



High Interactive Model For Situated Multi-Agent Chatbot Framework For Depression Self-Assessment

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5636

Abstract

Chatbots, which employ asynchronous messaging to facilitate human-machine communication, are becoming more popular. Users benefit from the assistance of these virtual entities in a variety of tasks (e.g., work, leisure, and health-related). A chatbot is a computer program that mimics human conversation in text or speech. In part, this is owing to the proliferation of mobile devices like smartphones and tablets, in part due to the rising level of interest generated by chatbot conversations, and in part due to the increasing complexity of the AI algorithms driving the bots' behavior. On the EBDI concept, we have developed a chatbot framework that uses a highly interactive approach to multi-agent systems.

Keywords- Chatbot, EBDI, Multi-agent system, Depression, situated intelligent agent.

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as a service to increase their capacity to communicate with customers at any time, and the answer is instantaneous, which provides the customer with a level of confidence and comfortability.

If you can't get an appointment with a doctor or a consultant when you need it, this approach may help you save time and money at the hospital. Depending on what the user is looking for and the knowledge base, a response will be provided. The sentence's main words are culled and applied to certain sentences. What

1. Introduction

Chatbot (conversational agent (CA)), sometimes known as a dialogue system, is a computer program that serves as a conduit for human users to communicate with software applications. Apple Siri [1], Googleassistant [2] Cortana [3], and Alexa [4] are among the best-known commercially and set the trends for consumers. Text or voice-based Chatbot are technologies that simulate human conversation. In the last decade, most firms across the globe have started using it



agents rather than from individual agent talents.

1.2 Extensible Beliefs Desires and Intentions (EBDI)

EBDI introduces a very suitable framework for the creation of embedded intentional software that constantly observes and/or monitors its own environment and starts behaving in accordance with its situated BDI, which is grounded in normative settings [6-8]. EBDI introduces a very appropriate structure. Using EBDI's methods, an agent's decision-making processes may be improved in order to maximize the action's reward. Beliefs about the environment, domain, or other services based on the information collected from or retrieved from a variety of sources.

These often rising services have been intended towards enhancing people's beliefs about what a perfect world looks like. In contrast, a system's beliefs are sought, which the system learns is not comparable and generates a collection of intentions. [9-11]. Hussain and Obied [12] presented an overview of a well-known agent (BDI and variations, such as Extensible Beliefs Desires and Intentions (EBDI), Beliefs-Desires-Obligations-Intentions BODI). A multi-agent, agent-based system for the hospital was the aim of Hussain and Obied [13, 14]. Automating and improving patient care may be achieved by using EBDI-based software agents and the Jade framework.

2. Theoretical Background

Despite the fact that Chatbots have been there since the 1960s (e.g., ELIZA [17]), their features and capabilities have greatly improved over the last several years. Chatbots have well-known qualities such as anonymity, asynchronicity, personalization,

happens when you find an exact match? You'll be given an answer or shown the same answer.

Exploiting the characteristics of the multi-agent system in building a chatbot system produces a highly interactive system capable of performing the tasks assigned to it with higher accuracy and productivity. Knowledge-based agents, who rely on their built-in knowledge to take appropriate action for the current situation with the EBDI model is the construct that will be used in our proposed model. Therefore it's suitable for employing our proposed system to detect the incidence of depression in people.

1.1 Situated Intelligent Agents

Situatedness is a characteristic of agents in the majority of MAS researches. According to Wooldridge and Jennings [5] "an agent is a computer system located in some environment and capable of autonomous action in this environment to meet its design objectives" This definition emphasizes the notion that an agent is not an isolated entity but rather one that exists in a context, but the concept of context is kept abstract in this definition. The definition does not explicitly specify that an agent's existence in an environment necessitates the presence of a social component. In MASs, agents are prominently social beings. The environment and the agents are complementary in a multi-agent world. Situatedness is a concept used to describe the local interactions between individuals and their surroundings. In particular, these linkages are what give the MAS its purpose and move the MAS forward. ' Because of its situatedness, an agent may see and interact with other agents from its current location. In a situated MAS, intelligence is obtained through interactions between



strategy is effective based on the available data.

More than 300 million people throughout the globe are afflicted by depression, according to the World Health Organization [15]. A recent comprehensive review showed that Chatbots are being provisionally utilized to deliver counseling on birth control, medication adherence, exercise promotion, and the search for clinical trials that are appropriate for the patient. Because they can converse with humans in a more natural manner than other types of software, Chatbot has great promise in the healthcare industry [16]. Some data even suggests that people react to them psychologically as if they were real beings.

