2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)
Amity University, Noida, India. June 4-5, 2020

Conversation to Automation in Banking Through Chatbot Using Artificial Machine Intelligence Language

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Abstract: **Artificial Machine Intelligence is a very complicated topic. It involves creating machines that are capable of simulating knowledge. This paper examines some of the latest AI patterns and activities and then provides alternative theory of change in some of the popular and widely accepted postulates of today. Based on basic A.I. (Artificial Intelligence) structuring and working for this, System-Chatbots are made (or chatter bots). The paper shows that A.I is ever improving. As of now there isn't enough information on A.I. however this paper provides a new concept which addresses machine intelligence and sheds light on the potential of intelligent systems. The rise of chatbots in the finance sector is the latest disruptive force that has changed the way customers interact. In the banking industry, the introduction of Artificial Intelligence has driven chatbots and changed the face of the interaction between bank and customers. The banking sector plays an important role in development into any country. It also explores the existing usability of chatbot to assess whether it can fulfill customers ever-changing needs.**

Keyword(s): Chatbot, Online Banking, AIML, Artificial Intelligence

I. INTRODUCTION

A chatbot is a conversational agent which uses the natural language to communicate with users. There are several chatbots required for serving in various domains. Nevertheless, chatbots knowledge base is hand-coded in their brain. This paper provides a summary of ALICE chatbot, its AIML structure and our experiments for automatically creating various ALICE prototypes based on a corpus method. A summary of the program built that translates readable text (corpus) into AIML format is provided along with a review of the various corpora we used.

Our tests revealed the likelihood that practical prototypes could be produced without the need for sophisticated natural language processing or advanced machine learning techniques. These prototypes have been used as tools for practicing different languages, for visualizing corpus and for answering questions [1].

The emergence of chatbots is the new disruptive force in the financial sector that has changed the way consumers communicate. In particular, the banking industry, the introduction of chatbots driven by Artificial Intelligence has changed the face of the bank-customer interface. This paper explores the feasibility of the growing use of chatbot by the banking industry. The banking sector in any country plays a major role in the economy of country. It also tests the latest chatbot features to decide if it can satisfy the ever-changing needs of consumers.

The concept of Chabot's isn't new. Over the past few years, however, the use of bots has attracted industries. Chatbots were first set up in the 1960s and have come a long way from their initial development. There are two different types of chatbots (Fig.1). The most common type of chatbot is based on rules, and the more advanced chatbot is powered by artificial intelligence [2].

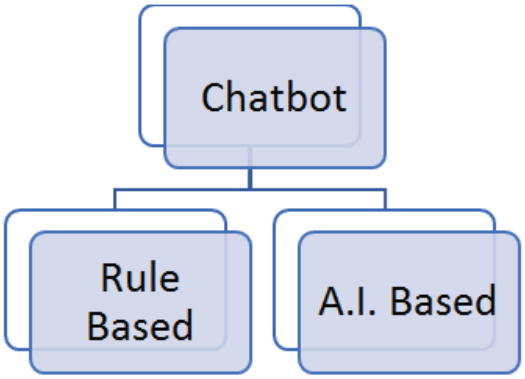

Fig. 1. Types of Chatbot

Chatbots use natural language processing tools for artificial intelligence (AI). Computers are configured in this framework for reading, processing and analyzing large amounts of natural language information. Technologies for artificial intelligence also include deep learning and algorithms for machine learning. AI bots learn from people's conversations and interactions, expanding their database. On the other hand, rule-based bots consist of simple systems and thus have limited responses. The program scans and decides keywords and responds with the appropriate command type the user input. Unlike the AI-based chatbots, when they encounter unfamiliar commands and unrecognized phrases, rule-based chatbots no longer respond.

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II. VIRTUAL CHATBOTS

Virtual Chatbots are computer programs (scripts) designed to mimic the human chatbot language. They use the portal or online store chat system to connect with others. The (Graphical user interface) GUI can be almost any common chat app on the market today. In a telecom environment, there are also chatbots that "live" and automate sending (short message service) SMS messages. Since chatbots mimic human language, they can be designed using different speech styles to develop their own personality. We can also understand (typed) written and spoken text and interpret it. Chatbots powered by artificial intelligence (or machine learning chatbots) can answer ambiguous questions and can generate an answer on their own based on processing technology for natural language. We can learn from their past conversations. From the beginning or scratch, we can also generate an original answer.

