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Dr First Aider: A vertical chatbot for First Aid

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Abstract: - The lack of first aid knowledge can have several implications especially in an emergency situation. The delayed or inadequate response may increase the risk of complications and even result in loss of life. In effort to increase preparedness and first aid awareness among the public, a vertical chatbot called Dr. FirstAider is proposed. The objective of Dr. FirstAider is to provide knowledge on recognizing early sign and symptoms of medical conditions or injuries, so the public is able to respond effectively in emergency situations. The prototype of Dr. FirstAider is developed based on the Engati tool and evaluated via a questionnaire among 30 respondents. The feedback received on the usability of Dr. FirstAider are positive with some suggestions for future work such as dedicating specific sections for children or elderly.

Keywords: Conversational Agent · Chatbot · First Aid

I. INTRODUCTION

First aid refers to the evaluation and interventions that a first aider can carry out in the event of an emergency without a lot of equipment before the proper medical personnel show up [1]. It is very crucial to administer adequate first aid within the first few minutes after an accident or illness if an injured or ill person, or a member of the public nearby, is to survive. First aid care is also critical in preventing future injury and pain consequences, encouraging recovery, and saving lives. Performing first aid before an ambulance arrives can often be the difference between life and death, but unfortunately, most countries have a very low rate of first aid trained individuals. This scenario may severely impact health outcomes or even result in death. According to The Guardian, up to 150,000 lives are at risk due to a lack of first aid knowledge [4]. In Malaysia, the statistics showed that nine out of ten cases of out-of-hospital cardiac arrest end in death due to the absence of first aid assistance and the lengthy ambulance response times [3].

Lack of public awareness and knowledge on first aid will turn into lack of readiness among the public in facing emergency situations. This can be due to several causes, such as lack of interest in first aid training programs, time constraints, and lack of understanding of the significance of first aid. Individuals may be hesitant or even feared to administer first aid in emergency situations if they lack the necessary information and training. In an emergency situation, unprepared by-standers may cause medication to be delayed, which could worsen health

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outcomes or even cause death. First aid may be able to save lives in situations like suffocation from clogged airways, which results in 2,500 fatalities annually, and heart attacks, which result in 29,000 fatalities [4].

To address the gap in first aid knowledge and training, this paper proposes a conversational agent or chatbot called Dr. FirstAider to educate the public on First Aids, and initiate the public to learn and perform first aid care in case of an emergency. Both literature and commercial platforms have seen rise of chatbot applications across many domains. Two particularly interesting chatbots that were referenced to in developing the proposed Dr. FirstAider are the Insomnobot and Woebot. Insomnobot 3000 (https://insomnobot3000.com/) is the world's first bot that is only available to chat exclusively via SMS. It is designed to provide someone with insomnia with bot to speak during sleepless nights between 11pm and 5am regardless of the time zone. Although this bot is unable to expand its knowledge base, it has an impressive set of over 2,000 different responses, making the interaction with users very engaging. Meanwhile, Woebot is a chatbot that is developed to become a personal ally for people to cope with mental health issues such as depression or anxiety. This bot is hoped to help users to understand themselves and to ease their mind from their train of thoughts. The chatbot design is based on the principles of Cognitive-Behavioural Therapy or CBT which is a form of psychological treatment that focuses on changing destructive thought patterns that produces a negative influence [5].

Dr. FirstAider is developed using the tool called the Engati, which offers Natural Language Understanding engine with a visual flow builder to develop the knowledge base. The main objective of Dr. FirstAider is to provide a quick, reliable, and accessible information on first aid treatments for common injuries or illnesses through natural language conversation. It is imperative that user has access to all first aid information on various platforms such as smartphones, and able to receive real-time assistance.

The remaining of this paper is organized as follows. Section 2 presents the design and prototype implementation of the proposed chatbot, Dr. FirstAider. Section 3 presents the evaluation results.