3. Proposed model

There are three knowledge-based agents in the proposed Chatbot architecture, all of which function together in cooperation (based on the EBDI model). People's depression levels will be monitored using this approach. Figure 1 shows the suggested framework Diagram.

scalability, authentication, and consumability [18].

As a result, the most important practical scenarios in this field include chronic disease attention [19,20], interviewing [21,22], counselling [23,24], chronic health issues observation [25,26], medication adherence [27,28], self-care [29], advocating for perfect health [30] and counselling and social treatment [31].

Brixey et al. [32] recommended the use of a Facebook-based chatbot to offer sexual health information about HIV to those with chronic conditions. Campaigns aimed at helping smokers give up the habit have shown a requirement for human engagement and encouragement using social media platforms such as Facebook and Twitter [33–35]. Such a chatbot, such as Tweet2Quit [36], aims to promote smoking cessation in small and private self-help groups every day through Twitter. It's too early to say whether or not this

5638



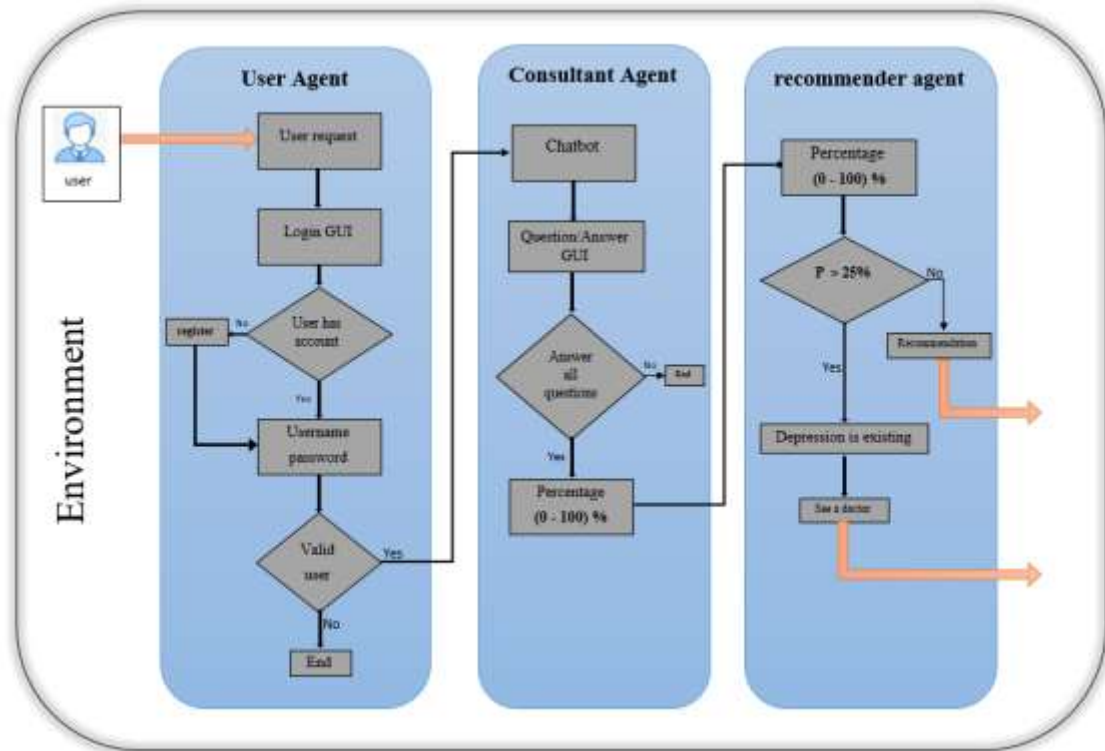


Fig.1.The Proposed Model Diagram

We constructed a chatbot to aid in the screening for depressive symptoms using the Beck depression scale [37] as a design artifact of our approach. The Beck depression scale has 21 questions, each of which has four possible solutions.criteria for depression as “0” (lesser weight) to “3” (highest weight). It has been validated for use in primary care.Table 1 will illustrate the final outcome.

