

Anti phishing Framework using a Modified captcha technique

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Abstract— Phishing is a technique of the fraudulent by creating exact look-a-like well known portal and making the possibility such that the users are navigated to phishing portal rather than the original portal and capturing the sensitive data like usernames, passwords etc. with the advantage of phishing portal and misusing the information. Many have proposed the solution for anti-Phishing area and their focus is on identifying the phishing as main. This Work comes up with a unique fame work to overcome this problem with a well know captcha technology. User is being questioned with multiple authentication procedures in order to tackle with phishing problem.

Index Terms— Phishing, visual cryptography, image captcha, shares, websites, passwords, Security.

1 INTRODUCTION

The fraudulent web site that supports the phishing email is designed to mirror the legitimate web site it is purporting to be. The fraudsters use multiple methods to do this, including using genuine looking images and text, disguising the URL in the address bar or removing the address bar altogether. The purpose of the web site is to trick consumers into thinking they are at the company's genuine web site, and giving their personal information to the trusted company they think they are dealing with.

In order to trick victims into falling for their scams, the attacker needs to either create a domain to use for their attacks or spoof an existing domain. Let's take a look at these numbers...

In the second half of 2011, there were 83,083 unique phishing domains worldwide; 200 of them were considered top level domains according to the Global Phishing Survey. In the same time period, 520 existing domains (like financial institutions and social networking sites) were targeted for phishing attacks. The top 20 targets accounted for 78 percent of all attacks.

In the first half of 2011, PayPal was the number one targeted domain for phishing attacks with a recorded 34,209 attacks. In the second half of 2011, the number of

PayPal attacks dropped to 7,169 attacks and Taobao.com, a Chinese site, took over the top spot with a recorded 18,508 attacks.

Of the domains used for phishing in the second half of 2011 25 percent were registered maliciously by phishers; 75 percent of the attacks came from domains that were compromised by cyber-criminals.

Finally, URL shortening was only used in 398 attacks in the second half of 2011, probably because users have come to lose trust in URLs that are hidden by shortening services.

Using existing companies as bait for phishing attacks seems to be on the rise again as shown by the fact that 400 brands have been used in phishing emails in the first quarter of 2012 alone.

The impact of phishing is on the verge of growth every year which can be an observed in the statistics stated above which has prompted in taking and Area of Research.

Today, most applications are only as secure as their underlying system. Since the design and technology of middleware has improved steadily, their detection is a difficult problem. As a result, it is nearly impossible to be sure whether a computer that is connected to the internet can be considered trustworthy and secure or not. Phishing scams are also becoming a problem for online banking and e-commerce users. The question is how to handle applications that require a high level of security.

Phishing is a form of online identity theft that aims to steal sensitive information such as online banking passwords and credit card information from users. Phishing scams have been receiving extensive press coverage because such attacks have been escalating in number and sophistication. One definition of phishing is given as "it is a criminal activity using social engineering

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techniques. Phishers attempt to fraudulently acquire sensitive information, such as passwords and credit card details, by masquerading as a trustworthy person or business in an electronic communication". Another comprehensive definition of phishing, states that it is "the act of sending an email to a user falsely claiming to be an established legitimate enterprise into an attempt to scam the user into surrendering private information that will be used for identity theft". The conduct of identity theft with this acquired sensitive information has also become easier with the use of technology and identity theft can be described as "a crime in which the impostor obtains key pieces of information such as Social Security and driver's license numbers and uses them for his or her own gain".

Phishing [1] attacks rely upon a mix of technical deceit and social engineering practices. In the majority of cases the phisher must persuade the victim to intentionally perform a series of actions that will provide access to confidential information. Communication channels such as email, web pages, IRC and instant messaging services are popular. In all cases the phisher must impersonate a trusted source (e.g. the helpdesk of their bank, automated support response from their favourite online retailer, etc.) for the victim to believe. To date, the most successful phishing attacks have been initiated by email – where the phisher impersonates the sending authority (e.g. spoofing the source email address and embedding appropriate corporate logos). For example, the victim receives an email supposedly from support@mybank.com (address is spoofed) with the subject line 'security update', requesting them to follow the URL www.mybank-validate.info (a domain name that belongs to the attacker – not the bank) and provide their banking PIN number.

