

Image based CAPTCHA using Polygon Filling: A Novel Approach

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Abstract

CAPTCHAs, have become an ubiquitous defense used to protect open Web resources from being exploited at scale. The widely deployed CAPTCHAs are text-based, image based, audio, video based and puzzle based which typically require users to solve a recognition task. In this paper, we have proposed a novel approach, an image based CAPTCHA using basic Polygon filling Algorithm. This method includes recognizing overlapped shapes which is difficult for bots as, intersecting the basic shapes results in additional complex image. This is easy to implement and can be used in various web resources for their protection and security.

Key Words: CAPTCHA, Polygon filling, Transformations, Bots, Web resources.

1 Introduction

CAPTCHA stands for Completely Automated Public Turing test to recognize the human not bots or computers. CAPTCHA is most popular and useful tool for differentiating between Computer operated software or a human being. Now-a-days, several daily activities such as communication, education, E-commerce, Entertainment and tasks are carried out by using the internet. To perform

such web activities users have to register regarding the websites. In registering websites, some intruders write malicious programs that waste the website resources by making automatic false enrolments that are called as bots. These false enrolments may adversely affect the working of websites. So, it becomes necessary to differentiate between human users and Web bots. CAPTCHAs are designed to be simple problems that can be quickly solved by humans, but are difficult for computers to solve. Using CAPTCHAs, services can distinguish legitimate users from computer bots while requiring minimal effort by the human user.[1] In the procedure, a computer or a program creates a test for its user, who is expected to be a human. The test is meant for the humans, that is, it is to be solvable only by humans and not any other machine, system or program. The user is required to provide a correct response to the test and then the user is permitted to access the work. When a correct response is received, it is presumed that the response arrived because of a human user.

CAPTCHA techniques have been classified into four categories: -

- Text based CAPTCHA.
- Audio based CAPTCHA.
- Image based CAPTCHA.
- Video based CAPTCHA.

2 LITERATURE REVIEW

A] Text based CAPTCHAs

It is the simplest yet innovative method is to present the user with some questions, which only a human being can answer. It is a distorted image containing text. Only human eyes can recognize the alphabets clearly, in such way the image is displayed. At the time of registration, such image is shown on the registration form and the user is asked to identify the same text and enter it in given text field. The robots fail to identify the text. Thus, website owners can prevent bots from registration and can ensure that all the members are humans. Some variants like easy mathematics calculations or Question based CAPTCHA can be written in the form of distorted

images that quickly can be solved by human only[8] because answering such problem requires four abilities of understanding text of question, detection of question images, understanding the problem, and solving the problem, present computer programs are unable to solve it. For government website especially the regional language CAPTCHAs are designed to provide more security against hackers, as the information may be very sensitive and confidential.[10]. Thus CAPTCHAs prevent automated posting to blogs and forums. CAPTCHAs can be used further in avoiding spam emails. Apart from these usage of CAPTCHAs; it is criticized that people with poor eyesight or blind people will be unable to use the web services offered. In normal CAPTCHA user fills the CAPTCHA code and press submit button. So CAPTCHA is programmed with Button. User submits the form after filling the entire recommended fields. Hackers can use this time between page- loading to page submission to break the it. There are two ways to strengthen the security: First make the Strong CAPTCHA and second, decrease time for Hackers. Time-Variant CAPTCHA decreases the time against the hacker[7].



Fig 1.Text based CAPTCHA

B] Image based CAPTCHA

In Image based CAPTCHA the users have to identify image by performing image recognition task. VidoopCAPTCHA2 is a verification solution that uses images of objects, animals, people or landscapes, instead of distorted text, to distinguish a human from a bots or computer programs. By recognizing that users are human not a bot, the site and users are protected against malicious bot attacks.



Fig 2. Image based CAPTCHA



Fig 3. Image based CAPTCHA: VidoopCAPTCHA2

Image CAPTCHA is recognized by bot using pattern recognition in image but it is a somewhat difficult AI Problem. Another problem with Image CAPTCHA that, Pix is available only in English language so the end user must know the English vocabulary but there are less than thirty percent internet users are English speaking. Most of the time objects recognition becomes awkward due to the ambiguity present in picture object. In the place of Turing test it has turn into almost an IQ test. Advanced Collage CAPTCHA, is one of the variants in image based CAPTCHA, as it uses image formed as collage[9].

C] Audio based CAPTCHA

The CAPTCHA accompanies a audio version of CAPTCHA to guarantee that visually impaired users can freely access the website. It uses radio program audio, which is not able to decrypt by the automated speech recognition. It exploits the human capacity to understand words through context. The audio CAPTCHA is slower than the visual CAPTCHA. It takes of an opportunity time to respond in due order regarding the test. To start with listen and replied in the answer box.

