Graphical Password Based Authentication System for Software

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Abstract: In the field of digital security, a conventional verification solution was based on passwords historically vulnerable to violation and unauthorized approach. Historically, the password systems have proceeded from basic alphanumeric combinations to complex multi -factor authentication mechanisms to alleviate growing cyber threats. Regardless of this development, the recent cyber security evaluation shows that more than 80% of data violations include endangered data, emphasizing the permanent vulnerability of current systems. Current techniques, including two -factor verification, improve safety, but often present difficulty with usability and remain vulnerable to specific offensive vectors such as phishing and gross attacks. This article presents an innovative three -layer method of verifying a graphic password aimed at strengthening security in various applications such as electronic trade, banking and social network platforms. The system seeks to reduce the predominant vulnerability associated with conventional and two -factor authentication systems by including user -selected color preferences, preferred sports and components of graphics derived from the selection of picture points. Historical data underlines a shift from a text based on graphic authentication and proves continuous efforts to improve user experience while maintaining security. Statistical research suggests a possible reduction in violation of events using layer verification methods. The proposed system solves the limitation of current verification procedures and provides a scalable solution suitable for various application contexts and therefore increases the robust frame of cyber security.

Index terms *- Graphical Password, Multi-layer Authentication, Cybersecurity, User Authentication, Security Enhancement.*

1. INTRODUCTION

Verification is a key element of current digital security, which guarantees that only allow users to access critical information and systems. Conventional verification techniques mainly depend on alphanumeric slogans, which are often vulnerable to attacks on hackering, phishing and brutal power. This project is a graphic password authentication system to mitigate vulnerability by incorporating user preferences and graphics passwords to a multi -layer verification frame.

In the digital era, ensuring that user identification becomes essential due to growing addiction to online platforms for vital services such as banking, electronic trade and social media. Conventional password -based methods, although necessary for digital security, have become more inadequate in protecting advanced cyber attacks [1, 2]. The procedure of authentication methods reflected the growing sophistication of cyber attacks, which has led to the creation of multi -factor and graphical authentication systems designed to improve safety.

Historically, the authentication of users has evolved from basic knowledge -based methods, such as alphanumeric passwords, more sophisticated approaches with multiple factors that integrate something the user knows, something the user has, and something the person embodies. Regardless of this development data from cyber security surveys expanding 2020 to 2023 show that the essential majority of data violations continue to use endangered credentials, emphasizing the permanent weaknesses of current systems. A 2023 data investigation report suggests that more than 80% of disruptions included stolen or weak credentials.

As a viable alternative, graphic password systems have appeared and use the capacity of users to recognize and remember visual elements instead of memorizing complex character sequences. These solutions can increase security by increasing the entropy of the password and reducing vulnerability to the predominant offensive vectors such as brutal power and phishing. However, current graphic verification techniques often find difficulty in the usability, complexity of storage and susceptibility to attack on the shoulder.

This research is an innovative three -layer graphic password verification system aimed at increasing security in different applications [10]. The system integrates user -defined color and sports preferences, followed by a graphical layer of password in which users choose specific areas in the figure. The method improves security by storing pixel coordinates with the level of approximation and maintains flexibility in the user input. This multilateral strategy seeks to solve the shortcomings of conventional and current graphic systems by offering more resistant protection against unauthorized approach.

Incorporating this method of verification into the current applications-teaching platform of electronic trading on cyber security tools-it develops its adaptability and scalability [17]. The usefulness of the system is increased by administrative features such as user management and feedback analysis, which makes it easier to improve by user interactions and security evaluation. This research increases the development of secure and user -friendly verification techniques by engaging safety and usability in an increasingly connected digital landscape.

2. LITERATURE SURVEY

[1] This analysis examines the diverse schemes of the graphic password and emphasizes their advantages memorable and resistance to conventional attacks. However, he notes that numerous systems show insufficient resistance to shoulder attacks and paint.

[2] The paper analyzes multilayer authentication framework and shows increased safety compared to one factor techniques. The authors identify usability problems and increased complexity as remarkable disadvantages.

[3] This study examines the impact of the integration of users' preferences, including popular colors and sports, on the involvement of users and the robustness of verification. The document identifies limited scalability as a restriction.