So here introduces a new method which can be used as a safe way against phishing which is named as "Anti phishing Framework using a Modified captcha technique". As the name describes, in this approach website cross verifies its own identity and proves that it is a genuine website (to use bank transaction, E-commerce and online booking system etc.) before the end users and make the both the sides of the system secure as well as an authenticated one.

"Anti phishing Framework using a Modified captcha technique" is a framework which on adoption associates multiple benefits

- Early detection of phishing
- Less network resources are used for anti-phishing framework
- Easy Access and Maintenance System

- Provides high Privacy preserving Technique
- Out Performs other anti- Phishing Techniques
- Provides high Secured Environment

The concept of image processing and an improved visual cryptography is used. Image processing is a technique of processing an input image and to get the output as either improved form of the same image and/or characteristics of the input image. Visual Cryptography (VC) is a method of encrypting a secret image into shares, such that stacking a sufficient number of shares reveals the secret image.

This paper is organized as follows: Section II deals with the related work using Visual Cryptography and Section III & IV presents the current and proposed Methodologies. Section V presents the implementation and Section VI deals with Results and Discussions. Section VII contains the conclusion.

2 VISUAL CRYPTOGRAPHY

One of the best known techniques to protect data is cryptography. It is the art of sending and receiving encrypted messages that can be decrypted only by the sender or the receiver. Encryption and decryption are accomplished by using mathematical algorithms in such a way that no one but the intended recipient can decrypt and read the message. Naor and Shamir [2] introduced the visual cryptography scheme (VCS) as a simple and secure way to allow the secret sharing of images without any cryptographic computations.

A brief survey of the related work in the area of visual cryptography is presented. Visual cryptography schemes were independently introduced by Shamir [3] and Blakley [4], their original motivation was to safeguard cryptographic keys from loss. These schemes also have been widely employed in the construction of several types of cryptographic protocols [5] and consequently, they have many applications in different areas such as access control, opening a bank vault, opening a safety deposit box, or even launching of missiles. A segment based visual cryptography suggested by Borchert [6] can be used only to encrypt the messages containing symbols, especially numbers like bank account number, amount etc. The VCS proposed by Wei-Qi Yan et al., [7] can be applied only for printed text or image.

A recursive VC method proposed by Monoth et al., [8] is computationally complex as the encoded shares are further encoded into number of sub-shares recursively. Similarly a technique proposed by Kim et al., [9] also suffers from computational complexity, though it

avoids dithering of the pixels. Most of the previous research work on VC focused on improving two parameters: pixel expansion and contrast [10],[11],[12]. In these cases all participants who hold shares are assumed to be honest, that is, they will not present false or fake shares during the phase of recovering the secret image. Thus, the image shown on the stacking of shares is considered as the real secret image. But, this may not be true always. So cheating prevention methodologies are introduced by Yan et al., [13], Horng et al., [14] and Hu et al., [15]. But, it is observed in all these methodologies, there is no facility of authentication testing.

Visual Cryptography Scheme is a cryptographic technique that allows for the encryption of visual information such that decryption can be performed using the human visual system. We can achieve this by one of the following access structure schemes.

1.(2,2) Threshold VCS scheme- This is a simplest threshold scheme that takes a secret message and encrypts it in two different shares that reveal the secret image when they are overlaid. No additional information is required to create this kind of access structure.

2. (2, n) Threshold VCS scheme-This scheme encrypts the secret image into n shares such that when any two (or more) of the shares are overlaid the secret image is revealed. The user will be prompted for n, the number of participants.

3. (n, n) Threshold VCS scheme-This scheme encrypts the secret image to n shares such that when all n of the shares are combined will the secret image is revealed. The user will be prompted for n, the number of participants.

4. (k, n) Threshold VCS scheme- This scheme encrypts the secret image to n shares such that when any group of at least k shares are overlaid the secret image will be revealed. The user will be prompted for k, the Threshold,, and n, the number of participants.

In the case of (2, 2) VCS, each pixel P in the original image is encrypted into two sub pixels called shares. Fig.1 denotes the shares of a white pixel and a black pixel. Note that the choice of shares for a white and black pixel is randomly determined (there are two choices available for each pixel). Neither share provides any clue about the original pixel since different pixels in the secret image will be encrypted using independent random choices. When the two shares are superimposed, the value of the original pixel P can be determined. If P is a black pixel, we get two black sub pixels; if it is a white pixel, we get one black sub pixel and one white sub pixel.

