May 2020

Knowledge Assistant for Learning

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ABSTRACT

This disclosure describes a virtual assistant that is tailored for use by children and is powered by a knowledge graph. Topics, which are structured collections of facts, are presented to users based on the knowledge graph, itself curated using folksonomy. As new facts are added to the knowledge graph, the topics presented to the users mature, and the knowledge graph grows day-by-day. Based on the knowledge graph, a natural language generator generates questions or quizzes that engage the users. Users can learn about a topic of interest using quizzes, narratives, etc. and can form groups with their peers, teachers, or parents to collaborate, interact, share knowledge, learn from their peers, assess and evaluate each other's ideas, and contribute. The knowledge assistant can be provided via a dedicated device and provides an effective learning experience.

KEYWORDS

- Virtual assistant
- Learning app
- Quiz
- Knowledge graph
- Knowledge assistant
- Semantic modeling
- Folksonomy
- Quiz generator
- Natural language generation

BACKGROUND

It is a parental aspiration to bring out the best in their children. A popular avenue to realize such an aspiration is to provide children with books specific to topics, provide access to online apps that enable selection of topics of interest (e.g., general knowledge, history, science, etc.) or that enable learning via quizzes. Some challenges in current app-based learning via devices that are also utilized for other purposes include:

- Children are easily distracted while using learning or quizzing apps, as the device (mobile phones, laptops) that host them also hosts distracting games, music/video, etc. Children also get exposure to a wider variety of internet-based content or applications than anticipated by the parent.
- Topics or quizzes are typically crowd-sourced, e.g., unmoderated, potentially exposing children to age-inappropriate or unsafe content.
- Although children achieve higher levels of learning and retain more information when studying in a group rather than individually, current platforms do not enable collaborative learning. For example, children are currently unable to capitalize on one another's resources and skills, e.g., asking one another for information, evaluating one another's ideas, assessing one another's work, etc. Collaborative learning, to the extent it exists today, is mostly face-to-face.
- To provide sufficiently challenging educational material, parents need to identify and provide multiple sources or books, which can be a time-consuming and tedious process.
- Although facts are best remembered when they are interconnected in the human mind, current learning apps do not fully leverage the interconnectedness of facts; rather, the discovery of interconnectedness is left to the user.

- The sharing of learned facts or knowledge amongst children currently happens by the sharing of books used by the children, an inherent limitation on the scale of sharing.
- It is difficult for children to get updates to any of the learned facts, e.g., that Pluto is no longer classified as a planet.
- Due to the tendency of children to jump topics, keeping track of what is (or not) learned during self-guided learning is challenging. Current products do not provide a mechanism to track learning progress.
- Learning or quizzing apps generally do not work without internet connectivity.

DESCRIPTION

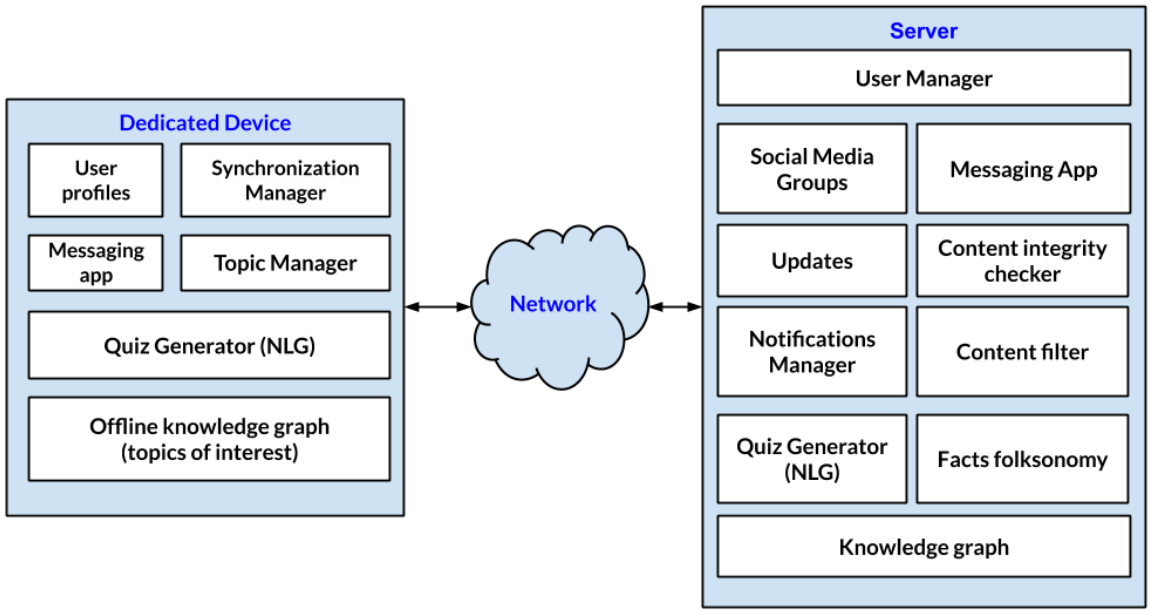

Fig. 1: Children's knowledge assistant provided via a dedicated device

Fig. 1 illustrates an example of a children's knowledge assistant provided via a dedicated device, per the techniques of this disclosure. A knowledge graph that covers a large number of topics is generated and maintained at a server. The knowledge graph is an ontological structuring

of knowledge that enables the acquisition and inference of new knowledge. Different modules are provided that utilize the knowledge graph in the manners described below.

