Intrinsic Real World Decisive CAPTCHA for Better Turing Test

Rupesh Sahu, Neelesh Jain, Devendra Rewarikar
Dept. of Computer Science & Engineering,
SAM College of Engineering & Technology, Bhopal, Madhya Pradesh, India

Abstract:- Web security is frequently needed in this day and age to protect against fraudulent activity. Many hackers attempt to create software that interacts with online sites automatically in an effort to access data or create numerous trash entries, which causes web servers to stall. With the use of CAPTCHA, garbage submissions may be stopped, and bots can be recognized and prevented from interfering with machine-based programs. Completely Automated Public Turing Test to Tell Computers and Humans Apart is referred to as CAPTCHA. There are a number of strategies accessible in the evolution of CAPTCHA, including distorted text, photo recognition, math problems, and game-based CAPTCHA. Today, game-based Turing tests are quite popular, but as games lack intellectual rigor, there are several ways they might be broken. Therefore, an inherent CAPTCHA is necessary. The suggested system is based on Situation Reaction Based Intrinsic Decision. The suggested method can more accurately categorize people and robots according to their underlying issues. It has been said that humans are more equipped to handle difficulties that arise in real life than machines are, who tend to have difficulty appreciating the context or understanding how to approach a problem. Therefore, the proposed system's difficulties are straightforward scenarios that are simpler for humans but very hard for robots.

Keywords:- CAPTCHA, Web Security, Turing Test, Reaction Test, Game Theory, Hard AI Problem, Bots.

I. INTRODUCTION

Because CAPTCHA does not have a submission form, hackers cannot create a software that automatically submits numerous phony entries, consumes the database, and renders the site inaccessible to other users. This makes CAPTCHA a crucial component of online security. Therefore, it was necessary to include a submission form and to apply a high security CAPTCHA. By using SEO (Search Engine Optimization), hackers can offer a false or dummy website and keep the real server busy, confusing legitimate users into entering their information in the incorrect location [1]. Different CAPTCHAs with varying levels of security are available. The most frequent problem is distorted strings, where the user must recognize the real string or phrase and input it. But if the distortion level is not excessive, this approach is a little weak. Text may be identified in image processing whether it is handwritten or typewritten. The warped strings may now also be understood. If the distortion level rises, it becomes increasingly difficult for humans, which may frustrate users by forcing them to reload the challenge repeatedly. Therefore, it is preferable to substitute new methods for this form of CAPTCHA. Even while picture recognition CAPTCHA is effective, it has several drawbacks. The challenge of picture recognition in artificial intelligence is no longer difficult. Machine translation may identify any item using one of a number of object categories or detection approaches. In a photo recognition challenge, the user must choose the correct object from numerous collections of pictures in accordance with the challenge provided. It gets tougher for humans to detect an object if it is too tiny. The benefits and drawbacks of photo recognition CAPTCHA are numerous.

Fig. 1: Picture Recognition CAPTCHA [2]

The difficulty of picture recognition increases with object visibility and decreases with object blending into the backdrop. Gamifying the CAPTCHA can attract users' attention and make the task more intrusive. Gaming CAPTCHA is a category of minigames that need user interaction. There are several CAPTCHA game options, including click-based, drag-and-drop, typing-based, and more.

Fig. 2: Gaming CAPTCHA [3]

Fig 2 shows the various gaming challenges that are based on drag and drop method. As per the quires, user is required to take decisions and make correct movements accordingly. As per the first game where user is required to make face by dragging facial features and dropping to the correct position.

