A Study on Interactive Automated Agent based Response System over Legal Domain

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ABSTRACT

The gradual advancement of Artificial Intelligence has attracted attention of public for Automated Response System. The Automated Response system will facilitate the end user to get their query resolved overcoming the obligations of their physical presence and time constraints. The improvement of human interaction with computers in a more usual manner is very important for blooming of human-computer interaction. It has outgrown from being merely a human-to-human conversation to present state of engaging human-machine interaction in the form of Conversational Agents or Chatbots. These agents are Artificial Intelligence based software that can simulate a human-like conversation and respond to its end-user. Nowadays, Chatbots are common in every service sector and are used in innumerable fields for the ease of daily routine. This also includes conversational agents in legal field that are used widely in everyday life for conversational purpose, as a virtual legal advisor. For better understanding of the concept, in this paper, authors have studied the existing Conversational agents and their response system to propose a case-based similar system in India.

Keywords: Chatbot, Artificial Intelligence, Natural language processing, Legal chatbot.

1. Introduction

Artificial Intelligence has advanced in an unprecedented pace in Communication environment [1]. Today, the users can easily get their queries solved [2] henceforth overcoming all the obligations of physical presence and time constraints with the help of Automated Response system. Human-computer interaction [3] has become very important for getting prompt response and 24x7 service [4]. To overcome the time constraints for every human interaction and to generate response on real time scenario, an Artificial Intelligence based computerized assistant [5] can be developed to respond each and every user query. This concept becomes the origin of chatbot based digital assistant to address all user queries immediately. Chatbot is a software [6] that can have a conversation with humans through Natural Language [7]. Chatbots are trained for doing some specific task. Machine Learning (ML) allows chatbot to learn by itself without programming and with the help of Natural Processing Language (NLP), chatbot gets the ability to understand human language [8] or text. Chatbot technology was first introduced in 1966 by Joseph Weizenbaum, after which with the help of modern technology chatbots [9] are growing day by day and getting advanced. Previously, Chatbots [10] were mainly used to have normal chat or fun and entertainment but with the growth of technology [11] and increase in the expectation and requirement of humans, Chatbots have added many other properties and can provide with many other services. This approach of chatbot based user response system can be implemented over multifaceted service sectors like legal, education, banking, healthcare, etc to provide quick response to the end-user. Similarly, this concept of chatbot can be implemented over legal domain to handle all user queries any time throughout the day through a digital assistant. As a result, end-user can obtain the desired information through this chatbot thereby withering away the obligation of physical mobility for it. For general legal guidance or assistance, legal chatbots are frequently looked upon nowadays [12]. It is also helping humans for making legal decisions, finding resources, providing legal guidance, etc.

Authors have organized the remainder of paper in the following way. Section 2 discusses about the general structure of Chatbot

and its types. Section 3 focuses on the classification of chatbots. Section IV emphasizes on different models of Chatbot. Section V mentions the literature survey on Conversational Agent over Legal Domain. The Conclusion and future scope are explored from this survey is mentioned in Section VI.

2. General Structure

To design and develop any system [12], the first and foremost rule is to divide the system into parts for modular development [13] that will work efficiently. These parts are used to build the chatbot [14] for which the basic components [15] are required which include Classifier, Graph-master and Responder.

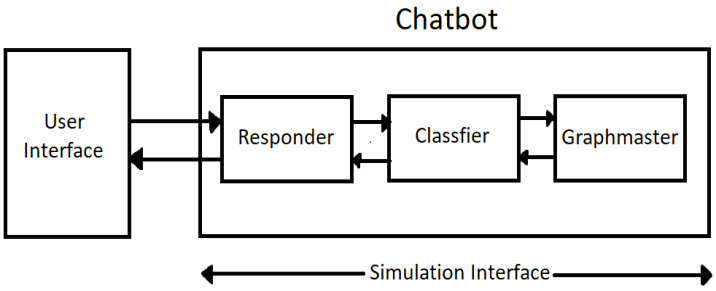

Fig. 1. Chatbot: General Structure

2.1. Responder

It is an interface between the user and the chatbot's main functions [16]. The functions of responder consist of 2 parts: (i) To transfer the data between the user and the classifier (ii) To monitor the input and the output of the chatbot [17].

2.2. Classifier

Classifier is the middle layer of the chatbot that is situated in between the Graph-master and the Responder [18]. The main functions of Classifier consist of: (i) normalize and filter input. (ii) Partition of user input to logical parts. (iii) Normalized sentence is transferred into graphmaster [19]. Transfer of normalized sentence into graphmaster and (iv) the output processing of graphmaster an handling of instruction related to database syntax are also done by the classifier [20].