[4] The authors advocate a pixel -based methodology for graphic passwords that increase entropy by

choosing coordinates. They recognize the direction of storage and processing as significant disadvantages.

[5] This analysis evaluates text, graphical and biometric verification approaches and concludes that although graphic methods provide excellent memorable, they often require more users and complex implementation.

[6] The research examines the diverse methodology of safe storage for information about the graphic password, emphasizes encryption and hash. It underlines a compromise between system security and performance.

[7] This study evaluates the usability of multi -factor systems with an emphasis on user experience and emphasizes that increasing safety often threatens user comfort and simplicity of the system.

[8] The authors examine recent developments in two -factor authentication, include biometrics and one -time passwords and evaluate their efficiency and limitations across different application scenarios.

[9] This research examines authentication systems that are resistant to phishing attacks, include graphic and behavioral methods, while emphasizing the importance of user education.

[10] Research offers scalable authentication solutions suitable for applications with high traffic and emphasizes the need for systems that harmonize security, performance and user experience.

3. METHODOLOGY

i) Proposed Work:

The aim of the graphic password verification system is to offer a safe authentication mechanism that uses cognitive memory and mitigates the weaknesses of your own standard HESS. The system uses the three -stage verification method that strengthens security while maintaining the user [12]. The three main layers include:

1. User Preferences Layer:

● Users have to choose a preferred color and sport during registration.

● These selections act as special verification measures to confirm the user's identity.

● This procedure guarantees that even if the attacker acquires the user's password, he must still be aware of personal preferences.

2. Graphical Password Layer:

● Users indicate four unique locations in the picture as a password.

● The system captures the X and Y coordinates of each point, allowing modest tolerance to take into account minor discrepancies during subsequent login.

● This method, unlike alphanumeric slogans, alleviates the risk of dictionary attacks and significantly reduces the efficacy of gross force techniques.

3. Secure Login Validation:

● Users must accurately enter their selected color and sport before entering to verify the graphics password.

- If the information supplied corresponds to the archived data, the system shall order the user to identify the same four locations in the figure.

- The system connects the clicks with archived coordinates, allowing minor discrepancies (± 5 pixels) to increase the usability while maintaining security.

This multilayer authentication system increases security by thwarting unauthorized access, even if the hacker tries to endanger one of the verification phases.

ii) System Architecture:

The authentication system was created as a web application including a three -stage security mechanism. The system architecture consists of a front-end interface for users and a back-end database for secure storage of verification information [3]. During registration, customers initially choose the desired color, then choose their favorite sport and finally mark four separate places for the selected image to create a graphics password. Selected pixels coordinates are recorded in a database with an acceptable range of approximation to adapt to slight discrepancies during login attempts.

Sign -up procedure parallels the registration phase: users must initially confirm their color selection, then their sports preferences, and finally verify through the graphical password by selecting stains in the picture. After successful verification, customers will gain access to the adapted control panel that demonstrates their profile and feedback [6]. Administrators have access to user management tools, password analysis metrics, and feedback analysis displayed in graphic representations.

Security protocols include data encryption, secure transmission protocols (SSL/TLS), and verifying the input of injection attacks. The system underwent testing on many platforms to verify compatibility and performance under different circumstances of the load. The user feedback was collected in order to evaluate the usability and determination of the areas for improvement and subsequent modifications of the login procedure [9].

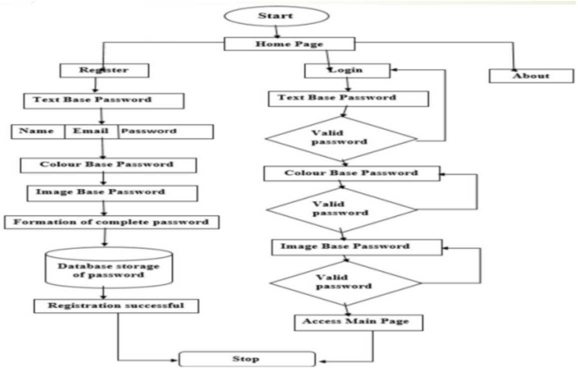

Fig 1 Proposed Architecture

1. Component-Based Architecture

- React components: Modular user interface components for verification, control panel and password input.

