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A Survey on Existing CAPTCHA Techniques and Proposed Gaming CAPTCHA for Better Security Analysis

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Abstract*—: CAPTCHA (Completely Automated Public Turing test to tell Computers and Humans Apart) is a method which is used to identify whether user is robot or human. For security concern it is required to know by using some kind of Turing Test. Traditionally, distorted letters in non-uniform positions are generally used for this test, because it has been considered that, it is easy to analyze the distorted letters by human which cannot by robot or bots. But later it could also be recognized by robot, then various research has been made, based on 3d alphanumeric letters, numerical calculations, moving alphanumeric letters, OTP & gaming. But some time distorted letters, 3d letters & moving alphabets are also difficult to recognize by human, it becomes irritating. And numerical calculation is often become easy now by robot, based on neural networks & OTP[4] takes longer time because it is depend on mobile network, so that is why these techniques are also not convenient for human. It should be very easy for human and almost impossible by robots. Then a new promising way was introduced i.e. gaming based CAPTCHA, it is most attractive and cognitive way in the world of CAPTCHA. This is the most recent method used by various personals. But the game which is used for is static, it means you will have to drag & drop static object to the given static target which may be breakable by some intelligent systems. So, that is why here it is the solution which proposes a dynamic object & target gaming based CAPTCHA, it means that here the target is not static as well as object, you will have to drag & drop moving object to moving target which is considered as impossible for robot in given time, because we are also using a CAPTCHA session, you will get 10-15 seconds to achieve your goal and it can be achieved by 5 to 8 seconds by human or may be less. But not possible by robot because after given session time another CAPTCHA will be appeared to achieve. So this technique is based on totally dynamic features and sessions which is very easy for human but almost impossible by robots. This is the newest way in the world of gaming CAPTCHA. Here a little survey has been made on existing systems.

Keywords: CAPTCHA, Drag and Drop, 3-D Alphabets etc.

I. INTRODUCTION

1.1 Introduction of Present Systems

There are so many techniques are available for this test. But traditionally most of the personal uses a technique of distorted letters along with noisy background. And one of the service provider i.e. Indian Railway (IRCTC) sometime uses graphical CAPTCHA, where you will be asked to click on the target area of the image. But the latest technique is gaming CAPTCHA where you will be asked to move the object to the target area.

Fig. 1.1: CAPTCHA - IRCTC

There are so many CAPTCHA technique exist and let it be more precise in literature survey.

II. LITERATURE SURVEY

CAPTCHA Design Based on Moving Object Recognition Problem proposed by JingSong Cui, LiJing Wang, JingTing Mei, Da Zhang, Xia Wang, Yang Peng, WuZhou Zhang in IEEE 2009. [1]

This paper proposed a system which is based on moving letters, you will have to recognize the moving letters and write them into the text field. If it is robot then it is impossible to recognize moving letters correctly. But sometime it is slightly difficult also for human to recognize. It should be easy for human and almost impossible for robot. But this system is not quite easy for human also, that is why it has not been considered a good approach.

Fig. 2.1: Moving CAPTCHA

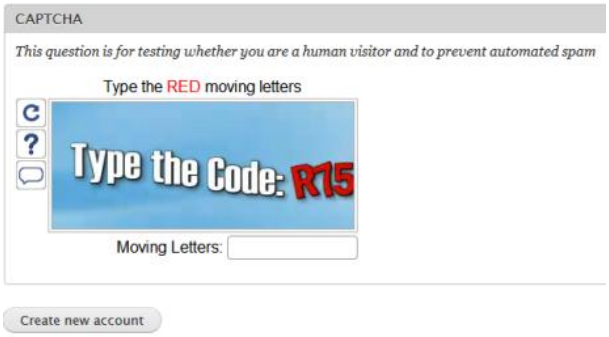

Fig. 2.2: Moving CAPTCHA

A CAPTCHA Implementation Based on 3D Animation proposed by Jing-Song Cui, Jing-Ting Mei, Xia Wang, Da Zhang, Wu-Zhou Zhang in 2009 International Conference on Multimedia Information Networking and Security of IEEE. [2]

This paper proposed a technique a 3D animation CAPTCHA instead of still 2D image. Still 2D image is easy to recognize by the intelligence system or by image processing technique that is why they proposed a 3D image for security analysis. You will get a 3D image with animation and you will have to recognize those characters and type in the desired box. But recognizing 3D animated characters is slightly difficult sometime by human, because 3D character is already a challenge itself to recognize easily and when it has animation also then difficulty level get increased. That is why it has not been considered a convenient approach for Turing test.