The more they talk, the more information they acquire and the smaller they are their conversational limits. Virtual assistants are able to do more than just talking. For many other reasons, chatbots are used, such as data collection, flight booking or placement of orders. They will support clients with different tasks and generate private conversational interactions that cannot be accomplished with websites or apps.

Chabot's are commonly used as tools for knowledge retrieval, such as product specifics extraction. Virtual assistants can help improve business performance, such as informing you about appointments, handling the to - do lists, taking notes, etc. Both are called interfaces for communication, but both are very distinct from each other [3].

A.I. chatbots can understand language beyond a set of pre-programmed commands and continue to learn based on the inputs they receive. When they experience new circumstances, they can also make changes based on patterns and become smarter over time. This form of chatbot can be extended to a variety of uses–from analyzing emotions to predicting what a client is searching for on your website [4].

III. USAGE OF CHATBOTS

The creation of chatbots is like the pattern of developing mobile apps and web pages and begins with the design initially. This design describes the bot's and user's interaction. The pattern also includes the building of the bot that uses a natural language processing engine to involve the input analysis. The bots are then analyzed and maintained after the initial stages.

The development of chatbot can take place on platforms provided by providers of Platform-as-a-Service. The IBM Watson, SnatchBot, and Oracle Cloud Platform are among them. Recent studies seem to indicate that people are spending more time using messaging apps than social media. Consequently, messaging apps now provide more channels to reach many customers for companies and businesses. Chabot's performance, especially those using AI, entices and encourages businesses to invest in these types of services.

Companies across industries are discovering the potential of conversational bots— to help automate and streamline business, enhance business productivity, and enhance employee and customer engagement. While the early conversational bots models are basic response systems, today's AI-powered bots are much more powerful— and will only become more advanced and efficient in the years to come [5].

Deep Chatbot learning: A deep learning chatbot learns from ground up in a process known "Deep Learning." The chatbot will be developed using machine learning algorithms in this process. From his data and human-to-human dialogue, a deep learning chatbot learns everything [6].

In the Fig 2., it talks about how the general vast types of chatbots operate where the user types in their input through any messaging platform being websites or mobile applications using high level language (Natural Language Processing) being the normal understanding language used by humans on a daily basis for communication ,which is then converted to bot logic through machine learning and then performs the action that was directed to do or provides the information that the user had asked for.

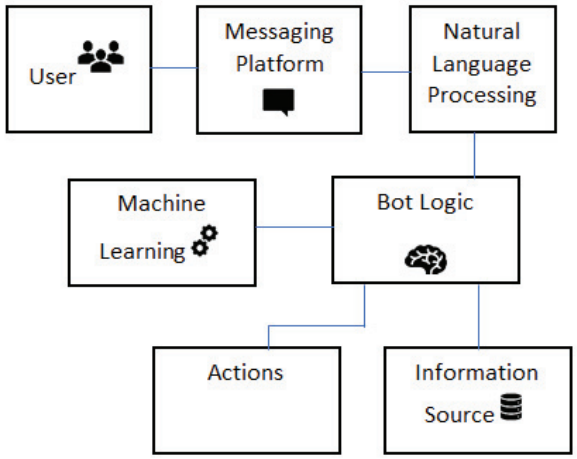

Fig. 2. User interaction with chatbot

Chatbots are programs that use Artificial Intelligence (AI) to mimic human conversation. It is built to be the overall virtual assistant, entertainment function, helping one complete task varying from answering questions, providing driving directions, turning up the smart home thermostat, playing one's favorite tunes, etc. Chatbot is now becoming more popular in business groups as they can minimize customer support costs and at one time support multiple users. But it is still necessary to make chatbots as efficient as possible to accomplish most tasks [7].

To address this issue, we provide a chatbot design in this paper that offers an accurate and reliable response to any request utilizing Artificial Intelligence Markup Language (AIML) and Latent Semantic Analysis (LSA) focused on the (frequently asked question) FAQ dataset. Using AIML, template-based and general questions such as welcome / greetings and general questions will be addressed, and other service-based questions will be answered using LSA to provide responses for customers at any time. Any university can use this chatbot immersively to address FAQs to interested students.

