Comparative Analysis of CAPTCHA Based Techniques : A Review

Jaswinderkaur
Department of Computer Engineering
Punjabi University, Patiala
 jaswinderkaur.jassi.jassi@gmail.com

Lal Chand Panwar
Department of Computer Engineering
Punjabi University, Patiala
lc_panwar@yahoo.com

Abstract:*CAPTCHA(Completely Automatic Public Turing test to tell Computers and Humans Apart) is used by every website on the internet to prevent unauthorized user or bots to use the bandwidth and resources of the network. At the present time every user has to register on the website to access any type of information or resources so he/she has to pass the CAPTCHA test. If the user has passed the CAPTCHA test he/she is assumed to be legitimate user and can access resources or information from that site otherwise he/she is attacker or bots. So due to more attack on the web sites CAPTCHA is used to prevent these attacks. This is more popular technique used in present scenario.*
This paper focus on the scope of CAPTCHA,various types of CAPTCHA and its techniques.

Keywords:*CAPTCHA, Time variant, Text based, Gimpy ,Bongo, MSN,iCAPTCHA, color based CAPTCHA.*

I.INTRODUCTION

CAPTCHA stands for "Completely Automatic Public Turing test to tell Computers and Humans Apart". It is simple test which is solved by human easily but it is difficult for Bots that are automated scripts. CAPTCHA has been broadly used in commercial websites such as web-based email providers, yahoo, Gmail, and Facebook etc. to protect their resources or bandwidth from attackers [1]. CAPTCHA is developed in 2000 by luis von Ahn, Manuel Blum, Nicholas J.Hopper and Jhon Langford.
 CAPTCHAs are puzzles based technique used to determine whether a user is human or not.

In other words a CAPTCHA is a program that can generate tests that most humans can pass but computer programs   cannot pass. Main motive of CAPTCHA is to block form submission, comment spamming, email spamming etc from the bots. CAPTCHAs should have three basic properties:
a) Easy for humans to pass.
b) Easy for a tester machine to generate and grade.
c) Hard for a software programs to pass. [1][2]

II. TYPES OF CAPTCHAs

A. Text CAPTCHAs: Text CAPTCHAs are very simple. Thissimplest approach is to ask the user with some questions which only a human user can solve. Examples of such questions are:
- What are two multiply three?
- What is the third letter in college?
- Which of Red, Monday and Mohan is a color?

There are other types Of Text CAPTCHA as:

1. Gimpy*: Gimpy is very reliable and secure CAPTCHA. In this CAPTCHA ten random words from the dictionary are fetched, display these words in overlap and distorted manner. Then Gimpy ask the user to enter at least three words from those ten words. The human user can do so but computer bots can't. Gimpy is developed by CMU collaboration with

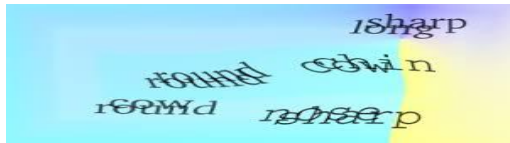yahoo for their Messenger Services.[5]Example as shown in fig.1

Fig1. Gimpy Image[11]

2 Ez–Gimpy:Ez-Gimpy is simplified version of Gimpy CAPTCHA. In this, a single dictionary word is taken then make it distorted, noisy and present to the user. Then ask the user to identified the word correctly. This CAPTCHA is adopted by yahoo in their signup page. As Show in Fig.2

Fig. 2.Ez-Gimpy[11]

3. Baffle Text:Baffled text is simple type of CAPTCHA. To create the baffle text, the random alphabets are chosen to create nonsense word. Then make it distorted and ask the user to guess the word and enter in textbox. Baffled text don't use dictionary word so it overcome the drawback of Gimpy CAPTCHA i.e. dictionary attacks.In Baffled Text it is assumed that humans are very good to fill the missing portions of an image as shown in Fig. 3 while computers are not.[9][10]

Fig 3. Baffle Text[11]

4. MSN CAPTCHA:MSN CAPTCHA is also known as Passport service CAPTCHA. It is used by the Microsoft. This CAPTCHA contain eight upper case characters and digits that are dark blue in color and background in grey. Wrapping is used to distort the characters and for ripple effect., which makes computer recognition very difficult.[9][10]

Fig4. MSN CAPTCHA[11]

B. Audio-based CAPTCHAs

Audio based CAPTCHA is mainly developed for visually disabled people. In the Audio based CAPTCHA distorted sound clip, sequence of number or word at random and renders the word or the numbers into a downloadable sound clip and distorts the sound clip using TTS software is used. Then this audio is presented to the user and asks users to enter its contents. User listens & enters the spoken word. It helps visually disabled users.Fig.5 shownbelow is the Google's audio enabled CAPTCHA
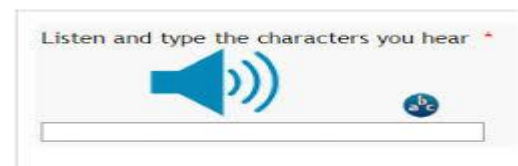