II. RELATED WORKS

In an effort to enhance security models, several research have been carried out in the field of online security utilizing a range of methodologies. Ahmet Faruk akmak et al.'s recommendation for an audio CAPTCHA approach is the Support Vector Machine (SVM) [4]. The user must listen to a series of audio files connected to a series of photos in order to recognize the series in this kind of challenge. Customers get distracted when listening to audio files featuring human voice. After training with varied auditory and visual data, the system has undergone testing. Specific numerals that are spoken in the audio must be recognizable by users. Eman Ababtain et al. [5] et al. proposed a different strategy to contend with the bots in the gesture-based CAPTCHA. In a gesture-based challenge, the user is supposed to perform an action that could be related to drag-and-drop games. Even if a minigame merely employs the drag and drop approach, there are currently a lot of ways to break it. A few years ago, this job would have been considered to be quite secure. The target module does not incorporate any intelligence in the identification of the thing or the action needed to verify CAPTCHA. S.Ezhilarasi et al. [6] presented a CAPTCHA

based on decision-making and image recognition. The writers added noise to the picture to make it more challenging to understand. To add noise to the image, the authors either combine two images or distort it. Overlapping the photographs is not practical for individuals since it makes the images more difficult to read and a significant level of distortion could make it challenging for people to comprehend the problem. A CAPTCHA should be as easy to use for humans and as difficult for bots as is practical.
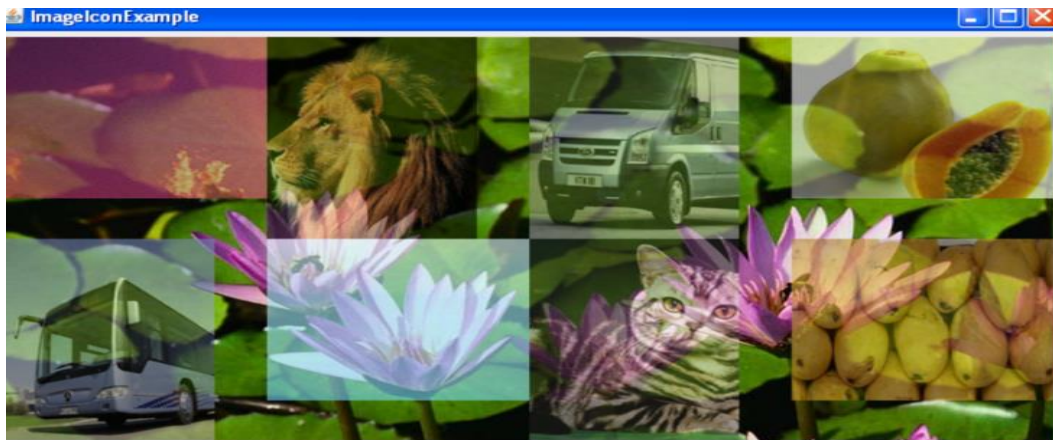

Fig. 3: Overlapping the Images [6]

Bots have a hard time reading the image recognition CAPTCHA in Fig. 3 because some images are superimposed on others. However, visuals like the one in the first image are typically challenging for people to understand. MontherAldwairi et al. [7] presented a flash-based game. Quick games that need the player to click or drag things into place are known as Flash-based games. Flash games tend to focus on puzzle elements. The item identification task in this article is related to the drag-and-drop technique and flash game. Figure 5 shows a flash-based game where the player must choose which soccer ball is one of several objects.

III. IMPLEMENTATION DETAILS

The method above provides a gaming CAPTCHA where there is an inherent issue. The suggested strategy is based on a complex AI problem that necessitates a strong judgment from the ground up. It may be characterized as a situation-based problem that a person faces every day. The recommended strategy is based on game theory, which enables participants to assess their situations and reach wise decisions. Similar to the recommended game that may be used in Turing tests, it is based on real-world problems that individuals may have to solve. This sets it apart from conventional systems.