- *User manager*, a module that maintains the profiles of the users (e.g., children and/or of their parents and teachers) with explicit user permission, and which enables easy collaboration between individuals.
- *Social media groups manager*, a module that enables collaborative learning using social media groups.
- *Messaging application*, that enables users to communicate with the knowledge assistant and/or with each other.
- *Update manager*, a module that integrates new knowledge into the knowledge graph.
- *Content integrity checker*, that verifies the integrity of the content in the knowledge graph.
- *Notifications manager*, a module that manages notifications, e.g., relating to updates to the knowledge graph or to previously-learned material, that are sent to the dedicated device.
- *Content filter*, a module that filters out inappropriate content, e.g., based on age criteria, or content that violates policies, e.g., profane content.
- *Quiz generator*, a module that uses natural language generation to create questions or quizzes from the knowledge graph.
- *Fact folksonomy manager*, a module that classifies, organizes, and associates facts within the knowledge graph to topics. The association of facts to topics can be done using, e.g., electronic tags, and by applying a variety of semantic (topic) modeling techniques and heuristics.

- *Knowledge graph,* that is a repository of information.

The generated questions and quizzes are communicated via a network, e.g., the Internet, to the dedicated device. The device maintains an offline (on-device) knowledge graph for a plurality of topics that are of interest to the device user(s). To access the on-device knowledge graph, different modules are provided on the device:

- *User profile manager*, a module that, with user permission, maintains user profiles for the purpose of recommending topics or facts that may be of interest to the user.
- *Synchronization Manager*, a module that synchronizes the topics, offline knowledge graph, user details, etc. with the knowledge graph maintained on the server.
- *Messaging application*, that enables users to communicate with the server and/or with each other.
- *Topic manager*, a module that generates and maintains topics of interest to the user.
- *Quiz generator*, a module that uses natural language generation to create questions or quizzes from the on-device knowledge graph.
- *Offline knowledge graph*, a portion of the knowledge graph that is stored locally on-device and enables offline use of the device when the server is not reachable over a network

In this manner, a virtual assistant powered by a knowledge graph that is tailored to children is provided via a dedicated device. Topics, which are structured collections of facts, are presented based on the knowledge graph, which is itself curated using folksonomy. As new facts are added to the knowledge graph, the topics presented to the users mature, and the knowledge graph grows day-by-day.

Users of the dedicated device that implements the knowledge assistant are provide a variety of ways to learn various topics, such as:

- *Quizzes*, wherein natural language generation is used to automatically develop questions or quizzes from the knowledge graph.
- *Narrative*, where facts and details relevant to a topic are presented as-is for the purpose of a comprehensive understanding of a topic, e.g., an encyclopedia entry about a historical figure.

Users of the knowledge assistant, e.g., children, teachers, and parents, are enabled to form groups. Children can share questions or facts with their peers using the built-in messaging application. Interesting topics can be shared by parents or children via the messaging application. Updates to any previously-learned facts are automatically provided to the users as notifications. The described knowledge assistant can work in two modes:

- *Online mode*, where the device connects to the knowledge graph stored on the server.
- *Offline mode*, where the knowledge graph is partially or fully downloaded to the device based on topics of interest and is periodically updated.

The dedicated device that implements the knowledge assistant in communication with the server enables children to learn by quizzing, while also enabling children to collaborate, interact, and share knowledge with each other and with their teachers and parents. Users can easily ask for more information, learn from their peers, assess and evaluate each other's ideas, contribute, and obtain an effective learning experience. As an example application, a schoolteacher can enable learning by specifying a topic for their students to learn, exposing them to auto-generated quizzes on the topic, pushing homework to student's devices remotely, etc.

CONCLUSION

This disclosure describes a virtual assistant that is tailored for use by children and is powered by a knowledge graph. Topics, which are structured collections of facts, are presented to users based on the knowledge graph, itself curated using folksonomy. As new facts are added to the knowledge graph, the topics presented to the users mature, and the knowledge graph grows day-by-day. Based on the knowledge graph, a natural language generator generates questions or quizzes that engage the users. Users can learn about a topic of interest using quizzes, narratives, etc. and can form groups with their peers, teachers, or parents to collaborate, interact, share knowledge, learn from their peers, assess and evaluate each other's ideas, and contribute. The knowledge assistant can be provided via a dedicated device and provides an effective learning experience.

REFERENCES

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