Fig5. Audio-based CAPTCHA[11]

C. Video-based CAPTCHAs:In The Video CAPTCHA,animation or video are used. In which a user must provide three words that describes a video. Then the user has to see the video and guess the words. This

approach may provide greater security and better usability than text-based and image-based CAPTCHAs..[9][10]

Fig6. Video-based CAPTCHAs[11]

D. GRAPHIC-Based CAPTCHAs

Bongo: BONGO asks the user to solve a visual pattern recognition problem. It displays two series of blocks, the leftand the right.These two sets are different because everything on the left is drawn with thick lines and those on the right are in thin lines. After seeing the two blocks,the user is presented with a single block and asked todetermine to which group the block belongs to.The user passes the test if he determines correctly to which set the blocks belong to.[9][10]
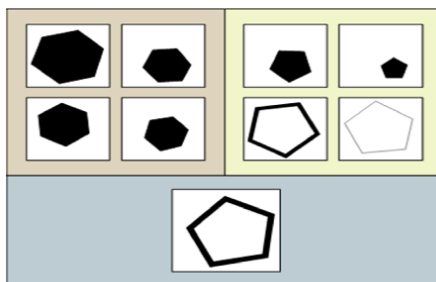

Fig 7. Bongo[11]

III. APPLICATIONS

1. Preventing Comment Spam in Blogs: Most bloggers submit fake comments, usually for the purpose of raising search engine ranks of their website. This is called comment spam. By using a CAPTCHA, only humans can enter comments on the blogs.

2. Protecting Website Registration: A few years ago companies such as Yahoo, Microsoft etc. that offers free email services suffered from bots attacksthat consume the bandwidth of network. So CAPTCHA is used to protect them.

3. Preventing Unauthorized Access: To prevent a hacker who tries to crack a password using Brute force method or any other password cracking method. CAPTCHA method is used.

4. Worms and Spam: CAPTCHA provides a solution against worms and spam i.e., it receives mail only if it is sure that there is human behind it not the computer bots.

5. Online Games: It is the another application of CAPTCHA where it is preventing web Robots from playing games

6. Phishing Attack: Phishing is attempting to get information such as bank details, usernames, passwords, and credit card details by masquerading as a trustworthy entity. CAPTCHA prevent these attacks.[9][10]

IV. Techniques on CAPTCHA

1. Hybrid collage CAPTCHA
   Hybrid collage CAPTCHA is a method in which there are different types of image along with distorted text on the right hand side of the screen. There is one image among these images on the left hand side of screen. Now the computer program ask the user to choose the correct picture with correct text name, then user is asked to enter the text name on that image in provided text box[1] As shown in figure 8.

2. Hybrid CAPTCHA

In this technique both picture and text with multiple fonts are used to build secure CAPTCHA. There is an Image on screen and many text are labeled on it with multiple fonts. The user is asked to identify the correct name of the underlying image among the text label that are scattered over it.[7]. As shown in fig.9

Fig.9 Hybrid CAPTCHA

3. iCAPTCHA

Interactive CAPTCHAtechnology defends the 3rd party human CAPTCHA attacks. In this technique the user has to solve the CAPTCHA test while interacting multiple times with this test. In this CAPTCHA the time difference between legitimate user and attacker is find which is used for better attack Detection. In iCAPTCHA there is a normal image that is randomly generated and when user clicks on the imageto begin iCAPTCHA, several buttons with obfuscated characters appear below the CAPTCHA image. Once the set of character buttons is displayed, the user must click on the button corresponding to the first character in the CAPTCHA image. Upon each click, a new set of buttons is rendered. This input sequence continues until one click has been performed for each character of the CAPTCHA image.[4] As shown in fig.10

Fig. 10iCAPTCHA[4]

4. Time Variant CAPTCHA

This is a technique in which CAPTCHA is rendered over the webpage for a fixed time period. After this time period new CAPTCHA image will display until the final CAPTCHA is filled by user.[3] As shown in fig.11a and 11b
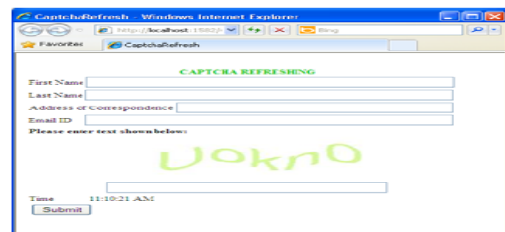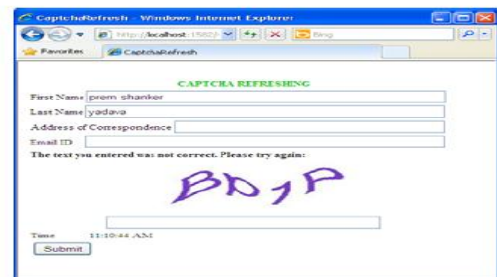