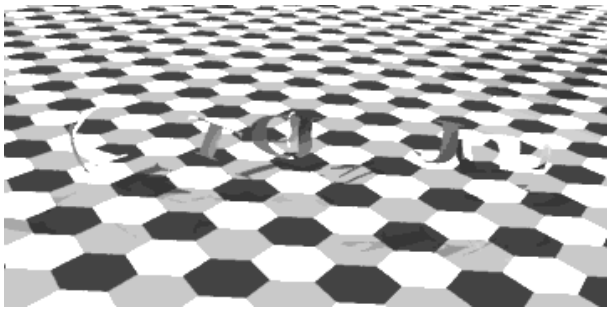

Fig. 2.3: Moving 3D CAPTCHA

EXECUTION TIME PREDICTION FOR 3D INTERACTIVE CAPTCHA BY KEYSTROKE LEVEL MODEL proposed by Ibrahim Furkan Ince, Yucel Batu Salman, Mustafa Eren Yildirim and Tae-Cheon Yang in 2009 Fourth International Conference on Computer Sciences and Convergence Information Technology of IEEE. [3]

This system is little bit advance from 3D character recognition because you will get a problem of 3D interaction to solve. You will have to rotate a 3d cube and all faces of cube has different colors along with character, you will have to recognize characters along with its color and respecting those colored faces you will have to put them in the desired input box for verification. This technique is impressive but little bit difficult because you will have to rotate a cube and recognize all color of faces along with character which is present on the faces of cube, it takes more time to solve and also can be breakable for some intelligent machines. That is why this system is also not convenient for users for Turing test.

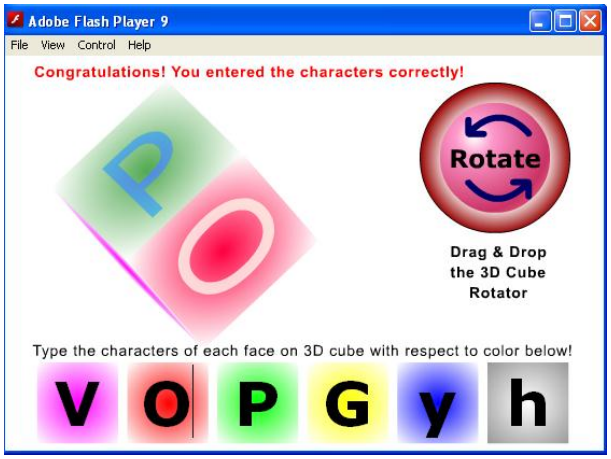

Fig. 2.4: D cubic CAPTCHA

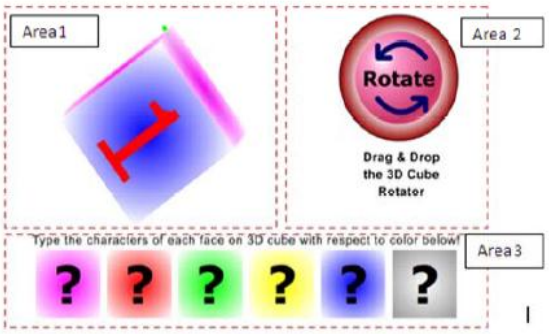

Fig 2.5: D cubic CAPTCHA

Depress Phishing by CAPTCHA with OTP proposed in IJCSE. [4]

This system is totally differ from all other CAPTCHA technique. You will have to enter either your mobile number or email id to get One Time Password (OTP) for CAPTCHA verification. This contains highest security verification compare to all other technique. But it irritates you when your OTP takes too much time to receive and this process takes too much time to complete and not considered as convenient for human.

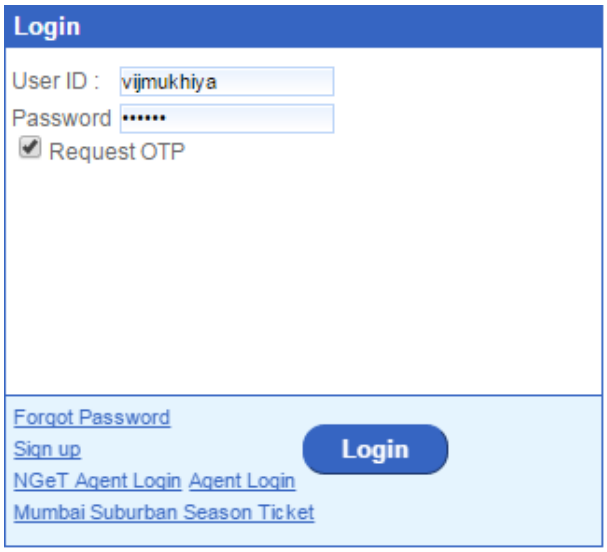

Fig. 2.6: OTP CAPTCHA

CAPTCHA Challenges for Massively Multiplayer Online Games proposed by Yang-Wai Chow1, Willy Susilo2, Hua-Yu Zhou1 in 2010 International Conference on Cyberworlds of IEEE. [5]