2.3. Graphmaster

Graphmaster is responsible for the matching of different patterns [21]. This component is also considered as the brain of chatbot [22]. The major task of the component includes: (i) To organize the content of the brain. (ii) It is also used for storage and pattern matching algorithm [23].

3. Chatbot – Classification

Chatbot is a bot [24] whose main purpose is to have conversations with humans [25]. In the past few years, chatbots [26] have become more innovative with the help of new technologies [27]. Chatbots are classified [28] into several classes based on certain criteria, that includes: (i) knowledge domain [29] (ii) interaction mode (iii) usage and design technique [30]. The above-mentioned criteria include the fundamental design [31] viewpoint of chatbot or the context[32] need extent that is kept and considered for the conversation to be considerate or purpose or kind of conversation [33] for chatbot designing. The broader aspect of classification [34] involves: (i) Domain specific Approach [35] (ii) Chatbot Application – It might be task oriented or

non-task oriented[36]. (iii) Mode of Interaction – it can be voice based or text based [37] (iv) Rule based Domain– It might be based on Machine learning [38], deep learning, etc. Considering a general point of view, chatbots [39] are mainly classified into two categories: (i) Non-task based chatbot [40] – As the name suggests, this kind of chatbots are not assigned for any specific task [41]. They are used for extended conversation [42]. It performs chatting for entertainment [43] purpose and pretends to have conversation with humans (ii) Task-based chatbot – In task-based chatbot, a particular task is assigned for short conversation in a closed domain. The main objective of task-based chatbot is to provide assistance to user for achieving a specific task [44].

4. Chatbot: Different Models

In 1966, Joseph Weizenbaum made a natural language conversational program that featured a dialog between a user and a computer program. This was a great breakthrough which has a great impact on the new age chatbot technology that has taken an enormous leap in the recent decades. A Chatbot is implemented in various fields today and is basically designed to respond to a query. Artificial intelligence and natural language processing algorithms are used in chatbots to increase their efficiency and accuracy. Most of the Chatbots extract the intent of users with the help of natural language processing capabilities to provide appropriate response from linguistic input [46]. It can be categorized into 4 parts: (i) Retrieval-Based Chatbot (ii) Generative-based Chatbot (iii) Long and short conversation chatbot (iv) Open and closed domain Chabot.

4.1. Retrieval-Based Chatbot

These chatbots use a set of pre-defined questions long with appropriate answers to respond to the query that is entered falls under the Retrieval based chatbot category. These chatbots do not produce any new text. An appropriate answer is selected from the pre-defined sets and stated as an output for the queries. These chatbots take the end users through a scripted interaction flow. Usually Retrieval based chatbots deal with a single domain and flexibility is one the limitations.

4.2. Generative-Based Chatbot

These models use artificial intelligence and machine learning algorithms. They possess the capability to learn from the queries they deal with. It uses Machine Translation technique as its basement. It translates inputs to outputs like translation of one language to another. The advantages are these chatbots develop themselves to be human beings like agents to answer the queries learning from past experience. Though these are expensive they exhibit flexibility and work through multiple domains.

4.3. Long and Short Conversation Chatbot

These models use artificial intelligence and machine learning algorithms. They possess the capability to learn from the queries they deal with. It has Machine Translation techniques as its basement. It translates inputs to outputs like translation of one language to another. The advantages are these chatbots develop themselves to be human beings like agents to answer the queries learning from past experience. Though these are expensive they exhibit flexibility and work through multiple domains.

4.4. Open and Close Domain Chatbot

Based on the domain in which the chatbot is implemented it can be classified as an open domain chatbot or a closed domain chatbot. When a chatbot is leveraged to work in open domain adobe the type of the conversation cannot be predefined and the end user can converse anything with the chatbot. Open domain chatbots are not designed to achieve a goal. Closed domain chatbots are designed to operate on possible inputs and outputs. In closed domain conversations are somewhat limited because the chatbot is built to achieve a particular goal. In today's world most chatbots that are being used are closed domain in nature.

5. Survey on Conversational Agents over Legal Domain

In this section, authors have provided a clear view of the different Conversational agents over Legal Domain.

Table 1 – Comparison of Various Tools.

