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Automatic Form Filler

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Abstract: ***In the present world, the elderly and illiterate people find it difficult to fill a deposit or withdrawal form in a bank. They often require the help of literate people to fill the form. To solve this problem, we introduce an automatic for filler that would take the customer speech in Malayalam as input and produces the required form. The system is implemented using python modules that involves text-to-speech conversion, language translation, speech-to-text conversion, pdf generation, etc. The system uses googletrans module for translating Malayalam to English and vice-versa. It also uses gTTS module for text-to-speech conversion. The system uses speech-recognition module for converting speech to text format and reportlab module for producing the required form in PDF format. The input speech is converted to text using Speech-recognition module and the generated text is then used for language translation by googletrans module. The questions to be asked is converted from text to speech gTTS module. The system takes both account number and amount from the customer and generate the form with correct entries in PDF format. The generated form is sent to the counter for further processes.***
Keyword: Speech recognition, Speech-to-Text, Text-to-Speech, Translation, Malayalam.

I. INTRODUCTION

In the current scenario of a bank, the deposit or withdrawal form filling is done manually by the customers. It is easier for an educated person to fill the form but it is different in the case of an old-aged, blind or an illiterate person. They require the help of a second person in the bank in order to fill their forms. To solve such a problem, we are introducing an intelligent system. The system aims at generating a filled deposit or withdrawal form by taking speech in local language as input. The output of the system is a filled deposit or withdrawal form generated as a print out from the system. The inputs given are the account number and the amount to be deposited or withdrawn, in the form of speech in local language into the system. The customer is directed to press a button that triggers the system. Then the system responds to the trigger by asking the customer to provide the required input details. The customer will then have to provide the input in the form of voice in their local language. After acquiring and verifying the input, the system is now ready to process the required form. The system then generates a filled form which will be printed automatically.

The system consists of five modules, speech to text conversion module, text to speech conversion module, local language to English translation module, English to local language translation module and, PDF generation module. The speech to text conversion module converts the input given as speech to text so that required operations can be performed by the system. The local language to English translation module translates the converted input text in local language to the corresponding meaningful English text and the English to local language translation module translates the English text into corresponding local language text. The text to speech conversion module converts the questions that the system would like to ask the user, i.e in the form of text to speech. PDF generation module helps in filling the deposit or withdrawal forms with the required data.

II. RELATED WORKS

Xing Wang, Zhaopeng Tu and Min Zhang [1] presented a paper 'Incorporating SMT word knowledge into Neural Machine Translation'. The model uses the Statistical machine translation (SMT) word knowledge in Neural Network-based model for Machine Translation. This method would result in a model size smaller than the sum of a word-based SMT and NMT models combined. Our system involves translating both words and numbers from Malayalam to English language and vice-versa in order to use them for further processing. However, the model fails to translate numbers and hence cannot translate **t**he account number and amount input in Malayalam to English. Thus the model cannot be used in the system as it cannot meet the major requirement.

Burhanuddin Lakdawala, Farhan Khan, Arif Khan, Yash Tomar, Rahul Gupta and Dr. Ashfaq Shaikh [2] presented a paper 'Voice to Text transcription using CMU Sphinx'. Thissystem could recognize and translate multi language speech or voice with maximum accuracy without the help of internet. Our system needs all the words spoken by the user to be recognized. But the CMU Sphinix tool requires all the input speech to be pre-recorded in the system in order to recognize. However, the above method is tedious because the user may enter any number as amount other than the predefined ones. Hence, the model cannot be used in the proposed system due to complexity that may occur while identifying amount.

A. Femina Jalin and J.Jayakumari [3] presented a paper 'Text To Speech Synthesis System For Tamil Using HMM'. This system has features like smooth and natural sounding speech which can be synthesized, and it is flexible to change its voice characteristics. Our system requires the input provided by the user to be played back for the user's verification. However, the model cannot translate numbers to speech making it difficult to convert the account number and the amount to be converted to an audio to be played back for user verification. Hence, the model cannot be used in the system.

Renjith S, Aju Joseph and Anish Babu K.K. [4] presented a paper 'Isolated Digit Recognition For Malayalam- An Application Perspective.' This system describes how a speaker independent isolated digit recognition system can be designed for Malayalam language and shows how such systems can be effectively used in the real-world applications. Our system adopts the idea of recognizing and translating the Malayalam digits as well as Malayalam words. However, the model fails to recognize and translate Malayalam words. Thus, the model discussed cannot be used in the system.