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IV. ADVANTAGES AND GROWTH OF CHATBOT

The bot helps the users feel that they are interacting with a human being .The bot responds very rapidly .The system is easy to comprehend and handle .The intelligent system understands user's queries and responses fast. Users need not write the query in standard format [8]. The growth of chat and voice technologies depends on NPL's (Natural processing languages) improvements. In fact, voice and chat bots are increasing and will continue to complement each other [9].

Projected development of the chatbot centered on the growth rate of 200 percent. Internet Live Stats Historical Site Statistics (Chatbots Magazine reposted the graph) The graph shown below is a comparison of the use of websites against chatbots in complete different times of the world. But shows even at its different times it started out roughly the same but as time goes by the difference keeps getting higher for chatbots in comparison. As well as the rate at which is increases is also vastly different for both.

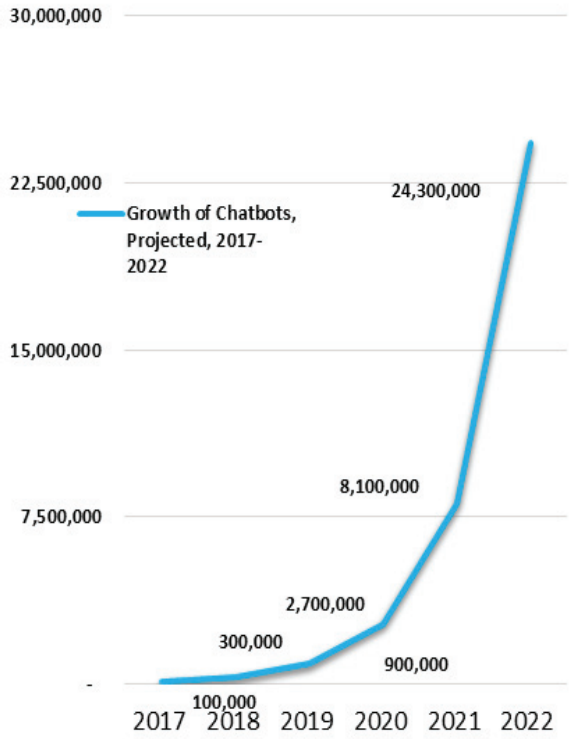

Fig. 3. Projected Chatbot Growth 2017-2022 [10]

In the Fig 3**,** it is seen that during 2017-2022 the use of chatbots is way more popular in the industry. Organizations prefer chatbots due to the convenience that provides the customers what it requires with ease and the ability to have less human workload and make the systems handle more and more work making it faster and better and more reliable.

V. CHATBOT INADEQUACIES

The responses to customer queries received separately by AI-based chatbots were, according to RichRelevance, more "creepy" than "cool" (40.7% vs. 27.0%) [11]. Chatbot technology is far from ideal even in 2019. Currently, businesses that use chatbots see many opportunities for improvement. According to Spiceworks, 59% of respondents reported that chatbots frequently ignored the complexities of human communication, 30% recorded incorrect chatbots executing orders, and 29% documented difficulties in interpreting accents. However, 23% of surveyed organizations find that smart helpers are unable to discern the "owner's" speech, which can be a concern under busy environments.

In Fig 4, it is seen that there are still a large scale of misunderstandings that occur in chatbots whether it be voice or text based and still require tons of additional information and requires further development and improvement to reduce these faults.

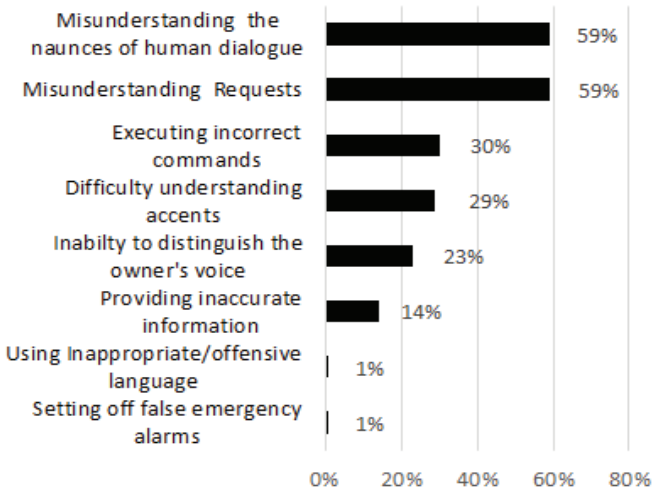

Fig. 4. Errors organizations have encountered using chatbots

For communication, messengers are playing a very important role today, examples like, Facebook Messenger, WhatsApp, WeChat and others are very popular today for mobile communication. Over a billion active monthly users, WhatsApp has reached nearly 700 million (source: statista.com), Facebook Messenger—900 million, WeChat [12]

The top four mobile messengers almost a year ago surpassed the global popularity of social networks (source: BI Intelligence). 36% of smartphone owners use text messengers, according to a Pew Research report released in 2015. In the 18–29 age group, this number increases to 49%. These results showcase that university going students, young age group in urban area heavy users of smartphone application for day to day uses.

