Chatbot Kim: A Digital Tutor on AI

How Advanced Dialog Design Creates Better Conversational Learning Experiences

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Abstract—Conversational user interfaces, aka chatbots, offer new ways of interaction that can be used not only for task-led applications, but also for learning itself. Still, most conversational learning applications offer a predominantly one-directional dialog – either bot-led, with the user only confirming, or user-led, with the bot answering questions, but not going beyond. In contrast to these common approaches, learnbot Kim by time4you [1] not only conveys information, but wraps it in an equally entertaining and instructive chat, combining pre-defined dialog turns with a flexible dialog management. This article explains the design decisions made during the dialog development process and the underlying reasons. After having read this text, you will have a better idea of how dialog in conversational learning can be modeled to allow for a more natural conversational experience.

Keywords—e-learning, digital learning, workplace learning, conversational learning, conversational experience, chatbots, artificial intelligence, AI, virtual learning assistant, digital tutor

1 Background

In marketing and service, but also in training and development, AI-supported digital assistants and chatbots are on the rise. Using human-like conversation and natural language as a means of interaction, they take on an increasing variety of tasks, from answering frequent questions to providing services like bookings, and many more [2]. But chatbots can do more than that.

Many digital learning apps already incorporate conversational assistants, for example in language training (Andy English Bot, Duolingo), or in (mental or physical) health self-education (Lark, Woebot, Youper). There are chatbot guides to the Louvre and the British Museum, helping to discover the museums' artworks with entertaining and instructive stories. This kind of interaction with a chatbot to learn something establishes a dialogical learning process that we call Conversational Learning. Conversational Learning offers a variety of new and extensive options to support

individuals through the learning process and to push the boundaries of classroom-based training.

Still, the majority of chatbots communicate mostly one-directionally: either they passively wait for the user to prompt them with a question to answer, or they tell stories in a long conversation flow which occasionally stops with a user prompt, most often offering few choices, only to portion the dialog, not to bring variety to it.

Those one-directional conversation approaches have their legitimacy and can work well in certain contexts and for certain aims. But if we want to take the concept of Conversational Learning one step further, we'll have to better remember what human conversations look like. After all, a digital learning assistant will only lead to successful learning when s/he not only interacts adequately, but involves their human learning partners in a purposeful, and at the same time lively, dialog.

2 Design Choices

As an example of how proven user-prompting techniques can be combined with a more complex dialog flow to establish a real Conversational Learning experience, we developed Kim. Kim is a learnbot, a digital tutor, giving a basic introduction to AI for novices with little or no IT and AI background. S/he (Kim's gender intentionally is ambiguous) is like the fellow from next door who is enthusiastic about AI and enjoys passing this enthusiasm to others, an informed fan rather than a sophisticated expert: knowledgeable, informative, factual, but not too dry or pedantic; entertaining, yet focused.

Kim is run by Jix [3], an AI solution by time4you GmbH designed specifically for developing and running Conversational Learning applications. Jix combines an intelligent bot with a straightforward and clear script language, Liza script. Liza script is easy to learn, yet very elegant and powerful, making it possible to create subject-specific chatbots and virtual assistants based on media didactics and actual organizational needs, regardless of use-case, industry, or subject-matter. There is only a very short training period because Liza script is so simple, easy to understand, and manageable, providing an authoring tool that is quick and easy to use, even without a background in IT-development. At the same time, pedagogical applications are made easy with the many options provided by Jix for designing outputs (buttons, menus, etc.) and for integrating different media (audio, image, video, links on websites and applications). Kim therefore offers not only dialog, but a rich media experience, incorporating graphics and videos into the chat.

Kim is not designed as an FAQ bot who answers users' questions, quite the contrary: from the beginning, Kim gets in the lead of the conversation, making offers about what to say and asking questions to the user him/herself. There is, indeed, a technical reason for this: The more Kim controls the conversation, the more foreseeable and better to handle dialog turns are, so Kim can better react to the users' input and avoid user frustration. But more important are other reasons that root in didactics or simply in human nature. No good fellow and true enthusiast would simply answer a question then silently wait for the next, but would on his/her own initiative come up with additional

information and aspects s/he finds especially interesting or enjoyable. An experienced instructor would even less rely on the learners' questions, but try to steer them along a path of discovery, not just giving them information, but encouraging them to think and understand.

