



CAPTCHA Based on The Form of Letters

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Abstract

The internet has been playing an increasingly influential role in human daily life, with the availability of many web services such as email, search engines and social media such as Facebook, Twitter, and Snapchat. However, these are often threatened by attacks from computer programs such as bots. To address this issue, CAPTCHA (Completely Automated Public Turing Test to Tell Computers and Humans Apart) was developed to distinguish between computer programs and human users. One of simplest CAPTCHA is Text CAPTCHA where characters with some noise are presented to the user to type these characters where he could do that but the bot programs cannot. In spite of the fact that this system offers great security and limits of confinement programmed enrollment to web administrations, Text CAPTCHA has a few weaknesses which enable programmers to reach the mechanism of the CAPTCHA. This paper presents an improved Text CAPTCHA method based on the form of Letters.

Index Terms—CAPTCHA, Hacker and Bot programs.

I. INTRODUCTION

The internet contributes significantly to numerous parts of human life, for example, chatting, education, and online business activities and etc. Some web services have online registration where the users provide information in order to connect and use services such as email in Yahoo, Gmail, and Hotmail. However, many programs have been created by hackers which consequently entire website pages with inaccurate data which can cause

activity clog, limit the execution of the framework and at times, even causing it to fail, especially where a site has countless. Therefore, researchers built up a system to recognize human clients and PC programs on account of online registration. The standard component utilized right now to address this issue is CAPTCHA (Completely Automated Public Turing Test to Tell Computers and Humans Apart). The idea of CAPTCHA depends on the capacity of people to do certain assignments which PC programs can't, for example, requesting that clients solve a distorted text or pick a specific picture from numerous showed pictures.

In recent years, numerous kinds of CAPTCHAs have been created. Where are based on text, image, audio, video or based on the puzzle. The first and least difficult CAPTCHA is Text CAPTCHA where a alternation of letters and digits present to the user with adding a few changes to the characters, for example, noise, diffusing, rotating or making characters as 3D these adjustments added to keep bot programs from perusing the actual characters. Although this type presented good security it has been broken by new bot programs such as the mechanism of segmentation letters. This paper will suggest new CAPTCHA type based on the form of letters (Capital &small) and test this method by using PHP. In addition, measure their usability toward users.

The rest of this paper will be organized as follows: Section II introduces Definition, Application, History, and categories of CAPTCHA. Section III presents the CAPTCHA based on the form of. Section V displays the results of CAPTCHA users and their analysis. Finally, Section VI summarizes the paper and presents the main conclusions.

II. BACKGROUND

A. Definition of CAPTCHA

"A CAPTCHA is a program that protects websites against bots by generating and grading tests that humans can pass but current computer programs cannot. For example, humans can read distorted text as the one shown below in figure (1) but current computers cannot" [1].

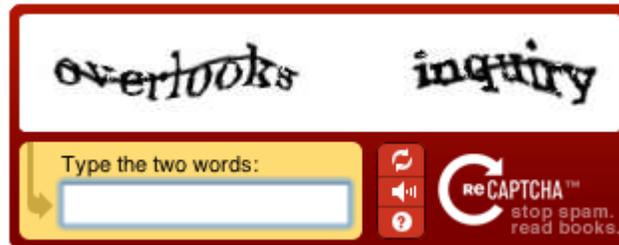


Figure (1) Concept of CAPTCHA

B. Application of CAPTCHA

1. Protecting Website Registration: CAPTCHAs are used to secure different free E-mail services, for example, Yahoo, Gmail, and Hotmail from bot programs that would record a large number of email accounts each moment utilizing computerized content [1],[2].
2. Protecting Email Addresses from Scrapers: This should be possible by concealing a client's email address from Web scrubbers by requesting that from client to solve a CAPTCHA before showing his or her email address [1].
3. Online Polls: CAPTCHAs are also used to control Web crawlers and bots from participating in web-based surveying by asking the client who needs to vote to solve a CAPTCHA before the vote submission. Nonetheless, this procedure can't keep clients from voting commonly [2][1].
4. Preventing Dictionary Attacks: This is to prevent PC programs from having the capacity to rehash through the whole space of secret word by requesting that from client to solve CAPTCHA test after various unsuccessful logins. This system is superior to locking a record after a specific number of unsuccessful logins. [1][2].
5. Search Engine Bots: CAPTCHAs can be used by administrators to prevent web search tools from ordering to keep others from downloading or reading these sites in light of the fact that occasionally they contain private data [1][2].