Cini Kurian, Firoz Shah.A and Kannan Balakrishnan [5] presented a paper 'Isolated Malayalam Digit Recognition using Support Vector Machines'. SVMs simultaneously minimize the empirical classification error and maximize the geometric margin. Our system requires digit recognition feature that convert the numbers spoken in Malayalam to English language. However, the SVM model cannot recognize Malayalam words, due to which the model cannot be used in the proposed system.

III. SYSTEM DESIGN

The proposed system is an automatic form filling and generating system that can be used in a bank. This system produces a filled deposit or withdrawal form based on the input provided by the customers which are the account number and amount to deposit or withdraw as speech. Elderly, blind and illiterate people need not look for an educated person in the bank to fill their forms as it is difficult for them to fill forms manually. This system takes speech input so it is easier for users to use.

A. System Architecture

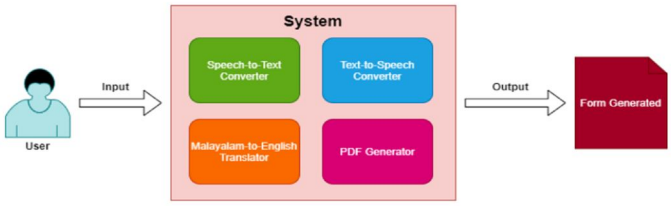

Fig.3.1: System Architecture

The system uses five modules: speech to text conversion module, local language to English translation module, English to local language translation module, text to speech conversion module, PDF generation module. The system initially asks the user which form is to be generated (deposit or withdrawal). Next the user will be asked to enter his/her account number as digits through speech. Then the user will be asked to input the amount to be processed in digits. The system also asks the user to verify and validate the input details after each entry. Fig.3.2 shows the flowchart of the system.

B. Modular Description

The different modules are:

1) *Speech to Text Conversion module:* Speech to text conversion converts spoken words into written texts. This process is also known as speech recognition. Speech recognition describes the process of extracting the meaning from speech, known as speech understanding. The term is different from voice recognition which is the process of identifying a person from their voice.
2) *Text to Speech Conversion module:* The Text to speech conversion system consists of two parts: a front-end and a back-end. The front-end performs two major tasks: First, it converts raw text containing symbols and abbreviations into equivalent written-out words. This process is often known as text normalization, pre-processing, or tokenization. The front-end then assigns these transcriptions to each word, and divides and marks the text to prosodic units like sentences, phrases, and clauses. The output of the front-end id the symbolic linguistic representation made by the combination of phonetic transcriptions and prosody information. The backend, referred to as the synthesizer, converts the symbolic linguistic representation into sound.