3 Dialog Handling

Kim chats in a personal, slightly colloquial voice, in concise dialog turns, conveying small information chunks that are easy to grasp. S/he incorporates emojis into the dialog, but also occasionally graphics and videos – just as a human would. After each dialog turn, Kim offers options on how to proceed, thus actively keeping the conversation going, while at the same time giving the user maximum autonomy in how deep he or she wants to dive into the content. Also, free-text input is possible at any time, allowing the users to give the conversation their own turn.

Although the dialog unfolds along a clear structure, it shows a significant variability. Pre-defined variations of phrases or even whole dialog turns make sure the dialog evolves a little differently each time, giving the conversation a more human-like touch – and, like a human, Kim repeats some things more often than others, as a probability can be assigned to each dialog element. Even the order of certain sequences can vary, and sequences change according to which information has already been given to the user in earlier dialog steps. From time to time (partly randomly), Kim adds fun facts and ancillary information to the instructional dialog, this way not only giving additional variety to the dialog, but also expanding the thematic horizon and offering a wider range of knowledge. These strategies ensure that despite its clear structure the dialog does not become static or predictable, and that Kim is interesting not only for one-timers, but also for returning users.

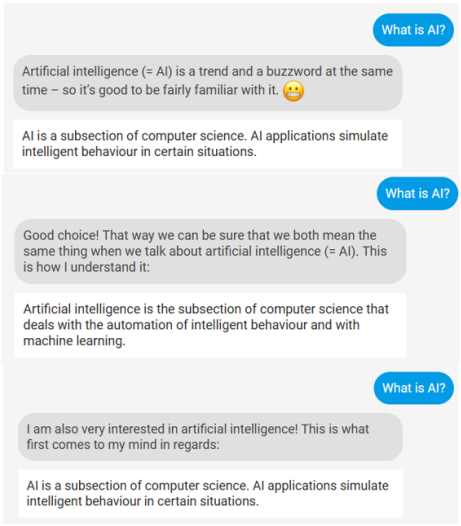

Fig. 1. One question – different answers

Of course, there are technical restrictions with which Kim has to deal. With every chatbot tool, comprehension is a challenge, as well as contextuality. In difficult situations therefore Kim resorts to proven human conversational strategies to solve possible conflicts and avoid user frustration: asking back, offering alternatives to what the user has asked for, or simply making clear again what s/he can do and what s/he cannot. [4]

An example of how technical restrictions can be addressed by human-like conversational behavior is the very start of the conversation. When a chatbot is run on a public website, it is not possible to determine if a user talks to Kim for the first time or not with sufficient reliability. In this case, an unreliable technical solution (e.g. placing a cookie) that makes the chatbot suffer from sudden attacks of amnesia (when cookies are cleared) can cause more irritation than no solution, with the chatbot not having any memory at all.

But it still would make sense to treat first-time users differently than returning users; first-time users are likely to need more assistance and information about Kim's scope. Therefore, after the greeting Kim simply asks: "Have we met before?", "Are you new here?", just as a human with a bad memory would. This human-like, credible communication strategy demands very little extra effort of the users, but works without any tracking technology. Depending on the user's answer, Kim then gives a short introduction or directly plunges into the dialog.

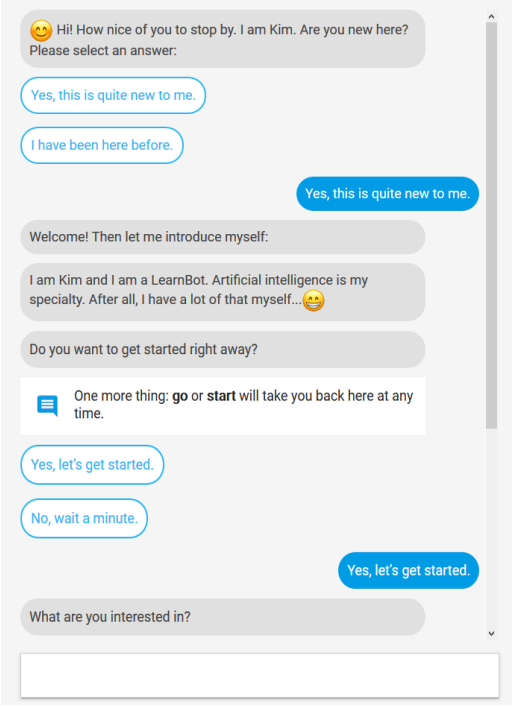

Fig. 2. When technology is unreliable – Just ask.