In proposed game for CAPTCHA where user is required to use his brain and take decision accordingly. There are no incorrect decisions involved but correct decision is related to the real life problems where human is very much capable to think over it. We may use the situation where a user needs to assist someone who has misplaced his phone and is seeking for it as an example. He might ask the user to assist him locate his phone in his bedroom. There are a number of items in the room, including an almirah, a bedframe, the trash can, and maybe another location. But essentially, or by using common sense from day-to-day living. His phone is the first thing he looks for under the pillow since it is the most important thing to check, and it is there. A person can think about this issue without difficulty and come up with a solution, but machines cannot. Users have a time constraint as well for figuring out the game's answer. Everything may be moved about and dropped at any time. In order to properly complete the CAPTCHA and fill out the requested form, a user must drag and drop the phone to the person they discovered it on. An answer to a game shows the optimal decisions that participants, who could have comparable, opposing, or mixed interests, would make and the possible outcomes. The game hypothesis has been used in a wide range of situations where the choices of the participants link to affect the outcome. By concentrating on the crucial components of navigation or views restricted by the participants rather than on pure possibility, the hypothesis advances and moves beyond the traditional probability hypothesis. It has been used, for example, to determine what combinations are likely to shape an electorate or a group of persons who should form a jury.

Table 1: Play off Matrix

	Rock	Scissor	Paper
Rock	0	1	-1
Scissor	-1	0	1
Paper	1	-1	0

Since the total payouts for the game equal zero, it is known as a zero sum game. In this case, the combination of rock and rock does not yield any benefits, but rock scissor yields benefits for the scissor, and in the pair of rock and paper, rock must yield adverse benefits. Similar to how each thing has a circumstance where it must pay off positively or adversely. There are fundamental principles linked with it that may be related to real-life circumstances, and it is part of game theory where scenarios are included and the user is forced to make judgments accordingly.
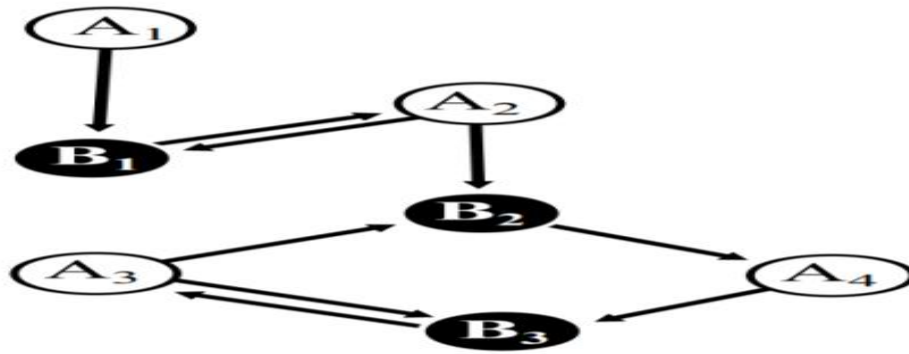
Fig. 4: Best Response Diagram

$$DP = \begin{cases} p, & Success \\ 1-p, & Failure \end{cases}$$

DP stands for the probability of failure, p for success, and 1-p for failure, respectively. The phrase "games against nature" refers to individual games. Without any opponents, the player only needs to make a list of their options before selecting the best one. The game may seem more complicated once chance is involved, yet on a fundamental level, the decision is still rather simple. For instance, while deciding whether to transport an umbrella, a person weighs the costs and benefits of doing so. There isn't a knowledgeable foe, even though this person could make a bad decision. In other words, nature is intended to be completely uninterested in the player's choice, and the person may make his option based on obvious probability. Games played by one person don't have any appeal for game academics.