VI. RISE OF MOBILE APPLICATION

Mobilesquared performed a study on mobile messaging sector and market patterns in the UK. One of the findings in this Fig 5 and Table 1 .

TABLE I. 2013-2017 GROWTH RATE IN (%)

Mobile messaging	20%
Smartphone	16%
Social Media	8%

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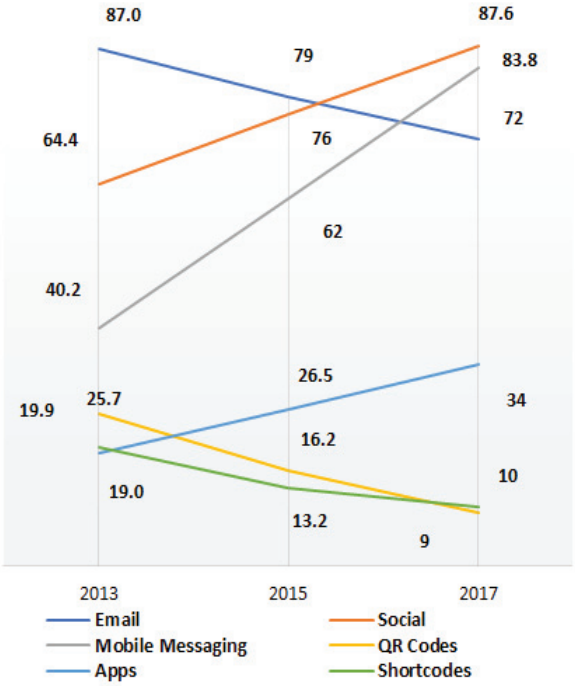

Fig. 5. Growth of Mobile Messaging

VII. Growth of Banking Industry

As a financial transaction intermediary, a bank conducts its business processes primarily on offering savings and lending money to potential borrowers for organizational development. Technology innovation enables a bank to enter the market on a wider scale by further expanding its footprint and is obligated to provide consumers with quick, safe and omnipresent products (as in financial services) in order to generate income through executing various business goals and strategies. Bank compilations are known as the banking industry; this is to separate the purposes of the banking industry itself— from financial support, savings and insurance, the banking industry is moving towards providing people with beneficial support [13].

The banking industry is continuous on growth, and as comparison to the financial crisis of 2008, total reserves are also in a healthy state. In turn, disruptive technology companies and neobanks come into the market, and traditional banks then negotiate with them or combine with them to boost their operation [14].

VIII. Global Online Banking

Global online banking is continuous on growth, and it is expected to reach $ 29,976 till 2023, which is 22.6% CAGR growth from 2016, which was $ 7305 (Fig.6).Online banking covers all sorts of transactions made online / internet for different purposes. To provide better customer services, it is the application of new technologies. The competition is largely driven by consumer satisfaction, higher interest rates, and technologically advanced design. High security vulnerability of data from consumers hinders development in the sector. Growth in mobile use, increased internet penetration among users, and increased development and growth of Asia-Pacific developing economies are some of the main factors that drive market growth [15].

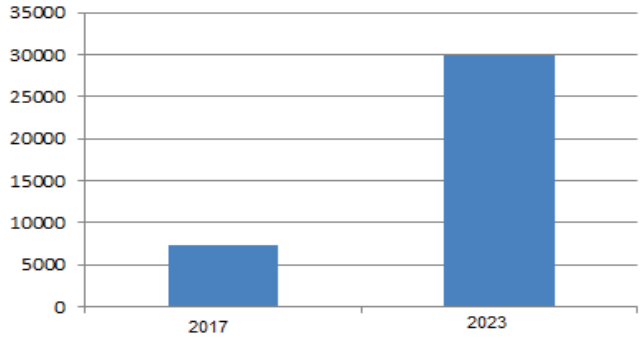

Fig. 6. Growth on online banking ($million) 2016-2023

IX. Artificial Intelligence Markup Language

There are three basic elements of Artificial Intelligence Markup Language. AIML's building block is the category. A question / answer or input / response pair is represented in each category. Categories are made up of patterns and templates themselves. Patterns are the feedback that the AIML interpreter provides. Templates represent the response generated by the interpreter to a given input [16].