II. MATERIALS AND METHODS

This paper proposes a web-based first aid chatbot called Dr. FirstAider, developed based on the Engati framework. Dr. FirstAider offers step by step first aid advice when medical emergencies occur and provides online first aid training to users to promote the importance of first aid. Fig. 1 shows the architecture of Dr. FirstAider chatbot.
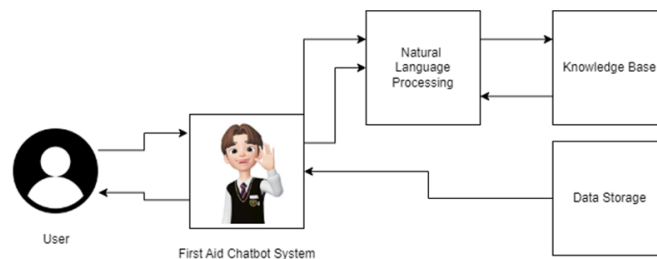

Fig. 1. Architecture for Dr.

Based on Fig. 1, Dr. FirstAider receives input from user in the form of natural language and perform Natural Language Processing (NLP) based on the Engati engine. Once the keywords from user input has been extracted, Dr. FirstAider will search its knowledge for appropriate responses and return to user using the same natural language interface. Apart from the NLP module, Dr. FirstAider is also supplied with data storage to store chat history by different users. Fig. 2 shows the conversation flow of Dr. FirstAider designed in Engati.
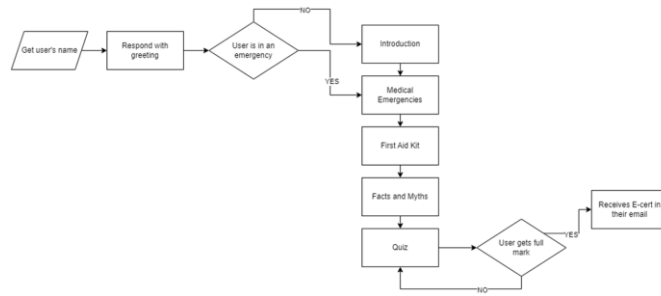
Fig. 2. Flow of Dr. FirstAider conversation.

Based on the figure, Dr. FirstAider consists of five modules, which are (1) Introduction, (2) Medical Emergencies, (3) First Aid Kit, (4) Facts and Myth, and (5) Quiz. Each of the module has its own semantic network. Due to space limitation, Fig. 3 shows a small excerpt of the semantic networks in Dr. FirstAider for the medical emergencies module.
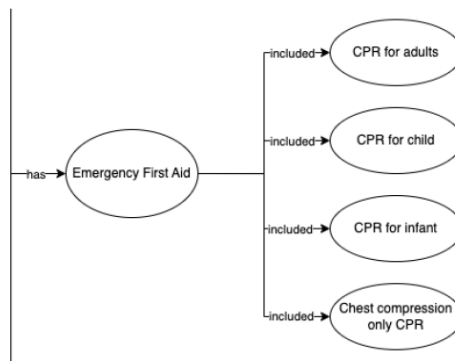

Fig. 3. Excerpt of semantic network for medical emergencies module

In addition, to attract young adults and children to use Dr. FirstAider as part of first aid awareness program, Dr. FirstAider offers a quiz module for the users. A quiz style chat-bot can be a fun and engaging tool to provide real-time and custom results to users. To boost this experience, Dr. FirstAider also issues e-certificates to the users as shown in Fig. 4.

Fig. 4. Dr. FirstAider e-certificate

The biggest challenge in an emergency situation is when a by-stander is unable to get immediate advice when medical professionals are not available The module First Aid Kit is developed to provide a quick reliable and easy accessible information of first aid treatments in case of emergencies where time is of the essence. Overall, the modules are designed for laymen understanding and interactivity to increase awareness among the public users.

III. ENGATI TOOL

Dr. FirstAider is developed using Engati, a cloud-based chatbot framework that pro-vides an easy-to-use plat-form for building, deploying, and managing chatbots. In gen-eral, Engati automates one-on-one interactions with

ready deployment to channels such as email, WhatsApp, Telegram and Skype [2]. Engati provides a user-friendly interface and easy integration with other tools, making it a suitable choice for educational chat-bots. Furthermore, The framework also supports customization for responses and offers pre-built templates, made it easier to build chatbots quickly and efficiently. Fig. 5 shows the overview of the Engati framework.
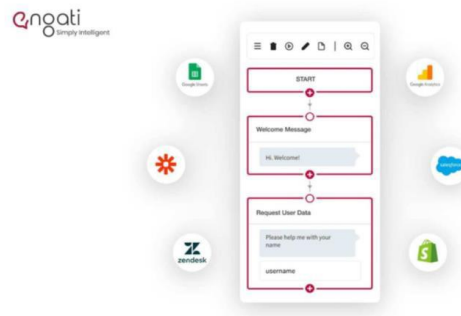