In this type of Turing test you may choose multiplayers to solve gaming problem for security analysis, you will be get an image with hidden characters, you will have to unhide hidden characters by swiping the image and recognize them and after recognition you will have to select the recognized characters from the given attribute. This technique is quite differ from the traditional one but a bit long to solve, it takes to much time to reach the goal. That is why it has also not been considered a good approach.

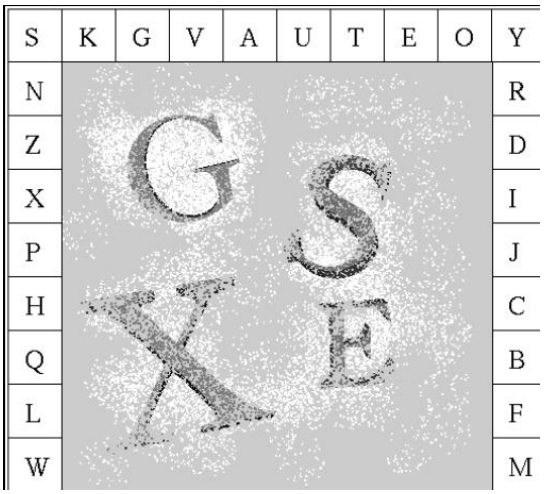

Fig. 2.7: The player has to uncover the hidden characters.

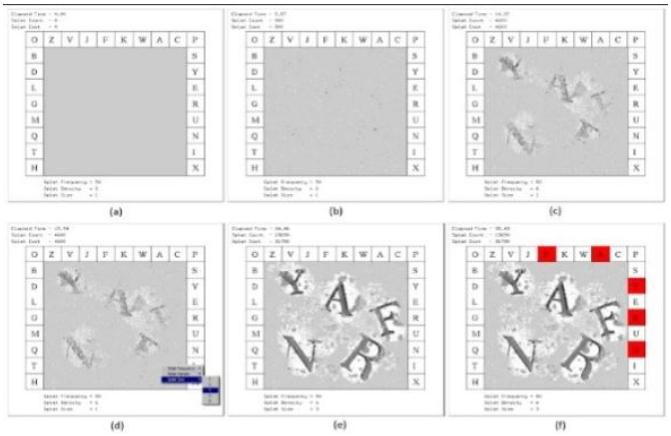

Fig. 2.8: Online Gaming CAPTCHA

Image CAPTCHA: Based on Human Understanding of Real World Distances proposed by Aadhirai R, Sathish Kumar P J and Vishnupriya S in IEEE Proceedings of 4th International Conference on Intelligent Human Computer Interaction, Kharagpur, India, December 27-29, 2012. [6]

This system is so much impressive compare to all other techniques. You will get an image of real world which contains so many thing, you will be asked to recognize object according to the distance, like which object is farthest away from the particular object which is only possible by human understanding, but sometime it is often difficult for human to recognize the farthest one. It creates confusion for robots but also sometime for human, that is why this system is also not convenient for human.

Fig.2.9: Distance based CAPTCHA

Gaming the game: Defeating a game CAPTCHA with efficient and robust hybrid attacks proposed by Song Gao, Manar Mohamed, Nitesh Saxena and Chengcui Zhang in IEEE 2014. [7]

This is an advance CAPTCHA based on gaming. You will get an artificial problem to solve like a game. You will be asked to drag and drop the desired object to the target place where you asked to put. This is advanced and most promising technique. But the problem is that a robot will have sufficient time to break this CAPTCHA, and the target as well as object are static in position. These static object can be cracked by modern intelligent systems.