Pixel	Probability	Shares #1	Shares #2	Superposition of the two shares	
□	$p = 0.5$	■	■	■	White Pixels
	$p = 0.5$	□	□	□	
■	$p = 0.5$	■	■	■	Black Pixels
	$p = 0.5$	□	□	□	

Fig. 1 Illustration of a 2-out-of-2 VCS scheme with 2 sub pixel construction.

3 CURRENT METHODOLOGY

In the current scenario as shown in the Fig. 2, when the end user wants to access his confidential information online (in the form of money transfer or payment gateway) by logging into his bank account or secure mail account, the person enters information like username, password, credit card no. etc. on the login page. But quite often, this information can be captured by attackers using phishing techniques (for instance, a phishing website can collect the login information the user enters and redirect him to the original site). There is no such information that cannot be directly obtained from the user at the time of his login input.

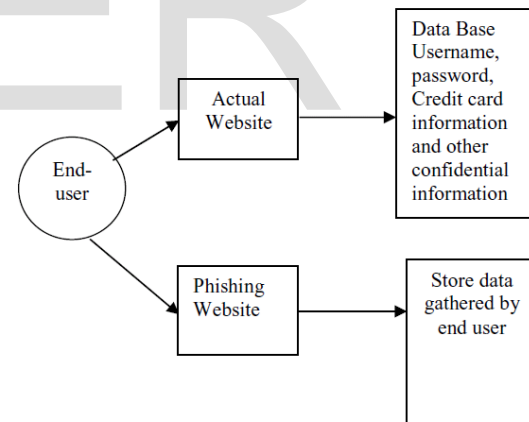


Fig.2 Current scenario

4 PROPOSED METHODOLOGY

In this Work we have proposed a new approach named as "Anti phishing Framework using a Modified captcha technique "to solve the problem of phishing. Here an image based authentication using Visual Cryptography is implemented. The use of visual cryptography is explored to preserve the privacy of an image captcha by decomposing the original image Captcha into two shares (known as sheets) that are stored

in separate database servers (one with user and one with server) such that the original image captcha can be revealed only when both are simultaneously available; the individual sheet images do not reveal the identity of the original image captcha. Once the original image captcha is revealed to the user it can be used as the password. Using this website cross verifies its identity and proves that it is a genuine website before the end users.

The proposed approach can be divided into two phases:

- A. Registration Phase
- B. Login Phase

A. Registration Phase

In the registration phase, a key string (password) is asked from the user at the time of registration for the secure website. The key string can be a combination of alphabets and numbers to provide more secure environment. This string is concatenated with randomly generated string in the server and an image captcha [16][17] is generated. The image captcha is divided into two shares such that one of the shares is kept with the user and the other share is kept in the server. The user's share and the original image captcha is sent to the user for later verification during login phase. The image captcha is also stored in the actual database of any confidential website as confidential data. After the registration, the user can change the key string when it is needed. Registration process is depicted in Fig.3.

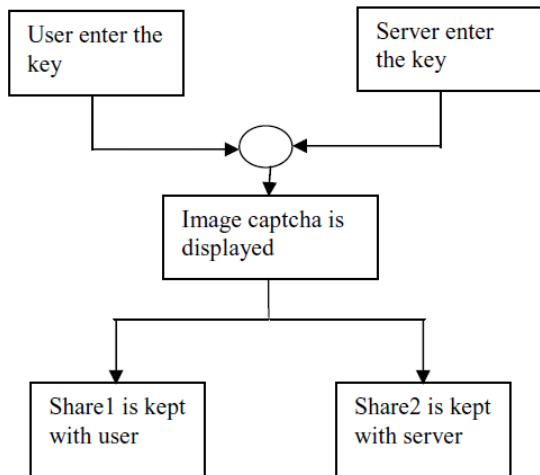


Fig.3 when user performs registration process for the website

B. Login Phase

When the user logs in by entering his confidential information for using his account, then first the user is asked to enter his username (user id). Then the user is asked to enter his share which is kept with him. This share is sent to the server where the user's share and share which is stored in the database of the website for each user, is stacked together to produce the image captcha. The image captcha is displayed to the user. Here the end user can check whether the displayed image captcha matches with the captcha created at the time of registration. The end user is required to enter the text displayed in the image captcha and this can serve the purpose of password and using this, the user can log in into the website. Using the username and image captcha generated by stacking two shares one can verify whether the website is genuine/secure website or a phishing website and can also verify whether the user is a human user or not. This phase is depicted in Fig.4.

