PREECLAMPSIA COUNSELING VIA CHATBOT FOR PREGNANT WOMEN

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Abstract

The clinical professors and their students use the chatbot for the purpose of understanding preeclampsia and its complications. Preeclampsia is a disorder caused by hypertension, along with the damage of internal organs, namely the liver and kidneys. The factors which influence the occurrence of preeclampsia include age, obesity, gestational diabetes, in vitro fertilization, previous history of preeclampsia, multiple gestation, family history of preeclampsia, history of chronic high blood pressure. Because of all these factors which come from clinical professors, the chatbot updates its knowledge base and allows the other clinical professors, medical students and the pregnant women to benefit from using it. Chatbots provide the user, which benefits from them, the ability of receiving replies within minutes, no matter their geographic location, or the device they are using to communicate. Data about preeclampsia is gathered from medical experts, as well as from blood pressure recordings which come from monitored patients, and all of them are stored on the server side of the system. The software provided by the system offers answers and solutions for monitoring and treating pregnant women after combining descriptions of the illness and the symptoms, diagnostics, predictions and prescriptions. The ontology of the system contains information about preeclampsia, other illnesses and the complications which pregnant women may undergo while being pregnant. These notions are stored as RDF triples, containing a subject, an object and a predicate. All the triples are placed inside the RDF type ontology. The triples represent the medical validated knowledge which is checked by clinical professors in order to find out if the notions have been well linked. Recommendations are constructed based on the triples. The learning analytics tool which stands behind the chatbot queries the data using SPARQL based on defined rules and suggests what the chatbot should answer based on the user's input. The user is provided with a set of actions which should be taken to better understand the pregnancy complications and treatments. After applying the set of actions, the feedback of the user is stored and further used for counselling.

Keywords: Preeclampsia, collaborative learning, learning analytics, ontology.

1   INTRODUCTION

We live in an era where the constant communication happens in a high-volume and with high-intensity. Different applications, approaches, and platforms are put forward, all with the means of helping make our life easier. However, it was not until recently when a new phenomenon entitled chatbots came to life that managed to change the way people choose to seek assistance in various domains. Chatbots are important in the sense that they give us information on whether to invest in funds, time and/or energy as business managers, developers or end-users.

Chatbots are online human-computer communication systems which process the natural language [1]. The first conceptualization of the chatbot is attributed to Alan Turing, who asked if machines can think in 1950 [2]. The interpretation of the messages is done using the natural language processing [3]. Likewise, chatbot adoption has also increased, especially with the launch of chatbot platforms by Facebook, Kik, Slack, Skype, WeChat, Line, and Telegram [4].

The pregnant women use the chatbot for the purpose of understanding preeclampsia and its complications. Preeclampsia is a disorder caused by hypertension, along with the damage of internal organs, namely the liver and kidneys [5]. The illness occurs during the third trimester, but it can appear anytime during the pregnancy, at the delivery or after the delivery of the baby for up to twelve weeks [6]. In the case in which preeclampsia is not treated, seizures can appear, as well as eclampsia [7]. It was found out that the illness appears due to the abnormal blood flow in the placenta [8].

A visible sign of preeclampsia is swelling [9]. The factors which influence the occurrence of preeclampsia include age, obesity, gestational diabetes, in vitro fertilization, previous history of preeclampsia, multiple gestation, family history of preeclampsia, history of chronic high blood pressure [10]. Because of all these factors, the chatbot updates its knowledge base and allows the pregnant women to benefit by using it.

Chats provide the user, which benefits from them, with the ability of receiving replies within minutes, no matter their geographic location, or the device they are using to communicate. Data about preeclampsia is gathered from books, as well as from blood pressure recordings which come from patients, and they are all stored on the server side of the system. The software provided by the system offers answers and solutions for monitoring and treating pregnant women by combining descriptions of the illness and the symptoms, diagnostics, predictions and prescriptions.

In the next section are presented the general overview of the system and of the proposed chatbot. Sectors 3 describes the results and benefits of the use of such a technology for all the pregnant women. The last sections outlines the conclusions.

2 METHODOLOGY

The purpose of the current research is to develop a chatbot which can advice the pregnant women who suffer from preeclampsia. The ontology of the system contains information about preeclampsia, other illnesses and the complications which pregnant women may undergo while being pregnant. These notions are stored as RDF triples, containing a subject, an object and a predicate. All the triples are placed inside the RDF type ontology which is the result of a previous research [11-13]. The triples represent the medical staff validated knowledge which is checked in order to find out if the notions have been understood and remembered.

Recommendations are constructed based on the triples. The learning analytics tool queries the data using SPARQL based on defined rules and suggests what the chatbot should answer based on the user's input. The user is provided the actions which should be taken to better understand the pregnancy complications and treatments. After the flow is initialized, questions can be asked. A question has several options, namely the response path, the question, the choices, notifications on expirations and reminders.

The chatbot serves as a virtual health assistant for the pregnant women in require of counselling regarding their current state. Based on the data the user is giving, such as the illnesses and symptoms, the bot can simulate a doctor who provides information about diagnostics, predictions and prescriptions. The conversation takes place by employing a chat interface where the user sends the messages and the bot answers almost instantly.