4 Didactical Aspects

Kim acts not as a passive knowledge base, but as an active instructor. Special focus is laid on conversation strategies that enhance learning, like giving both guidance and autonomy, encouraging exploration, and provoking self-reflection. Kim therefore often encourages the user to learn more, offering additional information and short side glances on diverse topics, and asks thought-provoking questions. At the same time, the user keeps maximum autonomy in how deep he or she wants to dive into the content, as Kim regularly asks back whether to continue or to switch topic.

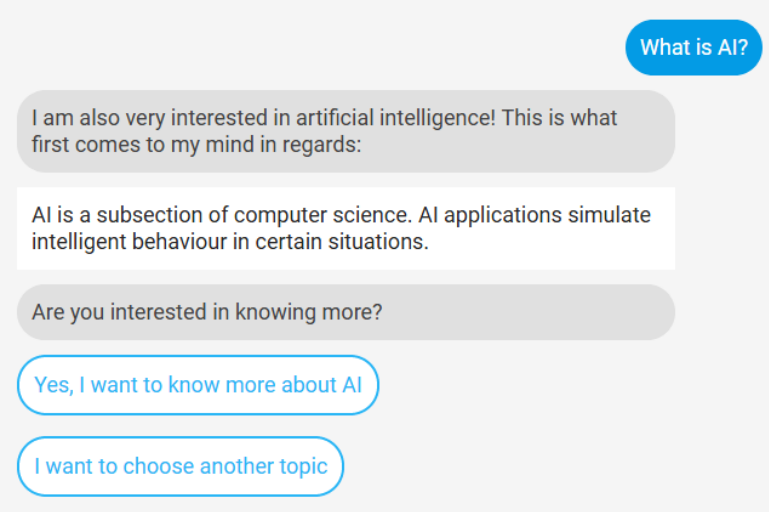

Fig. 3. The user has the choice how far s / he wants to go

Kim's perpetual prompts not only make sure the dialog does not end untimely, but also that the user is actively involved throughout the whole instructional session. Experience to date indicates that these strategies work: many users eagerly follow Kim's recommendations and remain in the dialog longer than originally intended.

Kim uses different conversation strategies to involve the user throughout the five main topics. While "What is AI" ("Was ist KI?") and "History and Milestones" ("Geschichte und Meilensteine") focus on quick and stepped information, "Examples of Application" ("Anwendungsbeispiele") aims to show connections between different aspects. And in "AI and Personality" ("KI mit Persönlichkeit") self-reflexive questions encourage the user to find his or her own point of view. Additionally, a little quiz gives learners the opportunity to test their AI knowledge, either as a self-assessment or as a learning control – and Kim gives competent feedback.

By using hypertext features like links and tooltips, Kim includes supplemental information in various ways, thus arising curiosity and encouraging further learning without entirely leaving the dialog. Audio and video as well as external websites can be included in the dialog, too.

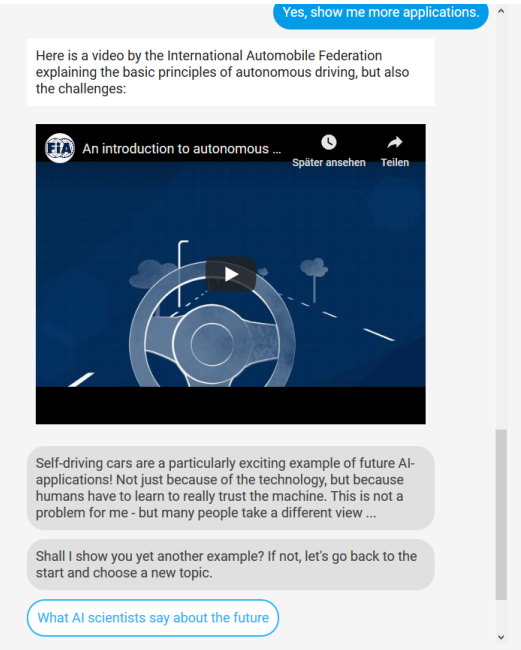

Fig. 4. Dialog Turn with Embedded YouTube Video

Different output formats for instructional texts, conversational elements, buttons, user prompts, help texts, etc., make sure the user is given good guidance throughout the dialog and never gets stuck.

