

# Audio Visual Reconciliation Intellectual CAPTCHA as New Era of Turing Test

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**ABSTRACT:** In this digital world; security is a significant concern towards access validation that can be computed through some kind of turing test i.e. CAPTCHA. The term CAPTCHA was introduced for classifying credibility of user whether the intervention has been initiated by human or bots. . CAPTCHA stands for “Completely Automated Public Turing test to tell Computers and Humans Apart”. It is a fortification tool that denies junk/bots entries in the form of challenging problems. CAPTCHA has been prefabricated in various forms such as alphanumeric distorted strings, 3D strings, picture identifications, gaming problems and many more. The recent approach is gaming CAPTCHA and most of the game may increases the server load towards the browser. The logic behind the gaming CAPTCHA is dealing with dragging & dropping object to the target position, so these CAPTCHAs do not belong to the hard AI problems. The objective of the paper is to provide better level of hard AI problem that can be solved within few seconds with fewer efforts that challenges bots to solve in a limited time. But proposed CAPTCHA is based on audio video reconciliation where user has to recognize the correct combination of appearance with its sounds. That is why it contains two level security premises, speech recognition with picture identification.

**KEYWORDS:** CAPTCHA, Web Security, Turing Test, Gaming CAPTCHA, Picture Recognition, Audio Video Reconciliation, Speech Recognition.

## I. INTRODUCTION

The most common and traditional CAPTCHA is text based CAPTCHA where user is required to recognize distorted string as per the image shows, it may be alphanumeric, simply numeric or having alphabets only, fig.1.1 shows an example. CAPTCHAs are basically considered as case sensitive, so every user has to feed the exact case mentioned in the image. In today’s era of excessive internet usage, a Turing test is required to oppose various attacks on websites [1].

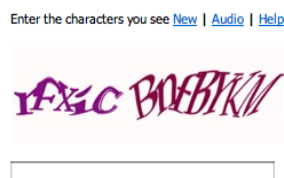


Fig. 1 Conventional CAPTCHA [2]

So, CAPTCHA has been trolled up to bigger level where picture recognition, 3D, Math and Gaming CAPTCHA have been introduced. A game may be either drag and drop or click based. A game should be as easy as for human but almost impossible for bots. Gaming CAPTCHA is one of the highly secured CAPTCHAs used by web applications. Most of the gaming CAPTCHA are based on simple logics where user can solve it by dragging object to the target position and some are often difficult to solve even by a human due to the difficulty level. Gaming CAPTCHA saves the

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game log and send it to server for accepting or rejecting user. As in the fig 1, where user is required to drop the fishes in the target area i.e. ocean that would lead to solve the CAPTCHA.



Fig. 1 Gaming CAPTCHA [4]

## II. RELATED WORK

JingSong et al. [5] proposed a CAPTCHA that serves moving alphabets along with complicated background. Recognizing moving alphabets from 2-D image is not a big deal for human as well as for bots because video is a sequence of frames and frame does not possess any motion. That is why the complexity level of this system is not up to the mark and it can be cracked if a still image has been captured. Jing-Song et al. [6] emphasizes the weakness of 2D CAPTCHA which is often easier to recognize and machine based attack can affect it. Here system proposes 3D animation CAPTCHA where alphabets move over a complicated background which creates heavy confusion even for human. It is hard to recognize the correct string which may irritates human. Ibrahim et al. [7] proposed a system in which user will have to rotate the cube and identify the respective colors whereas marked with question marks. Once the user is able to rotate and identified the character mentioned over 3D cube, system allow user to get accessed otherwise a new problem will be served and color model will get changed and a new challenge proposes. Text box and 3D cube both have identical colors and user requires to match both the colors and recognize the correct letter and type over there for successful turing test. Aadhirai et al. [10] proposed a system which is based on vision where user will have to identify the object based on distance. System serves an image of real world where different kind of object relies where user is required to recognize the objects according to the distance from a particular object. There are hazy appearances in the image which leads to the difficulty level high and recognizing object w.r.t. the distance from 2-D image is also difficult. Song Gao et al. [11] proposed a security strand for gaming CAPTCHA such as relay attack that can affect the security of gaming CAPTCHA. These games are called Dynamic Cognitive Game (DCG) and the motive of this paper is to perform attacks over these games. Fig 2 shows how an attack has been trained offline for interaction with GUI. Author demonstrated various attacks over click based games, drag and drop based games and many more.