The Flow XO platform is used for build, host and manage chatbots [14]. A chatbot service needs to be created for the application which consists of a flow which is managed as in Fig. 1.
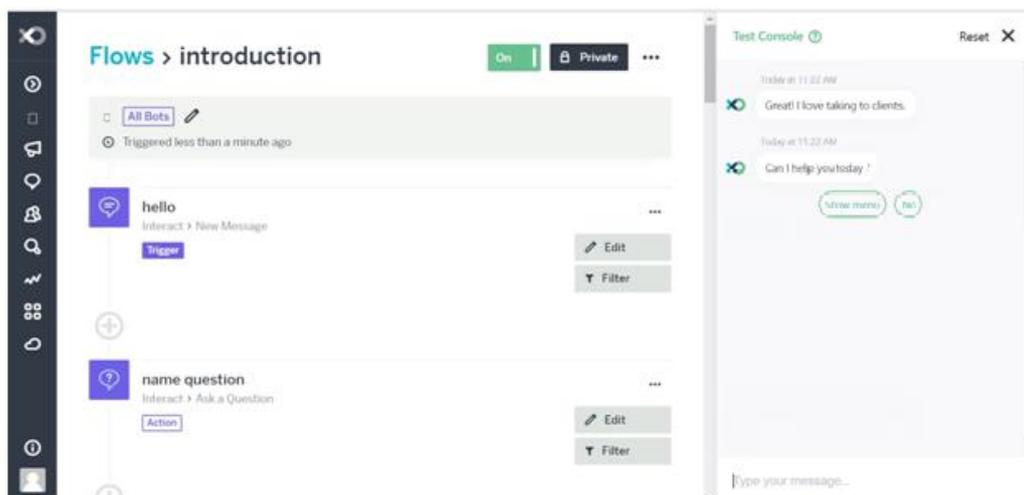

Figure 1. Chatbot flow

The flow is needed for interacting with the user. After creating the flow, it is necessary to set the trigger. A trigger tells the chatbot what user input to listen for based on the existent RDF triples. The trigger interface contains information about the active bots to which it should listen to, the words or phrases that can be typed to trigger the flow, shortcut buttons can be added, as well as additional welcome text. A filter can be set to inform the bot which choice will active the response. A condition will tell the chatbot what to check when it analyses a value.

If the user wants to know more about preeclampsia, a simulation can take place. The simulation will contain information about the suggested diagnostics, predictions and prescriptions gathered from medical experts. The questions follow a certain order and a different workflow, which is why it is really important for the user to remain inside the hierarchical flow structure while talking to the bot. If the user is not satisfied with the discussion outcome, she can always start again until she can finish the dialog and stop the flow. In order for the pregnant woman to utilize the application, a web connection with least 10Mbps bandwidth is required. Without the web connection, talking to the chatbot is impossible.

3 RESULTS

Chatbots are seen to replace customer support jobs in the near future. Gartner stated that by the year of 2020, over 85% of customer interactions will be handled by bots [15]. This aspect started to be more and more encountered on online websites. However, this is not all that the future predicts in the department of online chatbots. The market of chatbots will grow exponentially in the upcoming years, so much that these bots will be used to handle business tasks, such as helping organize meetings, collecting information about users, reducing overhead costs, including the assistance for proper animal product management [16-17].

One of the advantages of the chatbot relies on the fact that are systems based on the cloud system of data storing, and they also feature an expansion on a wide variety of array of channels. The chatbot starts by greeting the user, following with an encouraging sentence to ask a question about their health. Based on the existent knowledge based of the system, consisting of RDF triples which contain information about diagnostics, predictions and prescriptions in case of preeclampsia, the customers are then pointed in the right direction where they can find the necessary information. The user's feedback is asked at the end. This process will eventually lead to a new account opening on the system's website, due to the good engagement.

Machine learning for providing a proper preeclampsia counselling comes to the help the medical school students, as well as the pregnant women. This technology is used for the program to learn about the user behaviours, easily anticipate which will be their next question and how to respond accordingly to it. This makes the chatbot intuitive and easier to use as no download is required from the user.

Nowadays, users find comfort in instant chat conversations rather than making phone calls. If a user were given the possibility of talking to a person working for a healthcare institution, or using a chatbot to type out her questions, the user in question is more likely to choose the chatbot. However, this is only the case for younger people, which are more used to technology and find comfort in it. For the older users, they would rather make the phone call and receive the answer to their question directly from a human representative.

Chatbots need to be improved to resemble a human voice, so other people would be more willing to accept this new phenomenon. Another feature brought forward by chatbots, relates to being provided with speed and a personalized experience when interacting with a healthcare institution. The healthcare support of chatbots offer both live conversation and speed. Another aspect is that the proposed chatbot can help provide the patient with instant information related to all of the data found regarding the personal blood pressure recordings, the descriptions of the illness and symptoms. The bot can also set and manage budgets regarding the advised treatment. Artificial intelligence helps greatly as it provides recommendations based on RDF triples and advice for better health management.

The system's chatbot offers 24/7 digital support to any user visiting the website. This is strongly related to the present and increasing trend that say the client is 'always-on', and can require support at any time of the day. By offering the support of the chatbot for the user, the system manages to present a competitive advantage to other systems, and more likely to attract users long-term.

4 CONCLUSIONS

Chatbots have become a global trend and they are used in many ways, such as components of teaching, personal virtual assistants and aids in social work. In the future, as the technology becomes more advanced, even more kinds of opportunities may become available. These virtual assistants can be used for healthcare applications of specialized units. The aim is to target and interact with the patients around the clock, independent of their geographical position.

Patients will be able to be in touch with the latest treatments whenever, wherever and through whatever channels they choose to do so. Chatbots will reduce patient issues, but they will not be suitable for everyone. The actions of perfecting the bot under the observation of specialized healthcare staff will likely lead to competitive and monetary advantages for every healthcare unit which will use this tool.

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