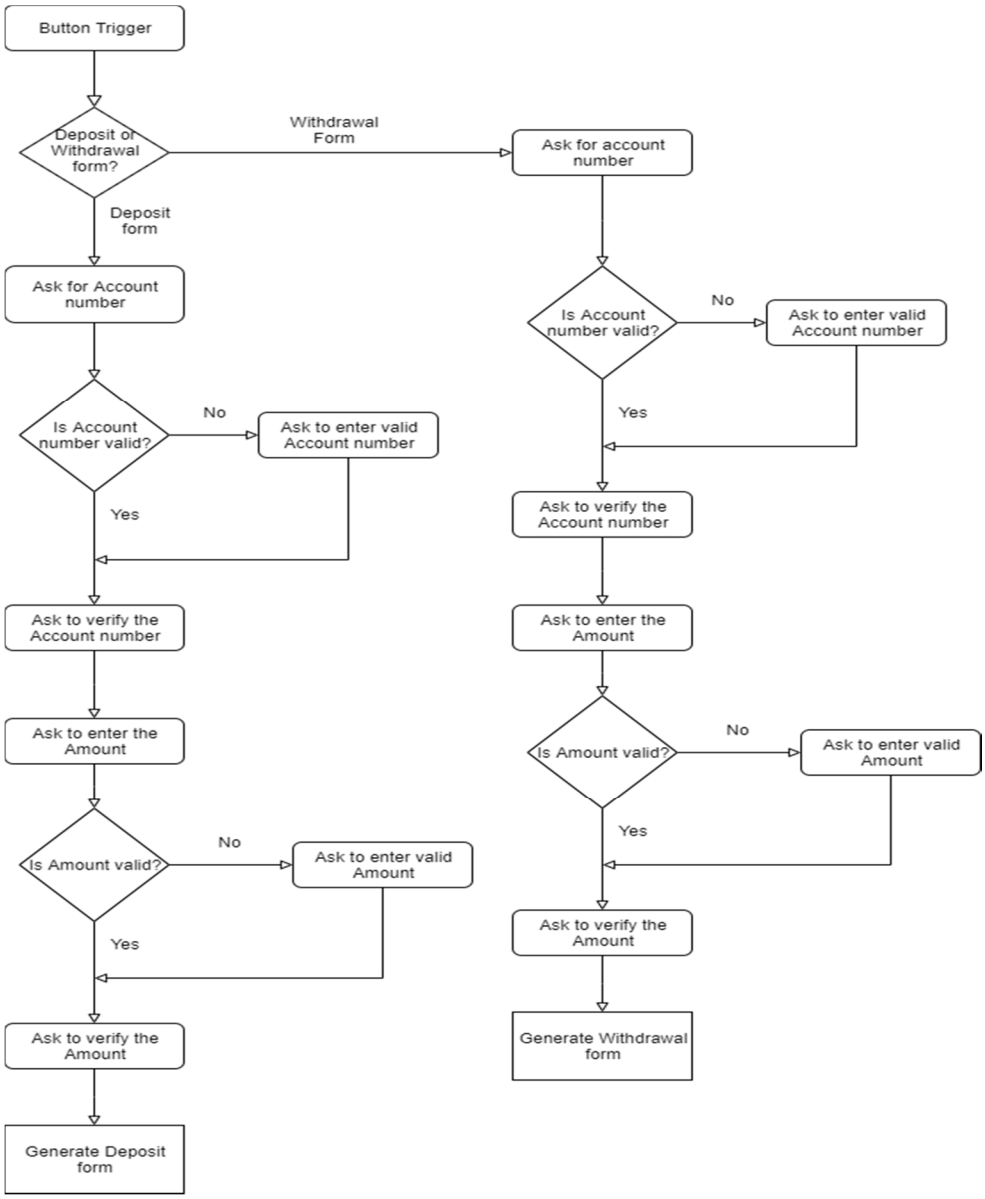

Fig.3.2: Flowchart

3) *Translation module:* Translation is the process of communication of the meaning from a source language to a target language. This process interprets the meaning of the text and produces the same meaning in another language. The main purpose of translation process is to convey the real meaning of the message, taking into account the cultural and regional differences between the source and the target languages. Since every single word of one language may or may not have a word in the other language, study of linguistics becomes crucial for the purpose of translation. Linguistics refers to scientific study of language. Linguistic approach used in translation focuses mainly on the issues of meaning and equivalence where the same meaning is conveyed using a different expression. Linguistics hence tries to find 'what' the language actually means. However, the 'sense to sense' translation is understood to actually carry the same meaning as of the source text. So, the translator is expected to maintain the linguistic equivalence between the source and the target texts.
4) *PDF Generation module:* The PDF format is a document generation format. It is mainly designed for fixed layouts that is compatible with specific paper sizes. With very few exceptions, the document should look exactly the same on two different viewers even on different operating systems, screen sizes or form factors.
5) *Audio Playing module:* The audio playing module is used to automatically playback the audio files like mp3, WAV etc. The pre-saved audios are made to play at the required time using the module.

C. Dataflow Diagram

1) Level 0: DFD Level 0 is also called Context Diagram. It gives the basic overview of the entire system being analysed or modelled. Fig.3.3 shows the Level 0 DFD of the system. The user gives their voice as input into the system which verifies the input data at various levels. The system finally generates a PDF file with the verified information.

Fig.3.3: DFD Level 0

2) Level 1: DFD Level 1 provides a more detailed breakout of the Context Level Diagram. It highlights the main functions carried out by the system into sub-processes. Fig.3.4 shows level 1 split into deposit and withdrawal modules.

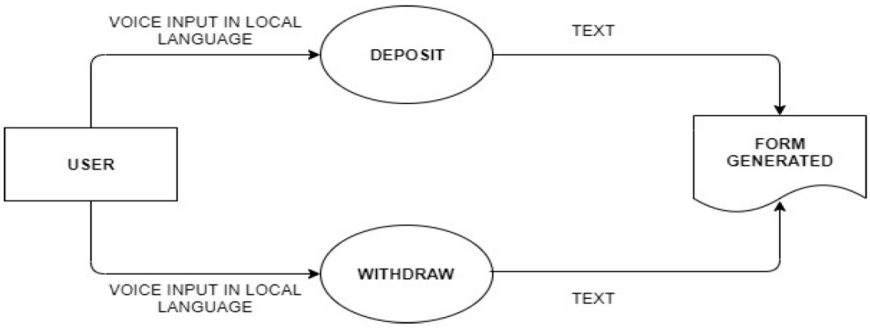

Fig.3.4: DFD Level 1

3) Level 2: Level 2 shows the processes involved when the user choice is deposit or withdraw.