Fig. 2.10: Gaming CAPTCHA

Fig. 2.11: Gaming CAPTCHA

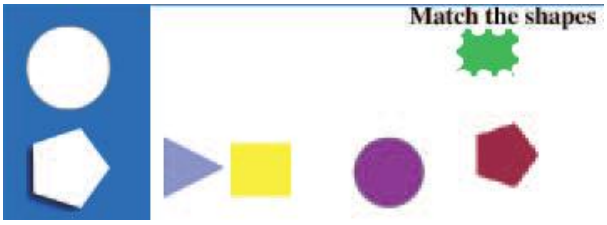

Fig. 2.12: Gaming CAPTCHA

Fig. 2.13: Gaming CAPTCHA

How Humans Can Help Computers to Solve an Artificial Problem survey by Seyed Mohammad Reza Saadat Beheshti, Panos Liatsis presented in international conference of IEEE in 2015. [8]

This is the most popular technique for CAPTCHA verification generally used by most popular companies like Google, Facebook, Yahoo and many more. In this technique of verification you will get an image containing two words fetched from old text books and you will be asked to recognize those two words which also contains spaces, this technique is called reCAPTCHA. But the system which is based on neural networks can break this security somehow. Even this technique is turned easier for human because you will get only a checkbox i.e. I'm not a robot. But somehow it is based on traditional system. It is easy but lacking somewhere. We require much more innovative technique.

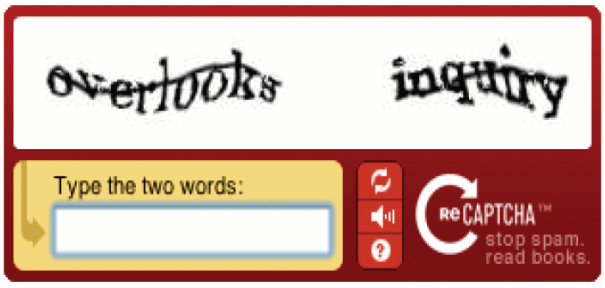

Fig. 2.14: reCAPTCHA

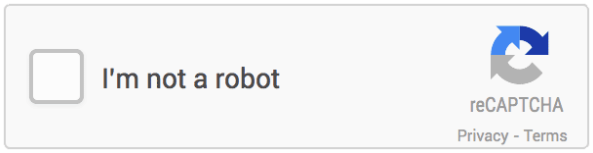

Fig. 2.15: reCAPTCHA

Cloud-Based CAPTCHA Service proposed by Artem Shumilov, Andrey Philippovich in IEEE 2016. [9]

This technique is based on sequences of images saved in cloud where you will be asked to identify similar kind of images from the given sequences. This is one of the most popular CAPTCHA technique uses by Google,Facebook and many more.

Fig.2.16: Cloud Based CAPTCHA

There are so many systems exist for CAPTCHA verification but they are lacking either to understand by human or breakable for robot which is required to overcome.

III. PROPOSED WORK

Dynamic Object & Target based Gaming CAPTCHA for Better Security Analysis:

Here it is the solution which proposes a dynamic object & target gaming based CAPTCHA, it means that here the target is not static as well as object, you will have to drag & drop moving object to moving target which is considered as impossible for robot in given time, because we are also using a CAPTCHA session, you will get 10-15 seconds to achieve your goal and it can be achieved by 5 to 8 seconds by human or may be less. But not possible by robot because after given session time another CAPTCHA will be appeared to achieve. So this technique is based on totally dynamic features and sessions which is very easy for human but almost impossible by robots. This is the newest way in the world of gaming CAPTCHA.

Let's have an example for the proposed system. Here it is the real world background of forest where few animals like elephant, giraffe and bird are present and there is a well in the forest. These animals are walking towards well and cross it within 15 seconds. You will be asked to drag and drop one the animal like elephant, as the figure given below you have been asked to drag and drop elephant in the well before crossing the well or within 15 second because if you are human then it can be solve within 5-8 seconds, but if you are robot then this 15 seconds is not sufficient to crack it. But breaking this CAPTCHA is not quite easy because it is not a static game where target and object's position is static and you will have no time limit to break it, here object as well target are moving, there is no static positions, every second the position is getting changed. It is understandable for human very easily but impossible for robot especially in 15 seconds. After 15 seconds you will get another CAPTCHA to solve but not like the previous one, it will change the target as well as object.

Fig. 3.1: Advanced Gaming CAPTCHA

IV. CONCLUSION

Thus the proposed system is able to provide best security in the field of CAPTCHA. It is non-breakable gaming CAPTCHA which has session, dynamic targets, dynamic objects and many more. This is the advance level of gaming CAPTCHA with more artificial interactions which cannot be cracked by robots. Hence it is the best way in the world of gaming CAPTCHA.

V. FUTURE SCOPE

The current proposed concept of Dynamic Object & Target based Gaming CAPTCHA for Better Security Analysis definitely get enhanced in future because we can also develop more interactive and intelligent game through which we can make system stronger.

VI. REFERENCES

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