- Custom hooks: The USE Graphical Password hook supervises the status and verification of graphics passwords.

- Responsive Design: Use of Bootstrap and CSS FlexBox for Mobile First Strategy

2. Multi-Layer Authentication Strategy

- Text password layer: conventional alphanumeric password with complexity verification

- Graphic Password Layer: System selection system based on canvas with 15px tolerance
- A layer based on preference: users' preferences (color/sport) work as a cognitive reinforcement

iii) Modules:

Modules Description

1. **User Registration Module**

   It allows new users to register with the collection of color preferences, popular sports and selection of graphics passwords.

2. **Login Module**

   It verifies users using a three -layer security process that verifies color, selection of sport and graphical password.

3. **Dashboard Module**

   It allows authenticated users to display information about their profile and provide inputs and ensure more personalized user experience.

4. **Admin Management Module**

   Administrators can manage users, analyze password security metrics, and monitor feedback data using graphical representations.

Algorithm:

```
BEGIN
  DISPLAY image grid to user
  IF (first-time registration) THEN
    USER selects a sequence of images/points
    STORE the selected sequence securely
  ELSE
    PROMPT user to select the correct sequence
    RETRIEVE stored sequence
    IF (input sequence == stored sequence) THEN
      GRANT access
    ELSE
      DENY access
    ENDIF
  ENDIF
END
```

4. EXPERIMENTAL RESULTS

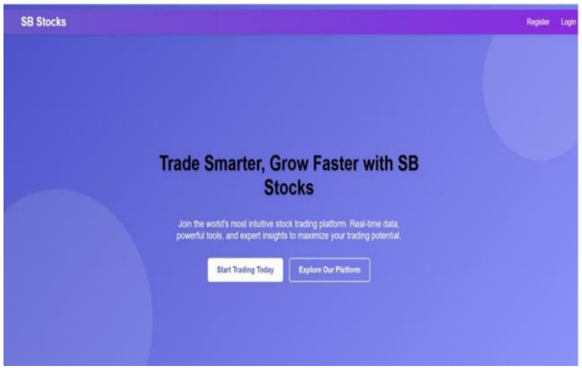

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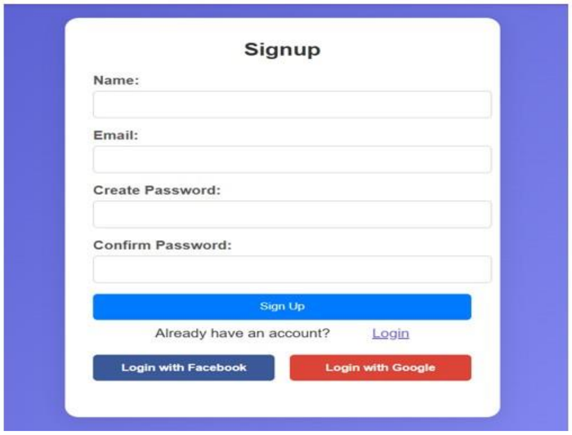
Fig 2 Home page

This screen displays the default input page for the user to get the project information.



Already have an account? Login

Fig 3 register page

On this screen, save the user information to the database and send the confirmation e -mail.