C. History of CAPTCHAs

- 1996 Moni Noar recommended the utilization of an Automated Turing Test to distinguish human clients and bots. [3].
- 1997 Andrei Broder et al. built up a component to differentiate between human clients and PC programs and furthermore around the same time, the Altavista site utilized this technique to piece bot programs from entering by showing a twisted English word to the client and requesting that the client write it [4][1].
- 2000 term CAPTCHA was instituted by the group drove by Manuel Blum and Luis von Ahn at Carnegie Mellon University [5], [1].
- 2002 Broder reported that a CAPTCHA framework had been set up for more than a year which had limited the quantity of spam publicizing URLs by over 95% [6], [1].
- 2003 Barid and Monica Chew from California invented the Baffle Text CAPTCHA [6], [1].
- 2004 the Yahoo site used a basic adaptation of the EZ-Gimpy technique [4], [1].

D. Classification of CAPTCHAs

The significance of CAPTCHA acquaints a test reaction test with the clients despite the fact that human or bot programs. The CAPTCHAs can be arranged into five sorts rely upon what is misshaped that is whether characters, digits, or pictures. These sorts are given beneath. [7], [1].

1. CAPTCHA Based on a text

Text-based is easy to execute where a succession of letters and digits present to the client with adding a few alterations to the characters, for example, noise, dispersion, rotating or making characters as 3D these changes added to keep bot programs from perusing the real characters [7], [1]. A few cases are appeared underneath in the Figure (2).

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Figure (2) Examples of Text CAPTCHA

Text-based CAPTCHA is the least difficult sort of CAPTCHA where it is the principal compose which has been concocted and actualized in Email administrations and web index. text-based CAPTCHA comprises of English letters and numbers. these characters are constrained so the bot projects and programmers can fathom the text CAPTCHA by outlining programs which filter the content CAPTCHA and writing it in the particular place. This issue is solved by doing some alteration on characters, for example, including some noise or rotate and scatter letters or present characters as corrupted and distorted letters or present characters as 3D. these alterations make a few issues for the client when he distinguishes the right characters since a few characters have comparable shapes in the wake of making modifications.in an expansion, Another issue in text-based CAPTCHA is introduced by English dialect where a few clients can't see a few kinds of text-based CAPTCHA, for example, clickable CAPTCHA and Strangeness in Sentences CAPTCHA.[1],[7],[8],[9][10].

2. CAPTCHA based on image

Image-based CAPTCHAs are situated in light of perceiving a particular picture from similarity pictures and now and then are blended with a few words. It is troublesome for Bot projects to recognize the designs where human clients can do that. Figure (3) indicates image CAPTCHA. [1],[7],[11],[12].

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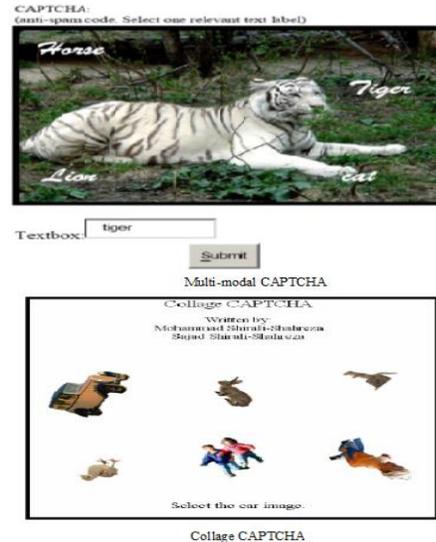


Figure (3) Image CAPTCHA

In spite of the fact that this type is simple, there are a few issues can confront the client when he is endeavoring to identify picture based CAPTCHA:

- 1) Some clients who have low vision or learning incapacity will meet a few issues when they are endeavoring to solve this CAPTCHA.
- 2) A probability of break the CAPTCHA by bot programs will increment if the quantity of decision is diminished so it is smarter to make more choices in the CAPTCHA to make it strong however this technique will exhaust the database.
- 3) This CAPTCHA is accessible just by the English language in this manner English speakers and some other people who have English vocabulary learning will comprehend the CAPTCHA only. [1],[11], [12].