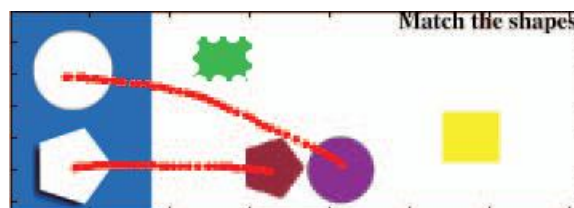


Fig. 2 Hybrid Attack [11]

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S. Ashok Kumar et al. [14] proposed a system which is based on mini games that have been designed using HTML5 and Java Script. These games are either based on clicks or drag. Fig 3 contains various birds with different colors and user is required to click only those birds that belong to yellow color. Color recognition is easiest thing in image processing to recognize with high level of accuracy.



Fig. 3 Color Recognition based CAPTCHA [11]

### III. PROBLEM IDENTIFICATION

By employing color detection algorithm, a color based target can be extracted easily with Image processing toolbox. These target objects either save coordinate values or layer's name, once the user performed a click over image then a coordinate value saved as game log or forward it to the server for further processing. Here, color detection has been applied on previously proposed system that stated a problem of finding yellow colored birds. Using MATLAB, it is often easy to recognize yellow color and Fig 4 shows target extraction using color detection.

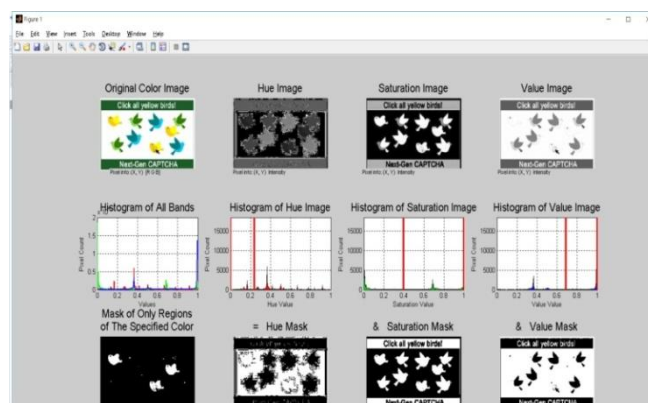


Fig. 4 Color based target acquisition

### IV. PROPOSED WORK

Here the system proposed a new level of CAPTCHA where user is required to recognize the correct object with a combination of speech and visual facts. This is called audio-video reconciliation CAPTCHA where two levels of AI problem have been interpreted. A CAPTCHA may contain various objects with different speeches associated with the

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same, user has to mouse over each objects and recognize the correct combination of audio-video match. User may obtain various correct visual with incorrect speeches but correct visual with correct audio is required to recognize for validating CAPTCHA in a given time.

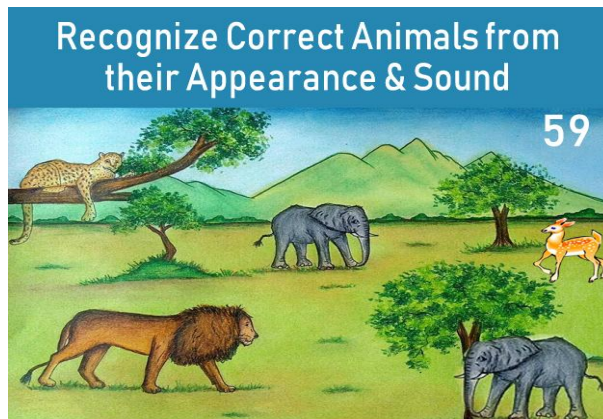


Fig. 5 Proposed Approach

User would have sufficient time for recognizing it but not more than one minute. One minute is sufficient for human being to crack without any problem but it is insufficient time for bots to crack it. Fig. 4.1 shows an example of proposed CAPTCHA where user is required to recognize all the animals that relate to the correct audio-video representation. Human tendency is often strong to recognize the speech at real time with high level of accuracy especially if it belongs to non-dictionary word as compare to the machine. Machine is not proficient well to recognize non-dictionary words such as animals sound, traffic noise and many more. Classification is bit lesser if it is intended by machine. But human can easily classifies the animal sounds as well as others.