Fig.11.aCAPTCHA when form loaded[3]

Fig.11.b CAPTCHA changed after 20 sec[3]

5. Advanced Color based Image CAPTCHA

This is new technique in which color based imagesare provided to the human user and ask different question like color of the image, number of color in the image etc. These color based images can have single color, multi-color, or number of object with different colors.This is very easy and secure technique. An accuracy of 100%, 95% and 90% is observed with single color, multi color and color image based CAPTCHAs respectively. [8]

Fig.12a Color based image CAPTCHA[8]

Fig.12   b   Multi   color CAPTCHA[8]

V. Advantages of CAPTCHA

- Distinguishes between a human and a machine.
- Makes online polls more legitimate.
- Reduces spam and viruses.
- Makes online shopping safer.
- Diminishes abuse of free email account service

VI.   Disadvantages   of   Various CAPTCHA techniques

- Sometimes very difficult to read.
- These are not compatible with users with disabilities
- Time-consuming to decipher.
- Technical difficulties with certain internet browsers.

Tabel I. Comparison of Techniques

CAPTCHA Techniques	Security	Usability		
		Easy or Difficult to use	Usable for visual impaired person	Easy for motor skilled persons
iCAPTCHA	Good	Easy	NO	Easy
Hybrid CAPTCHA	Good	Easy	NO	Easy

Time-variant CAPTCHA	Good	Easy	NO	Easy
Hybrid Collage CAPTCHA	Good	Easy	NO	Easy
Color Based Image CAPTCHA	Good	Easy	NO	Average

CONCULISION

CAPTCHA is a method to block form submission, comment spamming, email spamming etc from the bots-that are automated scripts. .This paper describes the various types of CAPTCHA and techniques. It is simple and easy method which is used by most of the web sites but has many problems. Researchers are trying to mitigate these problems by building a best technique to defend application layer attacks.

REFERENCES

1. DivyaShanker, Prashant Gupta, Aditya Jaiswa " Hybrid Collagecaptcha" international journal of scientific & engineering research, volume 4, issue 1, january-2013 issn 2229-5518

2. Er. VivekKumar andEr. PremShankerYadava "Position Based CAPTCHA: Changing Place Restriction Minimize the Automatic Access" International Journal of Advanced Research in Computer Science and Software Engineering

3. PremShankerYadava, Chandra Prakash Sahu, Sanjeev Kumar "Time-Variant Captcha: Generating Strong Captcha Security by ReducingTime to Automated Computer Programs" Journal of Emerging Trends in Computing and Information Sciences VOL. 2, NO. 12, December 2011

4. Huy D. Truong, Christopher F. Turner, Cliff C. Zou "iCAPTCHA: The Next Generation of CAPTCHADesigned to Defend Against 3rd Party Human Attacks" This full text paper was peer reviewed at the direction of IEEE Communications Society subject matter experts for publication in the IEEE ICC 2011 proceedings

5. School of Computer Science. (2009, Dec.). Gimpy. Carnegie Mellon.[Online]. Available: http://www.captcha.net/captchas/gimpy/

6. Moin Mahmud Tanvee, Mir TafseerNayeem, Md. MahmudulHasanRafee" Move & Select: 2-Layer CAPTCHA" International Journal of Video & Image Processing and Network Security IJVIPNS-IJENS Vol: 11 No: 05

7. Shouket Ahmad Kouchay, Abdullah Aljumah,Yasir Ahmad" SECURED ARCHITECTURE STRATEGY FOR FIGHTING AGAINST BOTS" GESJ: Computer Science and Telecommunications 2013|No.4(40)

8. Mandeep Kumar, RenuDhir " Design and Comparison of Advanced Color based Image CAPTCHAs" *International Journal of Computer Applications (0975 – 8887) Volume 61– No.15, January 2013*

9. Kiranjot Kaur, Sunny Behal" Captcha and Its Techniques: A Review" Kiranjot Kaur et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (5) , 2014, 6341-6344

10. Kumary R Soumya1, Rose Mary Abraham2, Swathi K V3" A Survey on Different CAPTCHA Techniques" International Journal of Advances in Computer Science and Technology Volume 3, No.2, February 2014

11. Various CAPTCHA images "https://www.google.co.in/?gfe_rd=cr&ei =B65kVJvjE4vC8geu64CwCw&gws_rd= ssl#q=captcha+images"