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A Novel Video CAPTCHA Technique To Prevent BOT Attacks

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Abstract

With the expansion of Web services, denial of service (DoS) attacks by malicious automated programs (e.g., web bots) is becoming a serious problem of web service accounts. CAPTCHA (Completely Automated Public Turing test to tell Computers and Humans Apart) is a human authentication mechanism that generates and grades tests to determine whether the user is a human or a malicious computer program. These tests are easier for humans to solve and tough for automated bots. We present a novel video CAPTCHA technique based on advertisement recognition. Our CAPTCHA provides a video which contains a predefined advertisement. The user has to identify the product that relates with the advertisement presented in the video by selecting the multiple choice options provided. If the user chooses the right option we can guess that the user is a human and not a bot.

Keywords:Video CAPTCHA;Human Interractive Proof,BOT attacks;

1. Introduction

Now a day's people are accessing online services such as email services, forums and well known specialized interest groups. Illegal usage of services like using a 'bot' to register legal accounts can mislead the valuable resources and distribute malicious information thereafter. Thus it is important for a service provider to differentiate a bot from human users. For this purpose CAPTCHA systems are widely used. CAPTCHA stands for "Completely Automated Public Tests to tell Computers and Humans Apart [1].

The idea is to launch a difficult AI problem so that either the purpose of differentiating bots and legitimate users is served or that an AI break-through is attained. A number of difficult artificial intelligence problems including natural language processing, character recognition, speech recognition and image understanding have been used as the basis for CAPTCHAs.

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2. Related Works

Captchas are categorized as

1.Text based captchas 2.Image based Captchas 3.Audio based Captchas 4.Video based Captchas

Text-based Systems

Generally text-based Captcha systems ask the user to discern the letters or numbers which are displayed in the distorted form. Most of the text-based Captchas had been developed using Baffle Text [2], Pay pal's Captcha[3],reCAPTCHA[4],Microsoft's Captcha[5] etc. Assaults on text-based systems mostly utilize OCR (Optical character recognition) algorithms. Increasing the complexity of text-based systems by elevating the noise and distortion to make the challenge difficult for bots which makes them less user friendly and also less usable to users. Samples of some text-based CAPTCHA techniques are shown in figure 1.

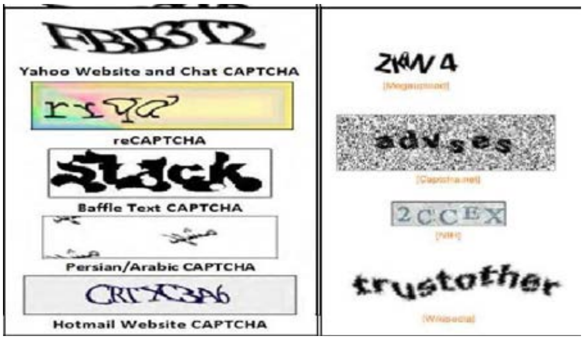


Fig. 1. Samples of some text-based CAPTCHA techniques

Image-based CAPTCHA systems

Image-based Capctha systems were proposed to increase the utility of CAPTCHA systems. However, many current state-of-the-art image-based systems suffer from the lack of flexibility and adaptability. Different image –based CAPTCHA schemes include ESP-PIX CAPTCHA [6], Bongo [7], Microsoft Asirra [8],Image Block Ex-Change [9] and Face Recognition [10] captcha. Samples of some image-based CAPTCHA techniques are shown in Figure 2.

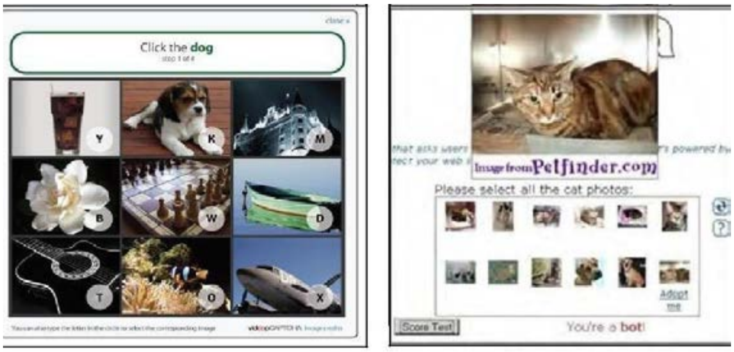
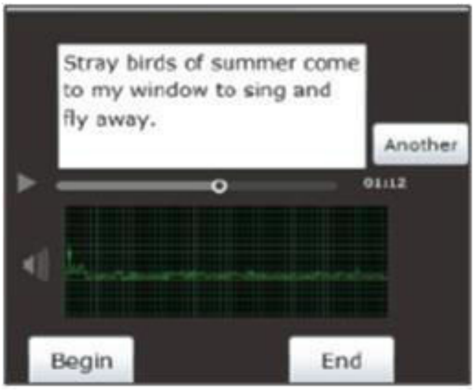


Fig. 2. Image-based CAPTCHA

Audio-based Systems

Audio-based CAPTCHA systems remedy the fact that image CAPTCHA systems are not accessible to visually impaired people. In a typical audio CAPTCHA system, letters or digits are represented in random intervals in the form of audio pronunciation. To make the test more robust against bots, background noises are attached to the audio files. These systems are extremely dependent on the audio hardware and the user gets a small amount of time to identify each character. Nancy Chan of the City University in Hong Kong has implemented a sound-based system of this variety [11].Haichang Gao [12] proposed a new audio CAPTCHA which utilizes the gaps between human voice and synthetic voice. Sample of Audio-based CAPTCHA technique is shown in Figure 3.