Fig. 5. Engati Tool

Overall, Engati is an efficient conversational AI interface that offers easy training and deployment for the deployer, 24/7 availability, and the ability to handle multiple users simultaneously, all while providing personalized conversations with the users. With its rapid and precise responses to user queries, Engati is an ideal framework for deploying the chatbot. Fig. 6 shows the Engati implementation for First Aid Kit module in Dr. First. For this module, there are four main options whether users wish to know what a first aid kit is, the importance of first aid kits, the contents in a first aid kit or how to build one themselves. The last option brings them to the main menu.
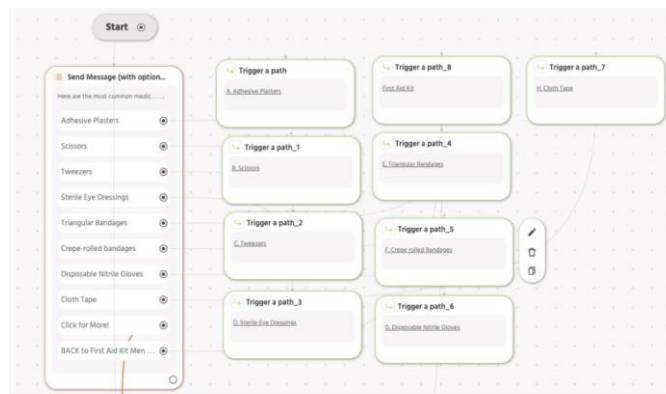

Fig. 6. First Aid Kit module in Dr. FirstAider.

IV. PROTOTYPE OF DR. FIRSTAIDER CHATBOT

Dr. FirstAider is deployed in a website called BeyondCare. Fig. 7 shows selected user interface of Dr. FirstAider across the five modules. Live version of Dr. FirstAider is accessible from https://app.engati.com/static/standalone/standalone.html?bot_key=bf67986c4ff947f7&env=p. The following shows an excerpt of a conversation in Dr. FirstAider. Note that its responses are not limited to text include diagram, pictures, and links

Dr. FirstAider: Are you in emergency now?

user: Yes help.

Dr. FirstAider: Welcome to the Medical Emergency Section. Please choose the

medical condition below:

– The Unconscious Casualty

– Respiratory Problems

– Wounds and Circulation

– None, Joints and Muscle Injuries

– Effects of Heat and Cold

– Foreign Objects, Poisoning, Bites and Stings

– Medical Conditions

– Emergency First Aid

user: I have respiratory problem

Dr. FirstAider: Are you choking?

User: What should

User: I do?

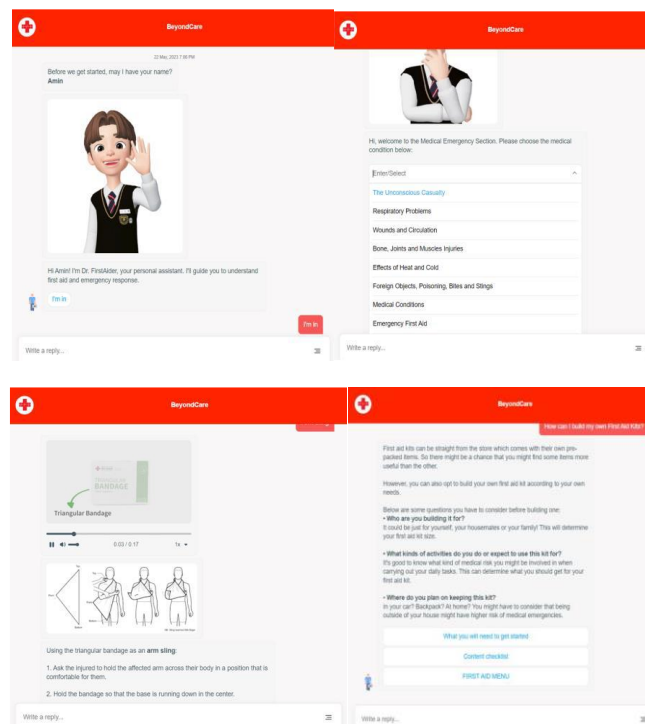Dr. FirstAider: If the casualty is breathing,

continue couching.