To create a basic AIML class from scratch, we first need to establish the software type (in this case XML with an XML version and encoding statement). Contrast this with the related variant of an open AIML comment. Start with the AIML declaration closed as shown below. First, apply the instance of the class above to the software and construct a valid question / answer pair.

X. The ALICE Chatbot System

Wallace first introduced the Artificial Linguistic Internet Computer Enterprise A.L.I.C.E (Foundation of Artificial Intelligence, 2007). Alice's English dialog series data is included in AIML documents. AIML is a subset of the mark-up language (XML) or the mark-up language of artificial intelligence [17].

AIML comprises of data items named AIML objects, comprising of structures called topics and categories . The topic is an additional item at the top level, it has a name attribute and a collection of similar categories. The design of AIML is as follows: PATTERN THAT TEMPLATE. The tag can be an option and implies that the present pattern relies on a previous chatbot input. The AIML template is plain, with letters, spaces, and the wildcard's and* signs. Since the beginning of 2013, A.L.I.C.E has been focusing on a draft proposal of AIML.

```
<aiml version –"1.0.1">
<topic name-"About TOPIC">
<category>
<pattern>  About the PATTERN </pattern>
<that> About the THAT</that>
<template>.About the TEMPLATE </template>
</category>
 ..
..
```


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```
</topic>
</aiml>
```

Terms can be letters and numerals, but there are no other representations. Characters are divided into one room, and the characters of the wildcard are like characters. The pattern language of the series is invariant. The principle of pattern matching methodology is based on finding the best matching pattern used to produce the answer to the chatbot of ALICE.

The AIML structure is as follows: optional is the < tag >, which means that the current design is focused on a previous chatbot output. The design of AIML is simple with the lines, spaces, and* indications of the wildcard. The terms that include letters and numerals, but there are no other characters. Words are divided by a single space, and the characters of the wildcard are like words. The vocabulary of the template is invariant string. The principle of matching pattern strategy is based on finding the shortest, best match between patterns.

XI. Types of ALICE/AIML Categories

ALICE / AIML can be categories in three different categories, as Atomic, default and recursive (Fig.7)

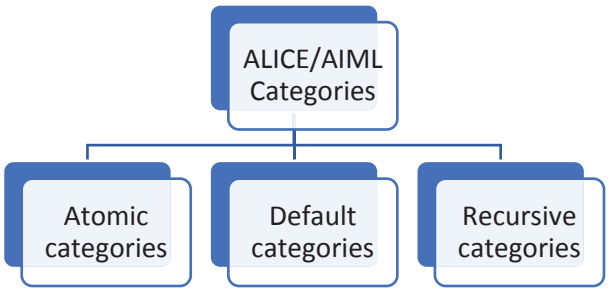


Fig. 7. Types of ALICE/AIML Categories

Atomic categories: They don't have wildcard symbols like _ and *. For Example:

```
<category>
 <pattern>25 Dirhams</pattern>
 <template>Lets go for this, its affordable. </template>
</category>
```

In the above category, if the user inputs '25 dirhams (AED)', then ALICE answers 'Lets go for this, its affordable.'

Default categories: Such forms have wildcard signs such as * or_ . The wildcard symbols suit some data, but in alphabetical order they can differ. If the computer does not consider the previous class with an atomic template, then it will match with a normal pattern like:

```
<category>
 < pattern >25 * </pattern>
 <template>
 It is Twenty Five.
 </template>
</category>
```

So ALICE will respond 'It is Twenty Five'.

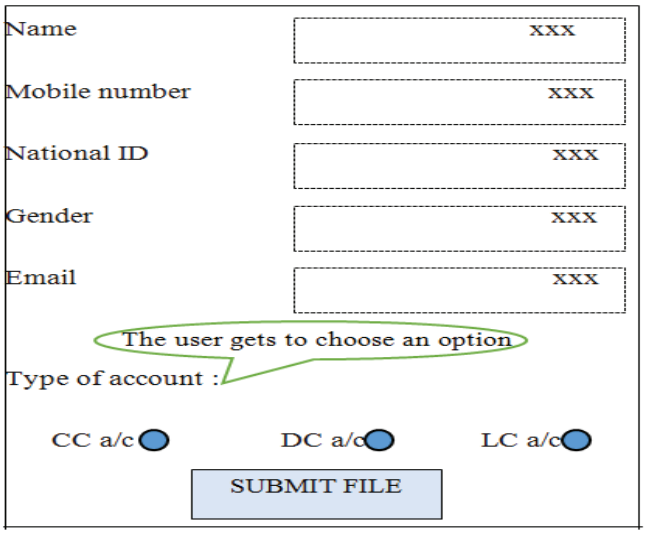
Recursive categories: These are the ones that apply to the laws of recursive reduction with templates and tags. Recursive definitions have different applications: linguistic reduction that reduces complicated grammatical forms to simpler ones; dividing and winning that divides the sentence into two or more sub-parts and blends the responses to each; and dealing with synonyms by translating different ways of saying the same thing to the same response. The feedback is mapped to a different form, indicating the same.

XII. Framework for Chatbot Interaction

Suppose we suggest a following Virtual Chatbot for a bank XYZ. Taking the example over here based on opening a new account which would require assistance from a website or mobile application, this would be the assumption for the following framework.

STEP 1: Set parameters to open an account

As seen in Fig 8**,** different sets of parameters are given by the bank that are considered most important and crucial data required for their database from the customer. In this example , three types of card accounts are given to the customer to choose from so that later in the chatbot the system could narrow down the processes it would have to run and only use the data that is required making it more time efficient and fast.



CCa/c-Credit card account| DCa/c-Debit card account| LCa/c-Loan card account.

Fig. 8. Customer Interface for Interaction

STEP 2: Submission of file

Shown in the Fig 9 below**,** is where a Reference_ID is generated for the customer. A following Pop up message shows up informing them about the time span it would take for the Reference ID to show up in the email.

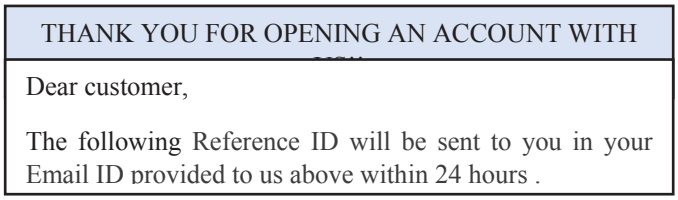


Fig. 9. Generation of Reference ID (Interface)

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STEP 3: Checking the status of the account

In Fig 10 below, it is where the chatbot system comes to play where it assists the user in further information than what's already provided in the webpage. This could be for existing (Bank ID) or new customers (Reference ID) as well to check on their status for their account within the different account types given.

The Bank ID and Reference ID are programmed as or commands whereas the different account types are programmed as if-else commands. The three different card account options are given if selected by the customer then another pop-up page shows up being a virtual chatbot then showing them their account status or if the customer has different account details that have to be enquired related to the card account, they selected then the following information will be shown. As seen, this is just a depiction and can be programmed however the bank wants their chatbot system to operate like as its very flexible.

Another option is given in case the customer has queries outside the given selections if so, it then connects the user to a human for further assistance making it convenient to ask about anything related to the bank and any kind of account.

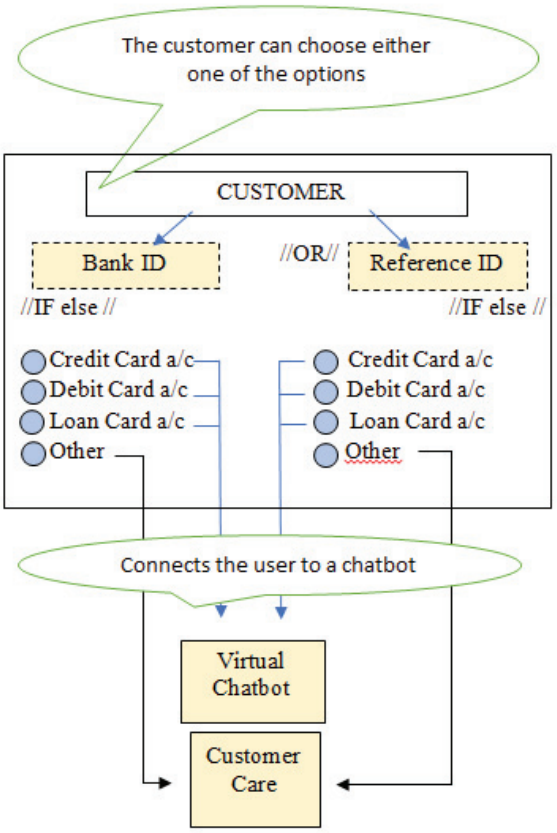

Fig. 10. Chatbot Internal Search

STEP 4: Examples for designing codes for the virtual chatbot