3. CAPTCHA based on audio

CAPTCHA based sound speak depicted in presenting acquainting words to the client as a form of voice, so the client is asked to type what he/she has listened to solve the CAPTCHA. The characteristics of this sort are that it can be utilized for visually impaired users. Figure (4) represents audio CAPTCHA.

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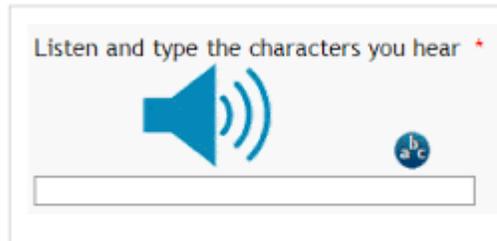


Figure (4) Audio CAPTCHA

In spite of the fact that sound CAPTCHA is accessible for visually disabled users, there are a few issues may confront the users:

- 1) The additional commotion to the recorded words is to make the CAPTCHA stronger and protect it from breaking by Bot programs, can confound the client and can conduct to the wrong answer.
 - 2) Audio CAPTCHA is presented in English dialect therefor only clients with English capacity can understand this write.
 - 3) In English dialect there are a few letters have comparable sound, for example, J &G, C, and K. this can make confounding the user. [1],[13], [14].
4. CAPTCHA based on Video

CAPTCHA video is seldom utilized as a part of CAPTCHA framework as it requires picture download through the web. Figure (5) indicates case of video CAPTCHA.



Figure (5) Video CAPTCHA

CAPTCHA video represents in presenting a short motion video contains individual speaking to some sort of activity and the client must choose correct depiction from the rundown. The extent of video in this technique is large so the clients will confront issue when they downloading it from the web. this issue can lead users to leave the

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site or Email which they were endeavoring to use it. Another issue can influence a few clients who don't have English dialect capacity since video CAPTCHA is accessible by English dialect only. [1],[15],[7].

5. CAPTCHA based on puzzle

In puzzle CAPTCHAs, the client is required solve a conundrum which depicts on presenting lumps of a picture and requesting that client to consolidate the pieces or recognize a particular piece of the picture. A portion of the techniques in this class are given as below in the Figure (6).

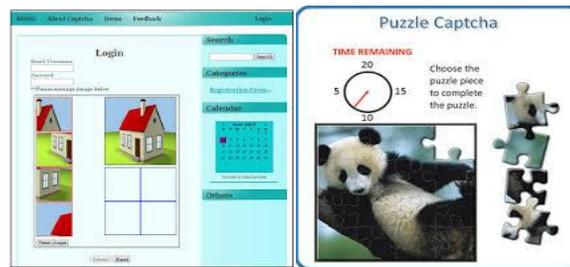


Figure (6) Puzzle CAPTCHA

This method expends more time to unravel so the client might be exhausted and leave the site. Moreover, users who have low vision will confront picture distinguishing proof issue. [1],[16],[17],[7].

III. PROPOSED METHOD

In our CAPTCHA, the user is required to type the characters (capital or small) exactly as it is required. The steps involved in using this CAPTCHA are explained as follows:

Step 1: A random sequence of letters is shown to the user. It is not important for these letters to have to mean, as this will strengthen this type of CAPTCHA from being compromised. These letters may contain a mix of both capital and small letters.

Step 2: A random set of instructions is shown to the user. These instructions inform the user as to the form of characters (capital or small) the user is required to enter. These instructions can also be conveyed by using the letter C to indicate a capital is required and the letter s to indicate a small letter is required.