a) Deposit

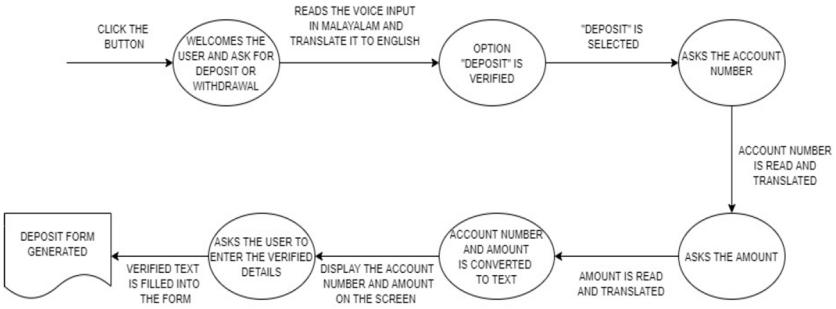

Fig.3.5: DFD Level 2.1

b) Withdraw

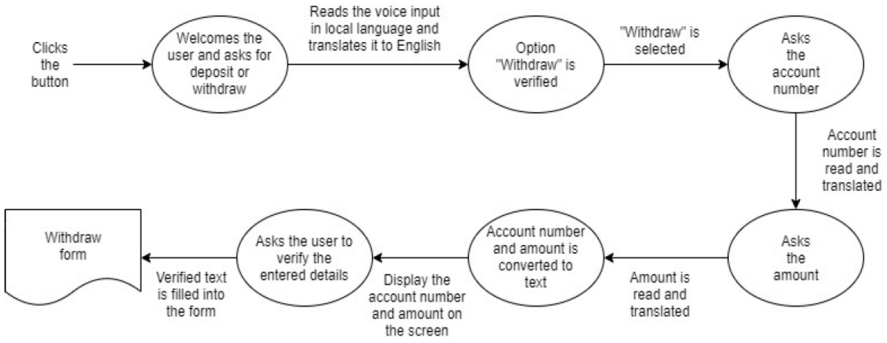

Fig.3.6: DFD Level 2.2

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IV. IMPLEMENTATION

A. Speech to Text Conversion Module

Many speech recognition engines and APIs are supported by Python, including Google SpeechEngine, Google Cloud Speech API, etc. Our system uses Google Speech Recognition Engine with Python. SpeechRecognition library uses the Microphone as the source for obtaining the speech. listen() function listens to the Microphone source and recognize_google() function converts the obtained speech to text.

The user input in their local language is captured through the microphone and is converted to text format in the required language.

```
import speech_recognition as sr
r=sr.Recognizer()
with sr.Microphone() as source:
        r.adjust for ambient noise(source)
        print("Speak Anything : ")
        audio = r.listen(source)
        print("Time over")
        try:
                print("Recognizing")
                word = r.recognize google(audio, language = 'ml-IN')
                print("you said: "+ word)
        except:
                pass;
```

B. Text to Speech Conversion Module

A text-to-speech system converts a normal language text to speech and its similarity to human voice and its ability to be understood clearly judges the quality of the speech synthesizer.

Several APIs are available to convert text to speech in python. One of such API is the Google Text-to-Speech API commonly known as gTTS. Our system use gTTS module to convert the text entered into speech stored as mp3 file in the specified language.

The instructions to be played for the users are converted from textual format to audio files by the system using this module. Also the system validated inputs are converted back to speech for user verifications using this module.

```
from gtts import gTTS
import os
myText = "hello"
output= gT
TS(text=myText, lang='en', slow='False'
output.save("hello.mp3")
os.system("hello.mp3")
```

C. Translation Module

Our system uses googletrans, a free and unlimited python library that implemented Google Translate API for translating Malayalam to English and vice-versa.

Googletrans uses the Google Translate Ajax API to make calls to such methods as detect and translate. The system receives the input in Malayalam and then translates them into English language. The text in English language is used for further processing in the system.