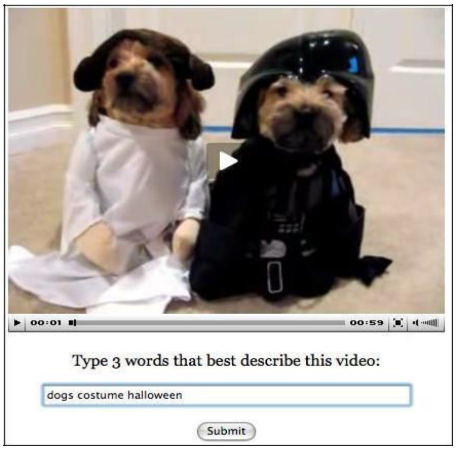


Stray birds of summer come to my window to sing and fly away.

Fig. 3. Audio Based CAPTCHA

Video-based Systems

These CAPTCHAs use videos rather than images or text. In one such CAPTCHA, users are shown You Tube videos and ask them to tag descriptive keywords [13]. Users will be prompted to watch a challenge video and then appropriately annotate (or tag) it. The challenges will be graded based on the perfect matching of the user's response against a database of ground truth tags of the video. Sample of video-based CAPTCHA technique is shown in Figure 4.



Type 3 words that best describe this video:

dogs costume halloween

Fig. 4. Video Based CAPTCHA

3. Proposed Video CAPTCHA

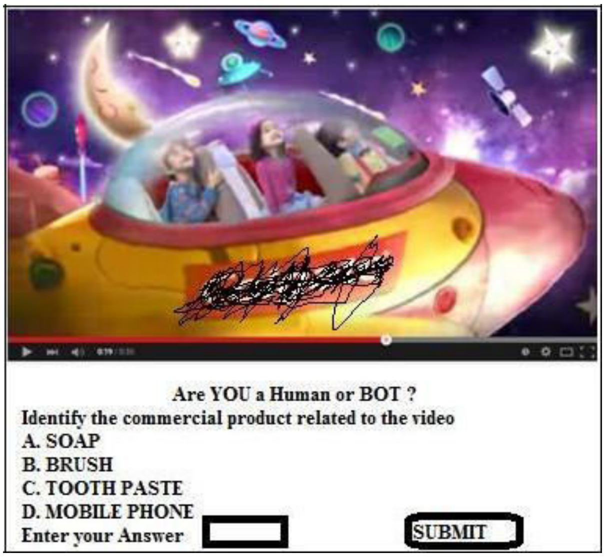
A database is created with small duration videos obtained from You Tube because they contain different categories of videos which are incorporated with some commercial product advertisements. Before adding a video to the database, the videos are edited using video editing software in order to scramble the text present in the video so as to restrict the automated programs from identifying the text, so that brand names cannot be recognized.

To check whether the user is human or BOT, a random video is presented to the user. The user must identify the commercial product related to that particular advertisement by selecting the right option from the given set of choices. The authentication process used in the proposed method is as follows:

STEP1. A small duration video is selected at random from a database of videos.

STEP2. The user must identify the correct commercial product related to that video.

STEP3. If the answer submitted is correct, the user is identified as a human or else if the answer is incorrect the user is identified as BOT. The Proposed Video CAPTCHA Interface is shown in the Figure 5.



Are YOU a Human or BOT ?

Identify the commercial product related to the video

A. SOAP

B. BRUSH

C. TOOTH PASTE

D. MOBILE PHONE

Enter your Answer

Fig. 5. Proposed Video Captcha Interface

4. Security and Usability Study

In order to analyze the usability of our VIDEO CAPTCHA, we had conducted user analysis by using the college-wide invitation as email to students. Majority of our participants are college students with the age groups of 18-24 and are familiar with commercial advertisements. Rules for CAPTHCA were given. The time to complete on entire CAPTCHA was recorded. The average completion time to solve the CAPTCHA turned out to 21seconds. After that, the participants were asked to fill the questionnaire's as 'DO you prefer this type of CAPTCHA? Most of the results stated that proposed CAPTCHA is enjoyable. The proposed video CAPTCHA is significant-ly more secure and unsusceptible to machine learning attacks in particular. Since the user has to identify a commercial product out of many, it is difficult for an automated program to recognize the correct objects displayed in the video using machine learning techniques.

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5. Conclusions

In this paper a new form of video CAPTCHA is proposed and evaluated. The results are encouraging and the users are satisfied with the new form of CAPTCHA and can utilize it efficiently. The user needs to identify the commercial product to win the challenge. A user study had also been conducted to verify the usability of CAPTCHA. Future enhancements will be concentrated on improving the quality and minimizing the buffering time of the video along with the reduction in memory space. A facility to choose videos of their own interesting category will also be provided to the users.

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