design and Scalability:

- **Cross-Device Compatibility**: Let the UI be perfectly fine on desktop, tablets, and mobile.
- **Scalability**: Build the system so as to be ready for future additions of modules, integration, and other growing user requirements.

6.Including QR:

- **Dynamic generation of QR**: Automatically generate unique QR codes for every animal.
- **Mobile interaction**: Allows customers to have quick access to animal, habitat, and behavior information by simply scanning.

The following section provides a brief overview of the norms used ...

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II. TOOLS AND TECHNOLOGY

PHP

PHP (Hypertext Preprocessor) is a commonly used server-side scripting language for developing dynamic web applications. PHP is being used for form validation, session management, dynamic content creation, and Zootomate core business logic. It also communicates with MySQL to retrieve and manipulate data. PHP has been furthermore used to implement role-based access control so that the users can access modules based on the role assigned to them.

MySQL

MySQL is a robust, open-source relational database management system that is used to store and manage structured data in Zootomate. It assists in maintaining current information about user credentials, animal profiles, sponsorship information, event details, and visitor reviews. The database is normalized to ensure data integrity and efficient querying. A graphical user interface known as phpMyAdmin was used to administer the MySQL database during development.

PHP QR Code Library

This module was used to generate a dynamic QR code for each animal profile. Visitors who scan these codes are directed to a particular webpage that contains extensive information about the animal's species, habits, habitat, and feeding schedule. The educational value and visitor engagement are enhanced by this feature.

Wamp Server

WampServer is a Windows-based web development environment that allows developers to create web applications using Apache2, PHP, and MySQL. The name "WAMP" stands for Windows, Apache, MySQL, and PHP. WampServer simplifies the process of setting up a web server on a local machine, making it an ideal tool for web developers and testers.

Installation and Setup

a. Download and Install

- **Download**: WampServer can be downloaded from the official website WampServer.
- **Installation**: The installation wizard guides users through the process, allowing selection of components and configuration options.

b. Configuration

- **Apache**: Configure virtual hosts, security settings, and modules via the httpd.conf file.
- **MySQL**: Set up databases and users, configure server settings through the my.cnf file.
- **PHP**: Customize PHP settings such as memory limits, error reporting, and module inclusion in the php.ini file.

Using WampServer

Starting and Stopping Services

Control Panel: WampServer includes a control panel for starting and stopping Apache and MySQL services, and for switching between different PHP versions.

System Tray Icon: The WampServer icon in the system tray indicates the server status (green for running, yellow for partially running, red for stopped).

Developing Web Applications

- **Document Root**: Place web files in the www directory inside the WampServer installation directory.
- **Accessing Applications**: Access local web applications via the browser at http://localhost/yourproject.

Database Management

- **phpMyAdmin**: Manage databases through the phpMyAdmin interface at http://localhost/phpmyadmin.

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III. METHODOLOGY

Using an incremental and modular software development methodology, Zootomate components were built, tested, and enhanced in phases. It started with an analysis of the requirements, wherein conventional zoo procedures were reviewed, discussions with the zoo personnel took place, and feedback from administrators, visitors, and other potential end users was gathered. From there came precisely structured functional and non-functional requirements.

The system design was then taken up, which used UML diagrams to arrange the modules through use-case and class diagrams. Referring to the three-tier model of system architecture, the data management (MySQL), application logic (PHP 8.x), and visual layer (HTML5, CSS3, Bootstrap 5) were segregated.

PHP and MySQL scripts were tested in real-time by using WampServer for local development. Each application module be it user registration, ticket booking, QR creation, and so on—was developed and tested individually before being integrated using modular coding techniques.

An important procedural step was the installation of the PHP QR Code Library, which could dynamically generate QR codes for animal profiles. These codes improved the educational value and user interactivity with the system, as scanning them with a mobile device would display comprehensive information about the animal.

The testing procedures consisted of system testing for concurrent user performance, integration testing on the linked processes, and unit testing for the individual modules. The trial operations produced a feedback loop whereby feedback was collected through Google Forms, which was then used for further enhancements.

After the system's development and delivery, the zoo staff participated in user training to provide smooth adoption. Finally, a maintenance plan for future updates, bug fixes, and feature enhancements based on real usage data was presented for approval.

IV. RESULTS AND DISCUSSION

There have been numerous other enhancements provided by Zootomate in the field of the general efficiency of zoo operations and UX (user experience). The accomplishment of the primary objectives of the system successfully digitized important processes such as sponsorship tracking, ticket purchasing, animal data management, and communication with visitors. Since user roles were clearly defined, each module operated as it was supposed to, ensuring ease of access and operation for the users. With the help of PHP sessions, Role Based Access Control (RBAC) was implemented to segregate user privileges and secure the system. Administrators are enabled to manage users and see system-wide statistics, whereas zookeepers only have privileges to perform animal-related activities. The remaining functionalities that included booking, feedback, and sponsorships are working and open only to visitors and sponsors.

The noteworthy addition of the PHP QR Code library resulted. QR codes for each species of animal were generated on the spot and linked to detailed profiles in the database. Testing-swarmed users scanned QR codes for real-time information on an animal, including species, habitat, and feeding times, all through their mobiles. Hence, this feature accomplished providing an interactivity and educational experience for the visitors-the very digital interchange people expect today.

V. CONCLUSION

Zootomate is a good example that traditional zoo operations were transformed by a centralized web-based operation system. By layering role-based access, real-time data capture, and QR code implementations of data verification, the platform increases engagement among visitors and fast-tracks administrative procedures. Sensitive data are protected with secure session management, and its interface ensures accessibility regardless of the device used to access the system. Because of its modular setup and comprehensive testing, the system caters to the needs of varying stakeholders, such as administrators, zookeepers, sponsors, and visitors. Zootomate is an interactive and scalable approach that serves as a foundation for developments like language support, analytics dashboards, and mobile app integration for its usability and accessibility.

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