Step 3: The user should enter the text as required. If the entered letters match the requirements, the user will be allowed to continue with the registration or will be given website access. Otherwise, different text with different instructions will be given to the user for a second attempt. Figure 7 shows CAPTCHA based on the form of letters.

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CAPTCHA Based On The Form Of Letters



Figure (7) CAPTCHA based on the form of letters

Noise and scattering can be added or the letters in the text can be rotated to make it more difficult for Bots and hackers, however, it is important that the level of difficulty does not cause confusion for the user in terms of entering capital or small letters.

CAPTCHA based on the form of letters has been implemented by using Php programming where the CAPTCHA was designed with showing the user an example of how to solve the CAPTCHA if he doesn't how to solve it as it is shown in Figure (8)

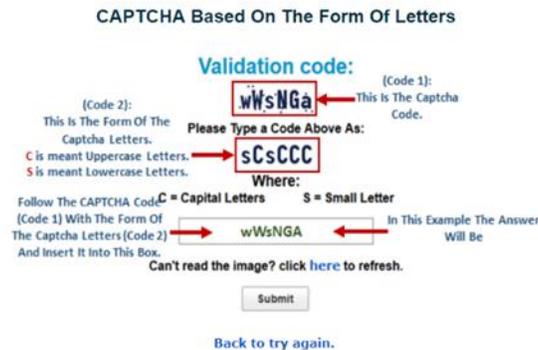


Figure (8) Example of CAPTCHA based on the form of letters

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In our CAPTCHA when the user input wrong word the system will present another new CAPTCHA until he inputs the write one, in our design, we put a counter to count how many attempts for each user to solve the CAPTCHA. After the user has solved the CAPTCHA correctly the system will ask the user to input his/her name, age, gender, nationality and rate the CAPTCHA (complex or Very Hard or Hard or Easy or Very easy).to use this information for analyzing the results as shown in the Figure (9).

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The Validation Code Is Match!

Name:

Age:

Gender: -- Select One --

Nationality: -- Select One --

Rate This Captch:

- Complex
- Very Hard
- Hard
- Easy
- Very Easy

[Back To Captcha](#)

Figure (9) User information

V. RESULTS AND DISCUSSION

The CAPTCHA based on the form of letters has been hosted in website <http://it-del.uot.edu.ly/captcha> and we asked many volunteers from different countries with different background and age to test this CAPTCHA. We take 100 results of volunteers and analysis the results. As it can be observed from Figure (9) the user has to fill four information which are age, gender, nationality and rates the CAPTCHA. We show different graphs, describing the responses of users. For instance, as it can be observed from Figure 10 that the participation of male and female is nearly equal where about 56% of the participants were male and about 41% were female.

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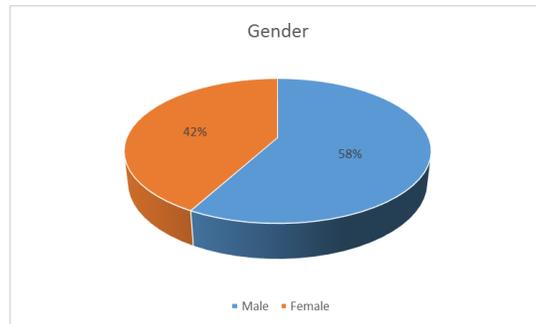


Figure (10) Gender distribution of participants

Figure 11 shows the different age categories, figure 12 provides the percentage of nationality which are participated in this task.