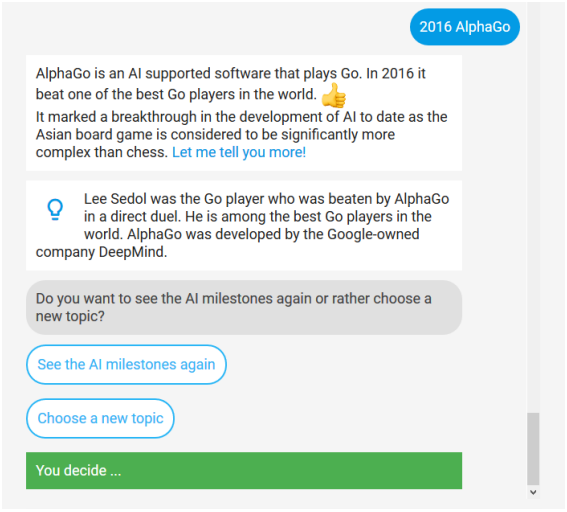

Fig. 5. Example of a Learning Sequence with instructional texts, chat bubble, buttons and a user prompt

All in all, the broad range of communication strategies, the variability of the dialog, and the multitude of output formats and media make for a multifarious learning experience that is instructive, easy-to-grasp, and entertaining.

As web-based chatbot, Kim opens in the browser (all common browsers are supported) and can be run on virtually any website. Wrapped in a SCORM package, Kim seamlessly integrates into any LMS, making it also possible to exchange, e.g., usage information and learning progress.

5 Lessons Learned

Conversational Learning applications that didactically prepare content tend to play on the safe side and not deal with user inputs too much. But if the dialog's structure is too one-directional, if options don't give real alternatives but serve only as breakpoints, and not branching points, user interaction is reduced to a kind of scrolling.

However, to start dialog design with a structured dialog offering distinct options after each dialog turn is helpful – on the one hand, to give the users guidance through the dialog and make sure they don't get stuck; on the other hand, to be able to handle the complexity of the emerging dialog.

A prerequisite to structuring a dialog is to carefully select relevant information and to boil it down to small, but meaningful dialog chunks. Without a clear notion of the chatbot's learning goal and target groups this is difficult to achieve.

Even more demanding is the design of the offered options, where you consequently have to take the users' perspective. Options and branching sequences have to be carefully designed to give the user real choice and keep his curiosity alive. If options are redundant, or important options are missing, the user eventually will become annoyed with the chatbot and quit.

That's where freetext input turns out to be particularly valuable, as the users can just write what they would have wanted. And even if the chatbot at that time won't know how to answer, you will notice that there is a need and can expand the dialog accordingly.

Of course, you are never fully done. No matter how much time and effort you put into the design process (and we recommend that it should be a significant amount), users will always come up with aspects you haven't thought of. But if you've started with a chatbot that is interesting enough, they will excuse occasional fails – and by continually expanding the dialog, the chatbot will become better and better in meeting users' needs.

This step-by-step approach is perfectly supported by Jix, as the script can be expanded easily and at any time. When you realize that too many users run into the same dead end of the dialog, you can easily insert additional rules and sequences without having to redesign and reconstruct the whole chatbot.

6 Conclusion

AI-driven conversational interfaces open up a variety of new applications for learning and development. But it's not the technology alone that makes the conversational learning experience; at least equally important are the concept and the dialog design.

If we want to create didactically adept chatbots, one-directional dialog strategies fall short. For a true conversational learning experience, a chatbot has to play an active part in the dialog, while at the same time allowing the user sufficient autonomy, too. A clever combination of chatbot-led vs. user-led dialog turns, plus a focus on human-like conversation strategies whenever possible, is a promising approach to Conversational Learning.

So, if we see a structured dialog not as the final chatbot, but as a starting point, a basic structure to which we by and by add greater flexibility, understanding of free user inputs, and additional dialog paths, we will be able to achieve a conversational learning experience that deserves the name.

7 Acknowledgement

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8 References

[1] www.time4you.de

[2] Comp. e.g. Shevat, A. (2017). Designing Bots: Creating Conversational Experiences. Sebastopol, California (O'Reilly Media Inc.), pp 9ff, 29ff

[3] http://www.jix.ai

[4] As Netaya Lotze points out, successful chatbot design does not perfectly simulate human conversation, but rather manages to integrate the specific functionalities and restrictions of a system to make full use of its interactive potential. – see Lotze, N. (2016). Chatbots: eine linguistische Analyse, Frankfurt/Main, Germany (Peter Lang). p 77

9 Authors

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