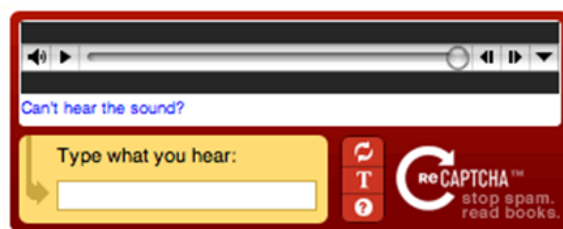


Fig 4. Audio based CAPTCHA

The drawbacks of speech to text conversion system are that its impossible to distinguish between the accents of the voice. So mostly it happens that the voice to text converter cant recognizes the voice or understands it the other problem is that its not possible to convert the noisy audio files with a high level of accuracy

D] Video based CAPTCHA

In this some words are specified to the user which elaborates a video. The users recognition must match to set off automatically generated tags then only the test is said to be succeed. The term video CAPTCHA is used to any CAPTCHA that uses a video as its means to present information to a user. Although video CAPTCHA is limited, both commercial and academic application does exist. Video CAPTCHAs work as a drawback for blind people, due to large size of file, users face problem to download video and find correct CAPTCHA and it leads to computation load on server.



Fig 5. Video based CAPTCHA

3 PROPOSED SCHEME

During the design stage the main principles which play an important role for providing amore robust CAPTCHA. Our proposed scheme, gives a novel approach of image CAPTCHA to deal with the bots. Normal Image CAPTCHA can be recognized by any System with AI and pattern recognition. Further machine learning can be added to train the system to recognize the image. So this paper suggest more robust method which is more beneficial in such cases. This method uses the simple concept of Polygon filling. CAPTCHA is the formed by number of different shapes.

The application uses following steps:

- Random shapes from a data set are chosen.: There are different types of shapes included in small dataset such as Rectangle, Triangle, Parallelogram, Kite, Trapezium, etc. The shaped with random size will be generated.
- All chosen figures are colored differently.: Colors and transparency factor will be generated using random generated values of R, G, B, and T.(Red, Green, Blue and Transparency.)
- Intersecting colors are merged to form new colors.: That will appear as intersecting shapes.
- The shapes are randomly transformed to form vague figures.: By applying different transformation functions such as rotation, Scaling, Translation, Reflection and Shearing the generated shape will

be drawn.

- Intersection results in new boundaries which produce new shapes.: Due to the intersection of different shapes and different transparency factor, additional shapes are shown in the resultant CAPTCHA.
- User is asked to identify the original shapes used.: Human can recognize the shapes easily, but Bot gives different additional shapes as result as by applying different image processing techniques, additional shapes can be recognized as object which is in actual the shapes resulted because of the intersection of shapes.
- Hence resulting in a CAPTCHA.

4 RESULT

The resultant CAPTCHA shown in following figures. The shapes can be easily recognized by the user if human not a Bot.

Output1 :- Invalid Case

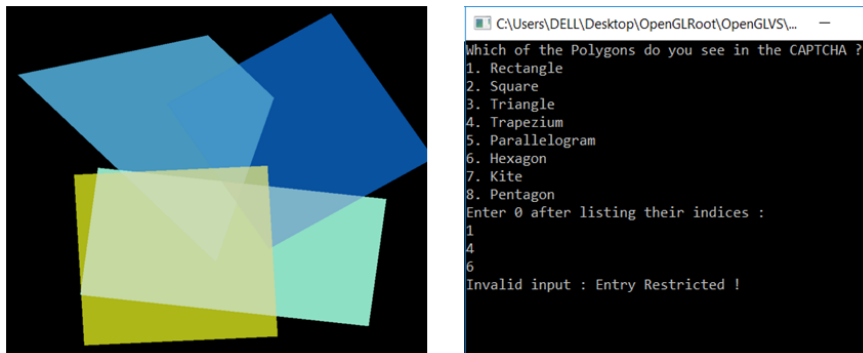


Fig 6. Image based CAPTCHA using Polygon Filling: Invalid case output

Output 2 :- Valid Case

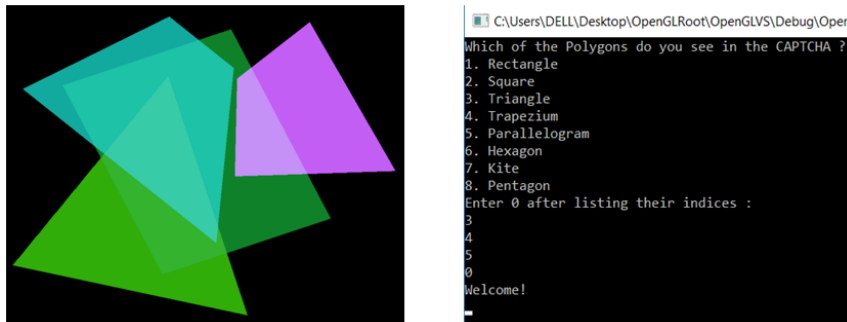


Fig 7. Image based CAPTCHA using Polygon Filling: Valid case output

5 Conclusion

As a contribution to the web and website security in the field of CAPTCHA and response against attacks issued by Bot programs, we have proposed a simple and robust image based CAPTCHA. Two main goals that can be achieved by using this Image based CAPTCHA using Polygon Filling are Simplicity and time required for recognizing the shapes for a human. To increase the difficulty extra shapes can be added. If input from user can be taken in audio, it will become more advantageous and can become more user friendly. Our mechanism provides a solution to maximize the robustness and usability of image-based CAPTCHAs simultaneously.

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