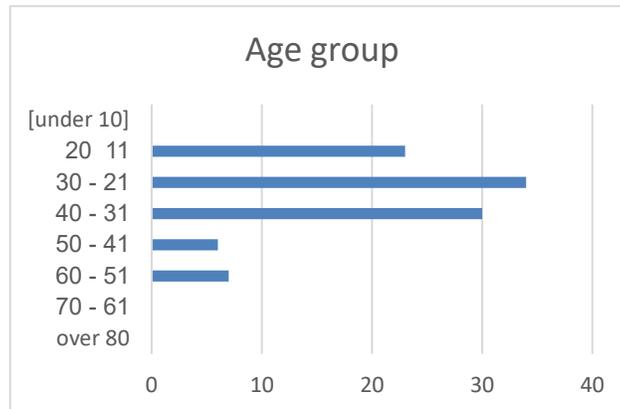


Figure (11) Age distribution of participants

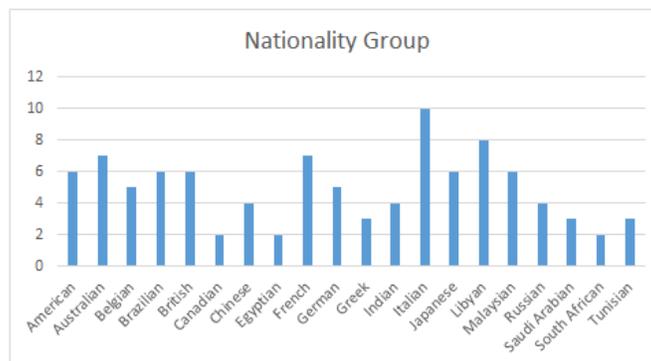


Figure (12) Nationality distribution of participants

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Figure 13 shows the number of attempts a user had to take the test before providing a correct response.

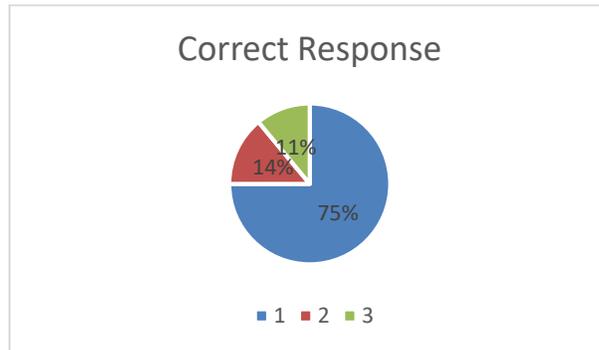


Figure (13) Number of attempts required by users to provide the correct response to the CAPTCHA.

As it can see in Figure 13 the majority of people could resolve the CAPTCHA at first attempt. However, 14% of the users needed two attempts to respond to the challenge, and only 11% of the participants needed three or more attempts. Figure 14 presented the rate of users toward this CAPTCHA.

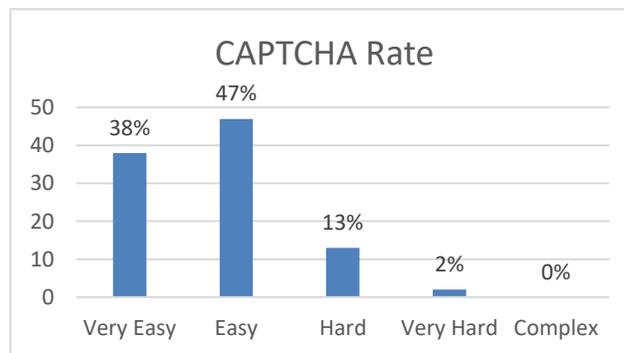


Figure (14) Rate users toward CAPTCHA.

Figure 14 describes the way that the participants interact with the CAPTCHA. If the CAPTCHA application is designed in an appropriate fashion, it can enhance usability and performance. A more complicated

and sophisticated application can confuse the user and consequently, it will negatively affect the user's usability and performance levels. In CAPTCHA based in the form of letters, the results of testing interaction with the CAPTCHA was very good where it was nearly a half of users said that is easy and 38% very easy. However, 13% found that is hard and only 2 % stated that is very hard.

VI. CONCLUSIONS

CAPTCHA plays important role in World Wide Web security where it prevents Bot programs and Hackers from abusing online services. This paper has introduced concepts and history of CAPTCHAs, CAPTCHA applications and describing the classification of CAPTCHA methods based on text, images, voice, video, and puzzle. This paper has also presented new mechanism of text CAPTCHA called CAPTCHA based on the form of letters where the user has to write text with following the instruction, which letters have to wrote Capital and which letters have to wrote small. Finally, we tested the usability and performance levels of this CAPTCHA and we found that it is suitable and appropriate fashion for the human interaction.

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