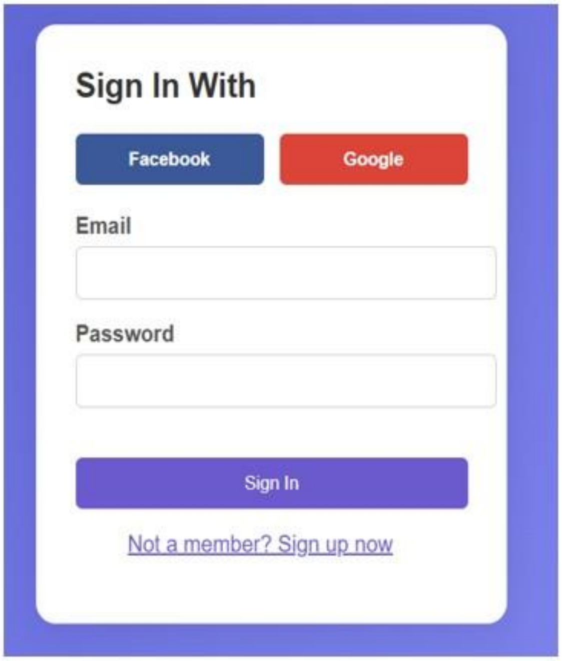
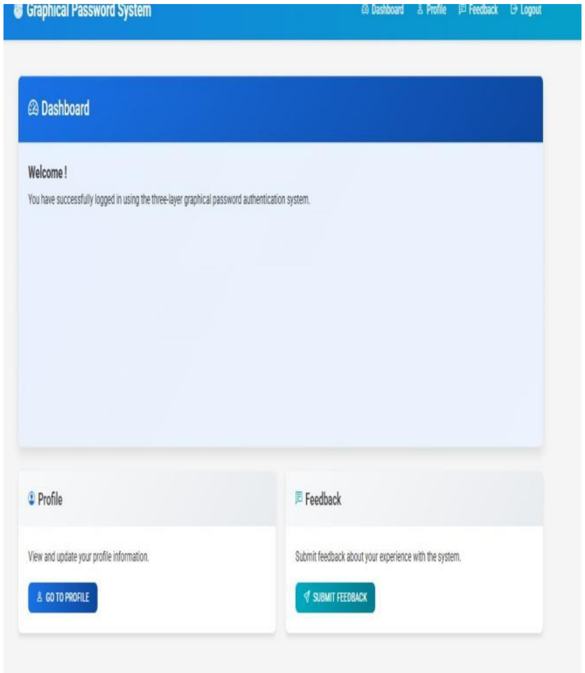


Fig 4 Login page

Verify the user on this screen and start the session.



Welcome !

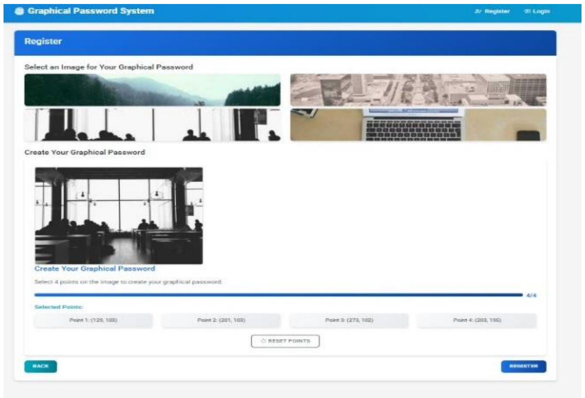
You have successfully logged in using the three-layer graphical password authentication system.

View and update your profile information.

Submit feedback about your experience with the system.

Fig 5 Profile

On this screen, the user can see and update the profile details.


Graphical Password System
Register
Login
Register
Select an Image for Your Graphical Password
Create Your Graphical Password
Create Your Graphical Password
4/4
Selected Points:
RESET POINTS
BACK
REGISTER

Select 4 points on the image to create your graphical password.

Point 1: (120, 103)

Point 2: (201, 103)

Point 3: (273, 102)

Point 4: (203, 195)

Fig 6 Image desk

5. CONCLUSION

Creating a three -layer graphic password authentication system indicates a big step forward to improving digital security in different applications. By combining the color and sports preferences of the user with the graphical password method, the solution not only tightens authentication protocols, but also increases the interest and memorable user. Historical and statistical data emphasizes the persistent vulnerability of traditional and two -factor authentication techniques and emphasizes the need for stronger solutions. The proposed system effectively solves these problems by incorporating other safety layers that reduce popular attack vectors such as brutal force, phishing and shoulder surfing. In addition, the scalability and smooth integration characteristics of the system are suitable for a wide range of application contexts, including electronic trading platforms and cyber security. Administrative functions extend their usability by offering full user management and intelligent feedback analysis. Overall, this initiative contributes to the ongoing efforts to ensure safer, more user -friendly and adaptive authentication techniques, which eventually strengthens the basis of digital security in an increasingly connected world.

6. FUTURE SCOPE

Biometric Integration

If you want to improve security, integrate biometric authentication factors such as fingerprint or face recognition.

Adaptive Authentication

Implement adaptive authentication techniques that change security requirements in response to user behavior and risk profiles.

Mobile Application Support

Increase the compatibility of the authentication system with mobile platforms and ensure safe access across several devices and operating systems.

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