```
//Referencing Fig 6//
<aiml version = "1.0.1" >
 <category>
 <pattern> * name is * </pattern>
 <template>
 Hello ,how can I help you <star index="2"/>
 </template>
</category>

<category>
 <pattern>My address is * . I want a new cheque book
delivered at home </pattern>
 <template>
 Hello! Alright ! <think><set address = "addr_name">
<star/></set></think>
 </template>
 </category>
<category>
 <pattern>Bye. </pattern>
 <template>
 Bye. Cheque book will be delivered at <get name =
"addr_name"/>
 </template>
 </category>
</aiml>
```

XIII. Turing Test

Turing test, introduced in artificial intelligence (1950) by the British mathematician Alan M. Turing to decide whether a machine would "think" [18]. The experiment was conducted as a kind of imitation game, as established by Turing. In one side of a computer screen sits a human investigator whose task is to talk with some enigmatic interlocutors on the other hand. Most of those interlocutors will be people; one will be a chatbot, created solely to make the judge think it is the real human being [18]. Turing's conceptual research was clear and strong, but it was disturbing from the outset. Turing does not contend on the basis that the ability to convince an unspecified number of people, unspecified credentials, an unspecified length of time, and an unspecified number of times, would support the inference that the machine is thinking— it merely asserts this [19].

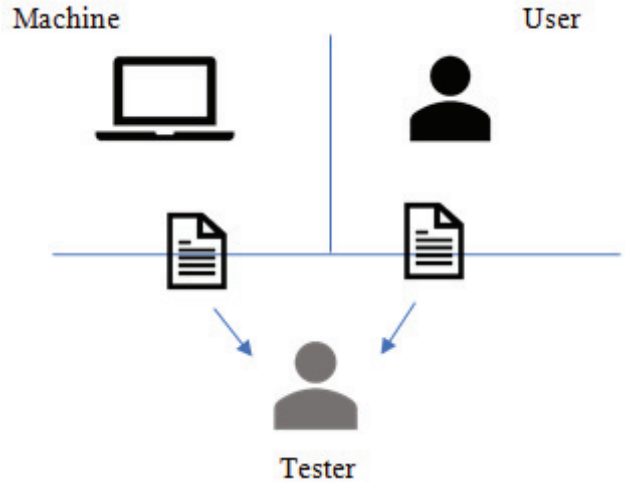

Fig. 11. Turing Test

XIV. Problems for the Turing Test

In the Fig 11. the Turing test is not a perfect measure to determine if a computer is smart. There may not be a stupid

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way to tell if an entity is smart or not. Intelligent conduct is sometimes found by intelligent beings. On the other hand, sometimes stupid machines can perform most things better and more reliably than intelligent people. But the Turing test has its own problems described below [20].

The Turning test is related in chatbot as it is a test used to tell if a chatbot is good enough and or is equivalent to a human being or not. It helps to identify weather or not the computer is capable of thinking like a human being. During the test the human functions, as the question are while the second human and the computer function as respondents. This test is repeated many times .if the questioner makes the correct choice in half of the test runs or less the computers considered to have artificial intelligence because the question regards it as just as a human respondent.

Limitedness: In terms of a machine's conversational abilities, the test can only feature intelligence in accordance to it. Intelligence is much more than that.

Short Preview: The scope of this test is limited to the limits of human ability to understand and respond in a human language. But it's not just the smart / intelligent behavior of the world. What about the intelligence of the animals? Consequently, the ability to pass the Turing test is not the only human intelligence predictor.

Unproductive Developments: It is just a distraction from more productive research to try to pass the Turing Test.

Disillusionment of Goals: Producing lifelike models of human beings is a vital activity. These objects may be useful in a match, or maybe as a more user friendly gui, but they are not part of the core science of making smart machines, that is, machines that solve smart problems. To achieve higher AI research goals, the experiment is not required to be passed.

XV. Case Examples

In Singapore: One of the oldest POSB (Post Office Savings Bank) banks in Singapore and part of the DBS Banking Group, a virtual assistant, POSB Digibank Digital Assistant, has been introduced [21].

It is built on the KAI conversational bot / artificial intelligence (AI) system by a New York-based fintech start-up, Kasisto.

POSB's chatbot can answer questions on Facebook Messenger about account balances, utility bill payments, and fund transfer requests. It will also be linked to the WhatsApp and WeChat chat networks. Due to government funding and accessibility to resources, Singapore is already known as the world's leading fintech center. The year is not yet over, but the banking world has already been changed by the industry. The association also established two business models for fintech, namely competitive, which specifically threatens traditional banks and cooperative, which strengthens their roles. Further momentum was obtained by those in the latter. Investment in collaborative fintech businesses has grown 138 percent, as fintech recognizes existing banks as potential partners slowly.