Fig. 7. User interface for Dr. FirstAider.

V. EVALUATIONS

In an effort to test user acceptance as well as to gather feedback regarding the chatbot system, an questionnaire is created through Google Forms where users are presented with 5 questions. They are then required to rate how they feel about the statement by selecting 1 out of the 5 choices which are "Strongly Agree", "Agree", "Neutral",

"Dis-agree", and "Strong Disagree". A total of 30 responses are gathered from the questionnaire which will be analyzed to find out the areas of weakness that can be improved.

The first question is to find out if the information found within Dr. FirstAider is accurate and clear to the users as they test it. From the results, a total of 53.3% and 43.3% selected the "Strongly Agree" and "Agree", respectively, which shows that Dr. FirstAider is successful in terms of this aspect. This could be due to the fact that Dr. FirstAider mainly focuses on dealing with emergencies and providing instructions to conduct med-ical treatment so it is only necessary that the writing of the content should be clear, direct and concise in shown in Fig. 8.
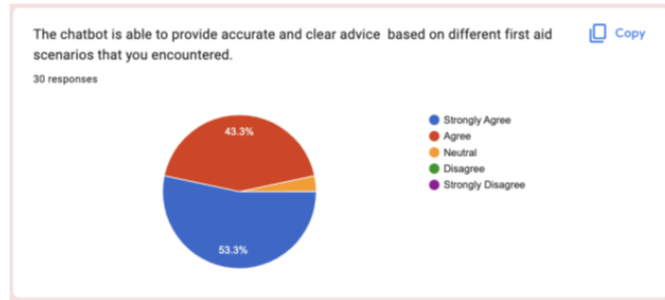

Fig. 8. Accuracy and clarity of Dr. FirstAider's responses.

The second question investigates the navigational aspect of Dr. FirstAider, whether the conversational flow is easy to maneuver around and essentially, easy to use. Majority of the respondents selected "Strongly Agree" and "Agree" while one selected "Neutral". From this, it can be concluded that the Dr. FirstAider is easy to use and most users will not have a problem with navigating around the system to obtain the information they wish to obtain. Fig. 9 shows the results for the second question.
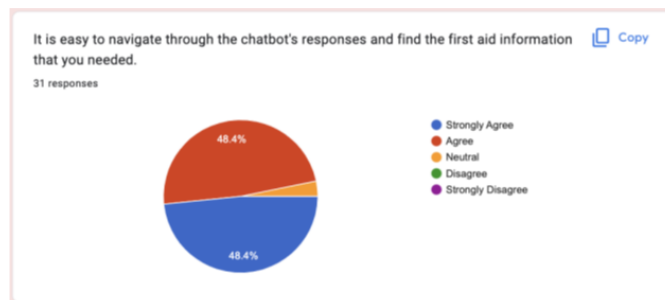

Fig. 9. Conversational flow of Dr. FirstAider.

The third question is to find out whether the information or advice found within Dr. FirstAider was conveyed in an empathetic and understanding tone. From this, majority still selected the positive outcome. However, 9.7% selected "Neutral" and one selected "Disagree". This could be because the overall tone of Dr. FirstAider is serious and direct as the initial aim was to convey the medical advice clearly, in a way that the users can understand and follow. In emergency situations where time is extremely precious, Dr. FirstAider was designed in a way to fit that criteria where users are able to access the information quickly and efficiently in case of an actual emergency. A way to overcome this is to add more empathetic language in its knowledge base to ensure users feel more grounded and confident during the conversation even if they are under the pressure of emergency situations. Fig. 10 shows the tone and feel of Dr. FirstAider.
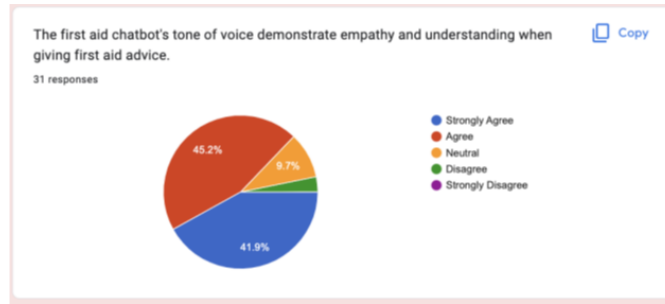
Fig. 10. Tone and feel of Dr. FirstAider