A. Flow Chart

The suggested gaming CAPTCHA flowchart is shown in Fig. 10, where the procedure is begun by launching a game, after which a timer is launched. One minute is allotted for the game, which is plenty of time to consider your options and make an informed selection.
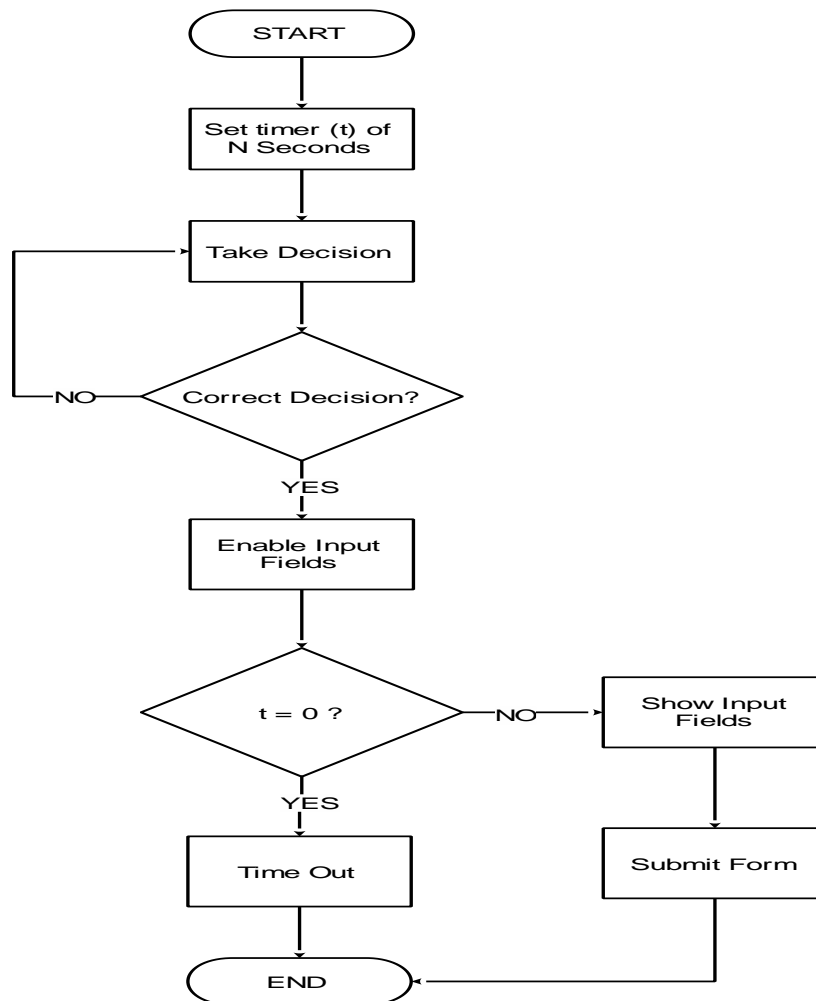

Fig. 1: Flowchart of the proposed gaming CAPTCHA

The system is continually checking to see if the user made the right choice. Once the right choice has been selected, the form's input fields will display, and the user may submit it to complete the process. However, the user is either a robot or a piece of software since they keep looking for the answer instead of making a choice.

B. Game Theory Algorithm

The Dynamic Game Theory Algorithm, which is based on the dynamic game theory methodology, is shown in Table II. The game must first be initialized using time t. Every single draggable item has unique coordinates that the user may modify by dragging the object to a different position. A new position must thus be calculated for each movement. There is a target object among all the other items, and the system is constantly updating its location. The user must locate the target item and drag it to the target place until t is not equal to zero before the user may be said to have made the right choice when it lands there. When the allotted time has passed, the CAPTCHA verification is considered unsuccessful, and a reload button appears. When the user clicks the reload button, a new different scenario will emerge.

Table 2: Game Theory Algorithm

Step 1: Initialize game
Step 2: Set time $t \leftarrow 60$ s
Step 3: $T(x_t, y_t) \leftarrow (x_1, y_1), (x_2, y_2), \ldots\ldots (x_n, y_n)$ // target
Step 4: Set Coordinates (left, right, bottom, top) //drag & drop
Step 5: Compute new location of the object
Step 6: if $T(x_{new}, y_{new})$ hits T_L // T_L Target Location
      {
      Correct $\leftarrow$ Decision
      True $\leftarrow$ Input Fields Visibility;
      }
      else
      Incorrect $\leftarrow$ Decision
      end else
      end if
Step 7: while (t > 0) do
      Repeat Step 5 & 6;
      end while
Step 8: if $t = 0$ **then**
      Verification Failed$\leftarrow$ t //timer
      end if
Step 9: End

IV. EXPERIMENTAL RESULT

The average amount of time it takes to answer the CAPTCHA, the system's lowest recorded time, the proportion of successful and failed users, the standard deviation and variance, the image graphics used in the CAPTCHA, and its difficulty and limitations are all used to determine the experimental outcome.