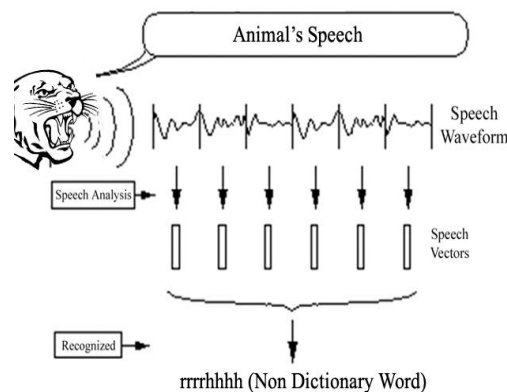


Fig. 6 Animal's Speech Analysis

Fig. 6 shows how a animal's speech forms a non dictionary word which is difficult to classify by machine but often easy for human. Even Hidden Markov Model may get confuses with different non-dictionary speeches, if it is challenges to recognize at real time. Proposed CAPTCHA will get expire after the time has been out and a new problem served if reload has been requested. Game theory has been used to construct interaction between human and

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game. Game theory is “the science of strategy,” a branch of mathematics that studies the strategy, rules, and statistics of decision making games and applies it to other fields. The data gleaned from studying games can be related to back to economics, political science, social science, business in general , or even biology to better understand decision making and behavior in that field. The term “game” is in the title, but it is more a branch of complexity science than a study of games. The game is a kind of mathematical model to understand decision making and the interaction between decision makers. The best known game is the Prisoner's Dilemma. Two people are arrested, imprisoned and given a date for a trial.

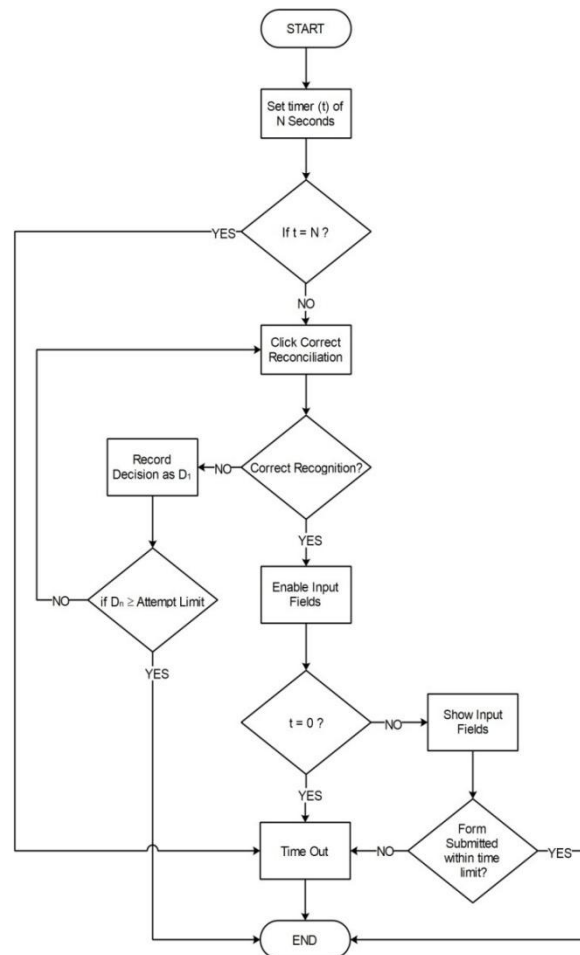


Fig. 7 Flow Chart

In the very first step, a timer is initiated and continuously validating with time limit. If time is out then it will end the process otherwise it will started verifying where correct reconciliation has been done or not, if it is a correct click then it will further check the time session and if it is made under that then input fields will get appear and user can submit form to the server. But if it is a wrong attempt then every wrong attempt will count and if it is greater than 3 then it will end the CAPTCHA as an unsuccessful attempt.

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### RGT (Reconciliation Game Theory) Algorithm -

Require: Total reconciliation object  $T_n$ , timer  $t$ , incorrect click  $O_i$ , correct click  $O_j$ , total incorrect clicks  $O_n$ , click  $c$ .