The fourth question is to determine whether the follow-up questions and prompts pro-vided by Dr. FirstAider has ensured the user that they have received detailed and accurate information. The same number of respondents selected the "Strongly Agree" and "Agree" option, which shows that Dr. FirstAider is able to provide follow-up questions in order to let users to gain more knowledge and to know more about the topic in a detailed manner. A way to further improve this feature is to always ask if the user understands the topic they selected or to ask if they are ready to move on. This way, they will not get bombarded with a large amount of information which can get overwhelming. Fig. 11 shows the prompts and follow-up questions by Dr. FirstAider.
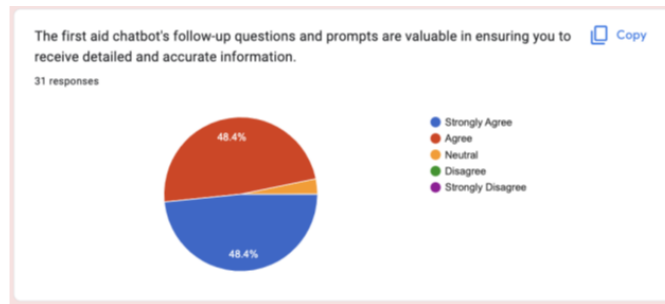

Fig. 11. Engati chatbot

The last question is to check whether the graphics found within Dr. FirstAider enhances user's understanding on the topic of giving first aid. 54.8% and 38.7% of respondents agreed that it helped while one said it was neutral to them. The reason why graphics were added such as demonstration videos and instructional images was to accommodate visual learners that learn more efficiently through forms of media as compared to reading long texts. Other than that, it may also be easier for users in general to cross check whether they are on the right path, no matter what type of first aid they are providing. This has proven to be very successful and a good implementation within the system. In the future, it is possible for Dr. FirstAider to be equipped with verbal audio explanations so that it can expand its accessibility to users that have vision problems or are of older age. Fig. 12 shows the impact of graphic use in Dr. FirstAider.
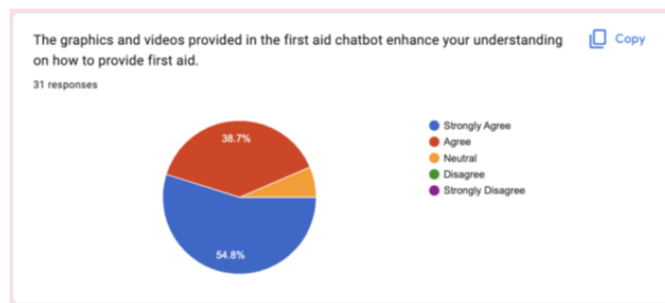

Fig. 12. Engati chatbot

VI. Conclusion

This paper described the design and development of a chatbot designed as a first aid expert among the public. The chatbot, Dr. FirstAider, is currently available web based. However, one of the hardest challenges for a chatbot is to make the user feel like they are conversing with a human instead of a robot. To improve their conversational skills, generative natural language processing can be integrated within the chatbot. With this, the system can learn how to recognize real language inclusive of instances such as the use of slang or presence of grammatical errors. It can also analyze the user's tone so that it will produce appropriate responses accordingly and ultimately, sound more human. Other than that, a machine learning algorithm known as neural networks can be implemented within the system. Neural networks are a series of interconnecting nodes similar to neurons in the human brain which is capable of using algorithms to recognize hidden patterns in data to continuously learn and improve on its own. With this, data can be collected through previous chats and the system will be able to learn to respond appropriately to many different scenarios in the future. To further widen its user accessibility, a mobile application can be developed specifically for the chatbot instead of having to access it only through a web browser. With an application, waiting time for the chatbot to load is decreased and users are able to have offline access which is useful as emergency situations are usually unpredictable. Extra features can be added such as more language options, customizable displays such as font size, animated avatars or a more colorful interface so that user experience is better.

Lastly, the content of the chatbot can be expanded into more specific sections such as first aid kit items that are suitable for children or elderly and more first aid scenarios. This can improve the chatbot's overall usefulness. In case of emergency add a voice to search command. So users can work on situation without using their hands.

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