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$$

$$S = \frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2$$

Where μ is considered as mean value of the system N is the total number of participants, x_i is the individual participant.

$$variance\ (S) = \sigma^2$$

Table 3: Experimental Results

Terms & Parameters	Proposed
Total No. of Users	30
Successful Users	30
Unsuccessful Users	0
Average Time	9.17
Min Time	5
Precision of Success	1
Precision of Failure	0

Table 4: Result Comparison

Terms & Parameters	S.Ezhilarasi [6]	Proposed
Total No. of Users	30	30
Total No. of Successful Users	29	30
Total No. of Unsuccessful Users	1	0
Average Time (μ)	15	9.17
Lowest Time	6	5
Precision of Success	0.97	1
Precision of Failure	0.03	0
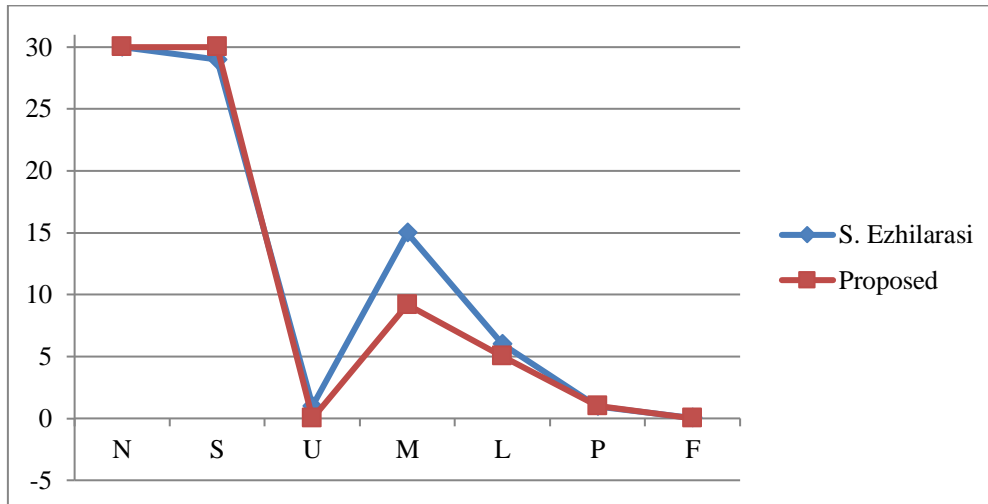
Graph 1: Result Comparison
N-Total No. of Users, S-Total No. of Successful Users, U-Total No. of Unsuccessful Usres, Average Time– M,
Lowest Time -L, Precision of Success-P and Precision of Failure-F.

V. CONCLUSION & FUTURE SCOPE

Situational decision-based reflexivity The modern obstacle that bots must overcome to succeed is CAPTCHA. The suggested challenge can distinguish between humans and bots or between humans and bots. The proposed challenge is based on a challenging AI issue since the user must overcome the CAPTCHA by using common sense to make judgments. The suggested challenge is based on actual scenarios, and the user may resolve the issue in a matter of seconds only by employing common sense or by making a fundamentally sound choice. For instance, if someone is extremely thirsty and given the option between a glass of water and a cup of tea, it is obvious that the person should select the drink of water, which makes sense given their condition. Humans can handle a number of intellectual difficulties in a given amount of time, whereas machines are ineffective at handling these kinds of issues. By making the issue more manageable and appealing in the future, humans will be able to address each problem more quickly. When compared to the basis paper and prior suggested systems, the system performed better.

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