Consequently, through partnering and investing in fintech firms, banks have also grasped the incentives. At 54 percent of fintech firms, those in the banking & payments subsector took the share. DBS has updated its IT system to incorporate big data, biometrics, and AI to make banking safer and more customer-friendly. DBS also launched Digibank on 16 April in India, a paperless, branchless, mobile-only bank that does not include signatures that make it convenient for customers.

A robotic AI-powered assistant developed in collaboration with Kasisto, Siri's spin-off project, supports clients. No human intervention, the virtual assistant will manage 80% of customer requests while the other 20% of customer requests go to live talk sessions [22].

In United States of America: As the U.S. market leader in both mobile banking and AI applications, Bank of America launched Erica (AmEricaa) to deliver consumer alerts, provide account data, advise on how to save cash, provide credit report reports, pay bills, and support basic payments to consumers. As an experienced virtual assistant, Erica's features have grown since the launch to help customers make smarter decisions. Erica is included in the mobile banking program of the Bank of America. Customers can use voice or email to help with banking issues. After evaluating customer data, this banking chatbot can provide personalized recommendations, deals and guidance. Erica can also submit financial education information [23].

In Hong Kong: Amy is a customer service forum that takes the form of a corporate banking HSBC Hong Kong Virtual Assistant Chatbot. Amy can provide direct support for consumer inquiries on 24x7 terms. Available on desktop and mobile in English, Traditional and Simplified Chinese, Amy already spans and expands its reach to many product pages.

An integrated customer feedback framework will enable Amy to enhance and expand her experience over time to cope with increasingly broad-based queries. Following implementation steps will see Amy merge with live chat to allow smooth human intervention on more complicated issues and improve Amy's learning process with new AI technologies.

XVI. Conclusion and Future Work

This paper discusses strategies for handling dialog in the banking and finance area based on ontology. Although this work has not yet been extensively tested, it is promising the current achievements. The future work involves the completion of the framework and development of chatbot [24]. The future system would be a stepping stone in the implementation of an intelligent question management program capable of not only responding but of self-learning to improve itself in the next stages, thus not only increasing the quality of user service but also reducing human loads, increasing productivity and, of course, increasing the number of satisfied users [25].

Consumers are getting technical support in all aspects of their lives in the fast-growing world of AI. The internet provides different ways of getting information and has radically changed how we communicate.

With more opportunities, innovation has enhanced our lives and everything is pretty simple for us. Everyone likes to work together and to expect prompt answers without much delay.

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You can frequently use online networking networks or websites to communicate with others for various reasons.

A chatbot is a program or service that connects easily with you to help you resolve your queries. The resources a chatbot can provide are quite diverse, varying from providing important life-saving safety updates to monitoring the weather forecast to purchasing a new pair of shoes. You should feel like talking to a real person whilst interacting with a chatbot [26].

It also further requires- The expansion of the domain. Intelligent answers created by entering not only the current FAQ list, but also various other outlets such as twitter, servers, and other data sources. Providing suggestions for closure. Intelligent response photo example, links. Merging linguistic similarity together with cosine similarity. Data relevant to the reporting account using the integrated system of the Bank.

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