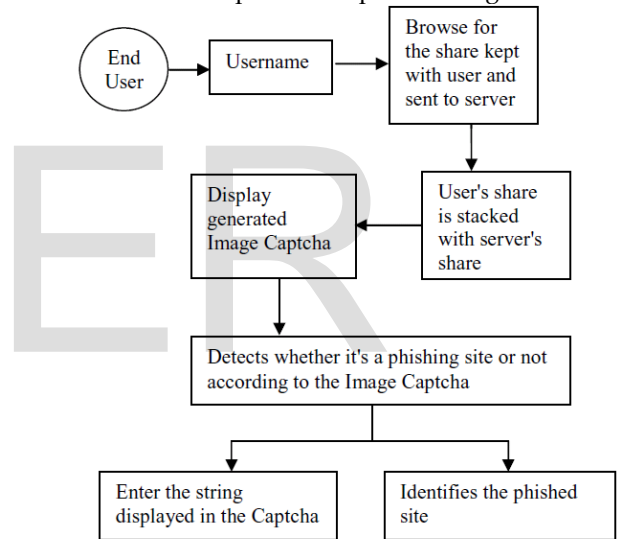


Fig.4

when user attempts to log in into site

5 IMPLEMENTATION & ANALYSIS

The proposed methodology is implemented using Java. Fig 5, Shows the result of creation and stacking of shares.

In the registration phase the most important part is the creation of shares from the image captcha where one share is kept with the user and other share can be kept with the server.

For login, the user needs to enter a valid username in the given field. Then he has to browse his share and process. At the server side the user's share is combined with the share in the server and an image captcha is generated. The user has to enter the text from

the image captcha in the required field in order to log in into the website.

The entire process is depicted in Fig.5 as different cases. Case1 and Case 2 illustrates the creation and stacking of shares of two image captcha's resulting in original captcha. In Case3 share1 of first image captcha (Case.1) is combined with share2 of second captcha (Case.2) resulting in an unrecognizable form of captcha.

Case.1

Original Captcha	Share 1	Share 2	Reconstructed Captcha

Case.2

Original Captcha	Share 1	Share 2	Reconstructed Captcha

Case.3

Share 1 of Case1	Share 2 of Case2	Reconstructed Captcha

Fig.5

Creation and stacking of shares

6 RESULTS AND DISCUSSIONS

It is observed that both original and reconstructed image captcha's are related with high degree of correlation. The correlation coefficient of original captcha and reconstructed captcha are shown in TABLE I. Also when two different shares are stacked their corresponding correlation co-efficient is obtained as - 0.0073. This shows that there will be zero degree of correlation between original and output images for two different shares.

TABLE I

Original Captcha	Reconstructed Captcha	Correlation Coefficient
		0.9679
		0.9598
		0.9627
		0.9578
		0.9657

7 CONCLUSION

Currently phishing attacks are so common because it can attack globally and capture and store the users' confidential information. This information is used by the attackers which are indirectly involved in the phishing process. Phishing websites as well as human users can be easily identified using our proposed "Anti-phishing framework based on Visual Cryptography". The proposed methodology preserves confidential information of users using 3 layers of security. 1st layer verifies whether the website is a genuine/secure website or a phishing website. If the website is a phishing website (website that is a fake one just similar to secure website but not the secure website), then in that situation, the phishing website can't display the image captcha for that specific user (who wants to log in into the website) due to the fact that the image captcha is generated by the stacking of two shares, one with the user and the other with the actual database of the website.

Second layer cross validates image Captcha corresponding to the user. The image Captcha is readable by human users alone and not by machine users. Only human users accessing the website can read the image Captcha and ensure that the site as well as the user is permitted one or not. So, using image Captcha technique, no machine based user can crack the password or other confidential information of the users. And as a third layer of security it prevents intruders' attacks on the user's account. This method provides additional security in terms of not letting the intruder log in into the account even when the user knows the username of a particular user. The proposed methodology is also useful to prevent

the attacks of phishing websites on financial web portal, banking portal, online shopping market.

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