Table.1- Interpreting The Beck Depression Inventory [37]

Total Score	Levels of Depression
1-10	These ups and downs are considered normal
11-16	Mild mood disturbance
17-20	Borderline clinical depression
21-30	Moderate depression
31-40	Severe depression
over 40	Extreme depression

lesser than 25 percent) This will make the job of agents more transparent, understandable, and less confusing.

Obtaining the percentage P , which is used to detect whether or not depression is present, is done by using a simple

There will be two recommendations in our suggested system: either seek medical attention from a specialist doctor (if the percentage P is more than 25 percent) or advise the individual that he/she is normal and does not need medical attention from a specialist (in case the percentage P is

have obtained a percentage that enables us to infer the presence of depression in a person from the absence of it and the fact that his condition is normal and just mild mood disturbances.

$$P = \frac{\sum aw}{hw} \times 100 \%(1)$$

Where **aw** refers to the weight of the chosen answer,
hw refers to the highest weight in the Beck depression scale.

easier to build agent-oriented systems using the Jade framework. Jade, a Java-based system for managing book collections, has comparable functionality and programming. As a consequence, programmers may construct systems that have several agents. A Java library might use the Jade technology. These are a few of Jade's unique qualities: Achieving a high level of compatibility Multi-part software having open-source applications Mobile apps that are easy to use. The paradigm of the agent and As a middleware layer, JADE facilitates the construction of distributed applications that employ software agents by providing agnostic functionality. Since Java, a well-known object-oriented language with an intuitive API, already implements this abstraction, JADE has the upper hand [39].

mathematical equation. The inputs to this equation are the sum of the weights of the answers entered by the user to answer the questions used in examining the degree of depression. The sum of the resulting weights is divided by the higher weight and the result is multiplied by 100%. Thus, we

3.1 Simulation Environment

JADE (Java Agent Development framework) is one of the most extensively used frameworks for generating agents is a software environment that lets you construct multi-agent systems utilizing a pre-defined, programmable, and expandable agent paradigm. It is developed in Java and utilizes Java libraries. It is now one of the most used middleware options for agents. Developers may focus on the business logic of their systems rather than the specification of agent communications and interoperability when they use Jade, a domain-independent infrastructure. [38]

There is a lot of flexibility in the technology of Jade distribution middleware. Agents are a collection of graphical tools make it



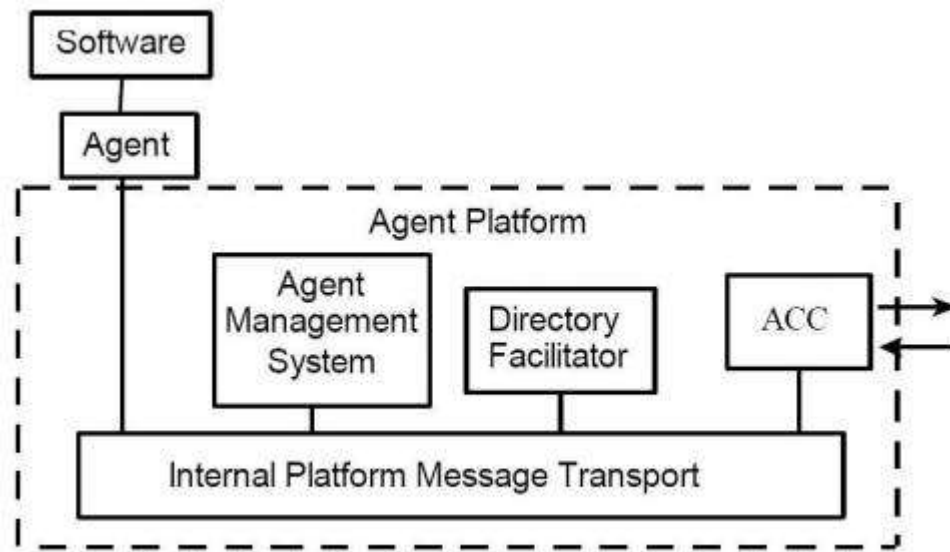


Fig. 2. FIPA model of an agent platform [40]

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4. Conclusion

As a virtual personal assistant, customized Chatbots face a number of issues, including how to deal with the agent's interactions, utilizing the EBDI model with the knowledge-based agents, and obtaining the results with the percentage rates. Because of the delicate nature of the situation, it's important to proceed with caution when using Chatbots in healthcare. A beginning point, rather than a final solution, is what the offered design considerations are all about. It is important for chatbot designers and developers to keep learning about the best ways to build conversational bots.

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