The user inputs their data in their local language which needs to be converted into the system default language. The inputs translated are then used for further processes and validations.

```
from googletrans import Translator
translator = Translator()
tex = translator.translate("ഡിപ്പാർട്ട്മെന്റ്")
print(tex.text)
```

D. PDF Generation Module

The PDF generation module is used to create the deposit or withdrawal form as per the user requirement. The generated form should contain the account number and the amount to be deposited or withdrawn. The generated form is saved as a PDF file. Our system uses reportlab.pdfgen library for PDF generation.

```
from reportlab.pdfgen import canvas
c=canvas.Canvas(Form.pdf")
c.drawimage('depo.png',0,600,mask='auto',width=600,height=200)
c.showPage()
c.save()
```

E. Audio Playing Module

Our system uses playsound module to play the audio. Playsound is a pure, single function module with no dependencies for playing sounds. It offers no functionality other than simple playback.

```
from playsound import playsound
playsound("hello.mp3")
```

V. RESULT ANALYSIS

The main aim of software testing is to identify whether there are any defects in the program. However, even after satisfactory completion of the software testing phase, it is not possible to guarantee that the program is error free. This is because the input domain of most of the programs are huge and it is practically not possible to test the program exhaustively with respect to the value each input can assume.

System testing gives a logical assumption that if all parts of the system works successfully, then the goal of the system will be achieved.

A. Unit Testing

Unit testing tests each module as a single unit of the system. In unit testing, module interfaces are tested in ensure that information properly flows into and out of the units under test.

Table 5.1: Deposit or Withdrawal

Sample Input (Voice)	Expected Output	Obtained Output
Deposit/ Withdrawal (in local language)	Detected Successfully	Detected Successfully
Invalid entries	Not detected. Ask for deposit or withdrawal	Not detected. Ask for deposit or withdrawal

Table 5.2: Account Number

Sample Input (Voice)	Expected Output	Obtained Output
Valid account number (in local language)	Detected Successfully	Detected Successfully
Invalid account number	Not detected. Ask for valid account number	Not detected. Ask for valid account number

Table 5.3: Amount

Sample Input (Voice)	Expected Output	Obtained Output
Valid amount (in local language)	Detected Successfully	Detected Successfully
Invalid amount	Not detected. Ask for valid amount	Not detected. Ask for valid amount

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B. Validation Testing

In validation testing, the system validates that the user inputs valid data. Invalid data prompts the user to enter valid data as inputs.

Table 5.2.1. Deposit or Withdrawal

Field	Sample Input (Voice)	Expected Output	Obtained Output
Deposit/ Withdrawal	പിൻവലിക്കണം	Detected Successfully	Detected Successfully
Deposit/ Withdrawal	നിക്ഷേപിക്കണം	Detected Successfully	Detected Successfully
Deposit/ Withdrawal	നിക്ഷേപിക്കണം	Detected Successfully	Detected Successfully
Deposit/ Withdrawal	അതെ	Not detected. Ask for valid input	Not detected. Ask for valid input
Deposit/Withdrawal	പറയാം	Not detected. Ask for valid input	Not detected. Ask for valid input

Table 5.2.2. Account number

Field	Sample Input (Voice)	Expected Output	Obtained Output
Account number	123567	Detected Successfully	Detected Successfully
Account number	598463	Detected Successfully	Detected Successfully
Account number	563	Not detected. Ask for valid account number	Not detected. Ask for valid account number
Account number	പറയാം	Not detected. Ask for valid account number	Not detected. Ask for valid account number
Account number	53അതെ	Not detected. Ask for valid account number	Not detected. Ask for valid account number

Table 5.2.3. Amount

Field	Sample Input (Voice)	Expected Output	Obtained Output
Amount	ആയിരം	1000	1000
Amount	രണ്ടായിരത്തി ഇരുപത്	2020	2020
Amount	ഒരുലക്ഷം	100000	100000
Amount	അതെ	Not detected. Ask for valid amount.	Not detected. Ask for valid amount.
Amount	ഇരുന്നൂറ്	200	200
Amount	അമ്പതിനായിരം	50000	അമ്പതിനായിരം. Invalid amount. Ask for valid amount.

Table 5.2.4. Over all Result Analysis

Field	No. of Sample inputs	% of Correct detections
Deposit/Withdrawal	1000	95%
Account number	1000	86%
Amount	1000	81.5%

The system detects the user choice for deposit or withdrawal form successfully with no delay. However, the system finds difficulty in detecting certain inputs due to difference in pronunciation and accent of individual users.