Input: Mouse Over || Mouse Click

Output: Correct Reconciliation

```
1: Steps  $\leftarrow$  0
2:  $t \leftarrow$  60 // Seconds
3: Click Objects  $\leftarrow$  True
4: //Check if incorrect reconciliation is clicked
   for all  $c \in$  entire layers do
     if  $O_i$  get clicked then
       Wrong Count  $\leftarrow$   $i++$ 
     end if
   end for
5: //Check if correct reconciliation is clicked
   for all  $c \in$  valid click do
     if  $O_j$  get clicked then
       Correct Count  $\leftarrow$   $j++$ 
     else
       repeat step 4;
     end else
   end if
   end for
6: while ( $t > 0$ ) do
   if  $O_i = O_n$  then
     Click.Enable  $\leftarrow$  false
     Verification Failed;
   else if  $O_j = T_n$  then
     Input.Fields.Enable  $\leftarrow$  True
      $t \leftarrow$  stop
     Submission  $\leftarrow$  Enabled
   end else if
   end if
end while
7: End
```

7: End

As per the algorithm every wrong clicks will get recorded for future validation and if it is equal to the wrong attempt or wrong clicks limit then entire process will get terminated. Wrong click area covers the entire background along with all layers.



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## V. RESULT ANALYSIS.

Table No. 1 Data Records and Collection

Sr. No.	User	Time Recorded	Result
13	Bhartendu Tiwari	10	Success
14	Udbhav Mittal	11	Success
15	Vaishali Singh	9	Success
16	Priyanka Gupta	12	Success
17	-	-	Failed
18	Sachin Soni	8	Success
19	Monika Agrawal	13	Success
20	Keshav Kumar	9	Success
21	Ruchita Chouksey	10	Success
22	Anamika Singh	12	Success
23	Neha dangi	12	Failed
24	Manoj Tyagi	11	Success
25	Anjali malakar	13	Success
26	Rashika Motwani	9	Success
27	rohan rajput	11	Success
29	priya khandelwal	9	Success
30	Jaidev Kumar Bhagwat	10	Success
31	Narendra Pathak	8	Success
32	swapnika gupta	11	Success
33	ajay mehar	6	Success
34	sakshi pandey	7	Success
35	rohit shakya	13	Success
36	rahit sahu	11	Success
37	Dashrath Mahto	9	Success
38	shivali pandey	12	Success
39	Aashish Sahu	10	Success
40	Sakshi Saxena	11	Success
41	rushak tiwari	13	Success
42	vivek kumar	11	Success
43	Neha Singh Bais	13	Success

$$\sigma = \sqrt{\frac{\sum f(x - \hat{x})^2}{\sum f}}$$

$\sigma$  – Standard Deviation

$\sigma^2$  – Variance

$\mu$  – Mean

Min – Minimum time recorded

Max – Maximum time recorded

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Table No. 2 Result Comparison

Terms	S. Ashok [14]	Proposed
No. of Participants	30	30
Min	2.9	6
Max	5.2	13
$\mu$	4.33	10.48
$\sigma$	0.79	1.84
$\sigma^2$	0.63	3.42
Success Rate	93.7	96.67

Here the previously proposed system is get affected by color detection tool. If system fails or get cracked the then feasibility of system has been destroyed and the result obtained on the basis of that cannot be feasibly examined. Color detection is not applicable for proposed CAPTCHA instead of that user requires visual and audio intellectuality. As per the hard AI problem that proposes for better machine tests, the minimum time required should lies between 5 to 8 seconds and maximum between 9 to 15 seconds. But if system takes more than 15 seconds then success rate affected that may irritates human.

## VI. CONCLUSION

Thus the New Technique for Generation of CAPTCHA based on Gaming Methodology provides most effective CAPTCHA till now that is better able to differentiate human and robot. This is the next generation CAPTCHA where users enjoy it along with best security motives. No attacks can affect the security premises of proposed system, thus the system is enough suitable for proposing enhanced level of protection in the field of gaming CAPTCHA. The current proposed concept of intellectual gaming CAPTCHA can be enhanced in future with more intellectual and artificial problem based CAPTCHA that can be solved within few seconds that would be impossible to solve for robots but easily possible by human with best level of security in the field of CAPTCHA.

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