Sl. No.	Paper Title	Technology Used	Company	Description
1	Law and Word Order: NLP in Legal Tech [47]	Natural Language Processing	Robert Dale, Language Technology group	It is done by implementing natural language processing in legal fields that includes providing legal decisions, determining information from a document, reviewing contracts, and providing advice through chatbot.
2	Intelligence Chatbot for Indonesian Law and Electronic Information & Transaction [48]	Natural Language Processing	VAH Firdaus, P Y Saputra and D Suprianto	Legal chatbot provides general information if the government enforces legal norms at any time so that the Indonesian get to know about that law.
3	LAWBO: A Smart Lawyer Chatbot [49]	Deep Learning, Natural Language Processing, Artificial Intelligence	Subhashri G, Unnamalai N, Kamalika G	Legal chatbot helps lawyers to analyze any case and give binary relationship tuples from the cases similar to the given one.
4	Using a chatbot to increase tourists' Engagement [50]	Artificial Intelligence	Samane Hosseini	Chatbot helps the tourist to know about the place they are visiting. It is also use as Reservation Bots, Customer Support, Online Travel Agency, Expense management and Local Insider.
5	A Chatbot Framework for the Children's Legal Centre [51]	Machine Learning, Neural Networks, Natural Language Processing	Jay Morgan, Adeline Paiement, Monika Seisenberger, Jane Williams, Adam Wyner	Chatbot provides guidance to children with legal advice and also give information about their legal rights.
	DoNotPay [52]	Artificial Intelligence	Joshua Browder	Legal chatbot is use to resolve issues related to dispute in people's parking tickets in the United Kingdom.
7	Robot Lawyer LISA[53]	Artificial Intelligence	Chrissie Lightfoot	It is world's first impartial Artificial Intelligence (AI)

				lawyer that can also startup and property time of business and customer effort and money.
8	Ross [54]	The Artificial Intelligence Machine, powered by IBM's Watson technology	Andrew Arruda (CEO and Co-founder) Jimoh Ovbiagele (CTO and Co-founder).	Legal chatbot which handles bankruptcy cases.
9	BillyBot [55]	Artificial Intelligence	Chrissie Lightfoot	Legal chatbot helps to find the right barrister or mediator for legal problem.
10	Docubot [56]	Artificial Intelligence	1LAW	Legal chatbot helps lawyers to generate legal documents.
11	Solosuit [57]	Artificial Intelligence	George Simons	It is a Legal chatbot that handles law related debt. It asks for all the relevant information it needs, and then fills out the appropriate legal document.
12	Improving Access to Justice with Legal Chatbots [58]	Artificial Intelligence	Marc Queudot, Éric Charton and Marie-Jean Meurs	Two of the chatbots delivers legal data out of which one of the chatbots deal with Canada related immigration issues and another chatbot helps bank employees with legal issues related to their job.
13	LawGeex [59]	Artificial Intelligence	Noory Bechor	It is a Legal Chatbot that analyses contracts that are related to business. It analyses proposed contracts, highlights potential problems and suggests edit based on a company's policy.
14	Immigration Virtual Assistant (IVA) [60]	Dialog Flow, NLP, Java, MySQL, Spring	BotsCrew	Legal chatbot gives free legal consultation of the people who wants to go abroad to Canada for work, study, travel, and immigration reasons.
15	Automio [61]	Artificial Intelligence	Claudia King	Chatbot creates documents for law firms.
16	Ailira [62]	Artificial Intelligence	Adrian Cartland	A Legal Chatbot that provides assistance in estate planning, business related structuring, speedy legal advice, tax research and wills.
17	LegalMation [63]	IBM Watson	James M. Lee	It is a Chatbot that provides litigation of attorneys and also for legal advice.
18	Legalibotin Spain [64]	Artificial Intelligence	Spain based Legal Chatbot	Legal chatbot assists user that comprise of legal papers and agreements over Facebook Messenger.

19	Parker [65]	Artificial Intelligence	Stephen Parker	It is a Chatbot using natural language processing as well as IBM's Watson platform to answer questions regarding data breaches and privacy law.
20	Renters Union [66]	Artificial Intelligence	UK based Legal firm	It is a Chatbot delivers legal guidance on housing related issues for inhabitants of London. It helps in analyzing the tenancy agreement of the user and accordingly provide

6. Conclusion

Artificial Intelligence has taken an unprecedented pace in communication field resulting in the increase in use of conversational agents in every sector and are used in innumerable fields for ease of daily routine. This also includes conversational agents in legal field that are used widely in everyday life for conversational purpose, as a virtual legal advisor. Authors have studied the existing Conversational agents and their response system to propose a case-based similar system in India. They have discussed about the general structures, classifications and the different models of Chatbot. A survey has been performed based on the different types of Conversational Agents used over Legal Domain that will provide a clear view of the use of Chatbots .
Furthermore, as the future scope of this research work, authors will propose a conversational system based legal framework using artificial intelligence to facilitate common people with their general legal issues hence reducing the pressure of legal professionals in India. Implementation of chatbot for crime against women will be considered as a future scope of our research work.

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