VI. CONCLUSION AND FUTURE SCOPE

The system is a solution to the difficulties faced in manually filling the bank forms by the illiterates, blind and elderly people. The system is easy to use and is very user friendly. Since it is available in local languages, it makes the task even easier for those who cannot understand English.

However, network availability and noise cancellation are required for the smooth functioning of the system.

The project can further be extended by linking them with the bank database and the form can be directly sent to the bank officials thus mitigating the need for printed forms. Also, the user biometrics can be used so that the user need not enter his/her account number into the system. The project can also be used as a user guide in malls, railway stations, etc.

The project meets the entire system requirements and satisfies the user requirements to a greater extent.

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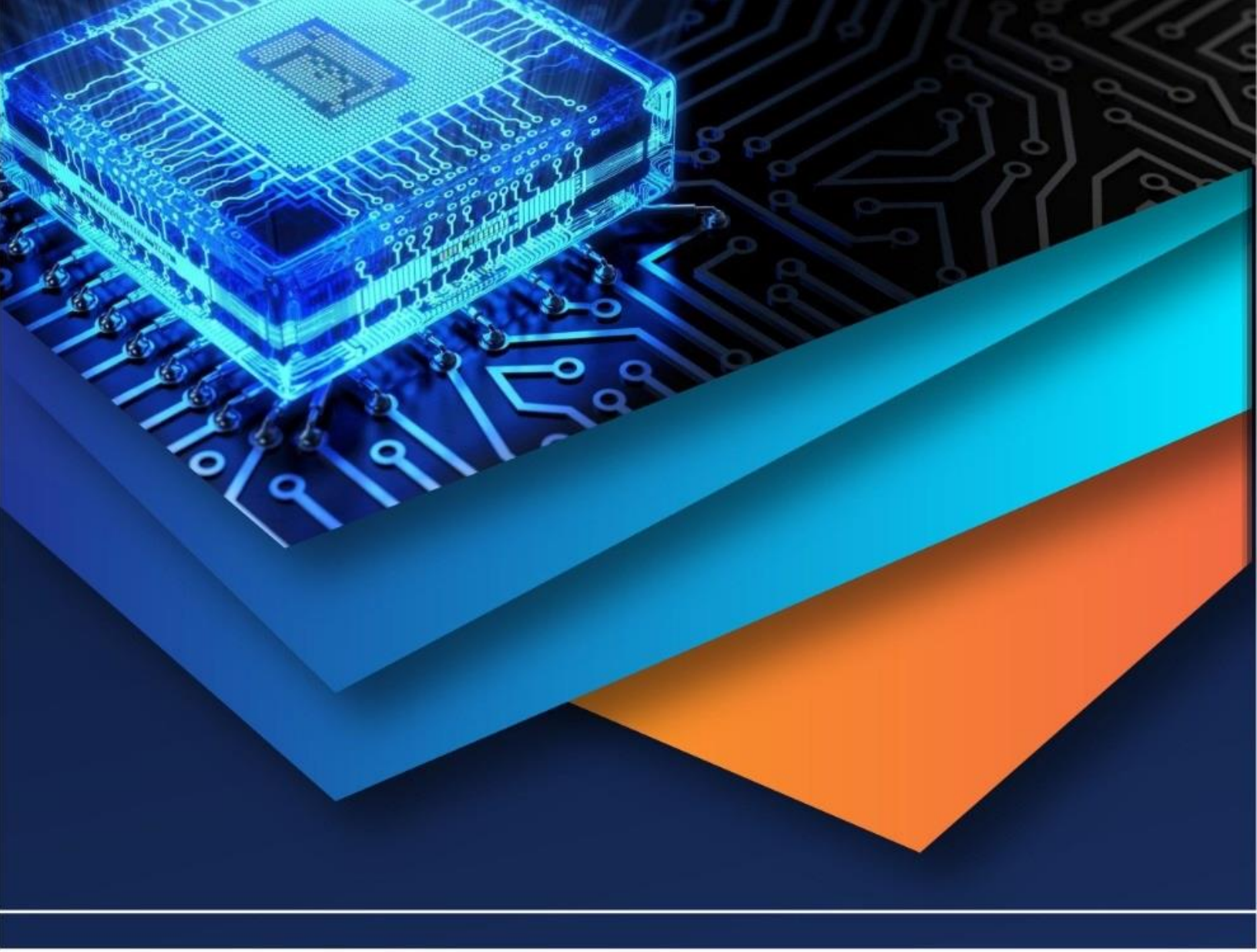

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