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Book-Bot: An AI Companion for Library Assistance

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***Abstract*—This paper outlines the construction and testing of an artificial intelligence library support system, Book-Bot, that is based on a specialty chatbot environment in the Telegram framework. Establishing the idea of accessibility, automation, and user engagement for a future AI chatbot implementation into modern library systems, this study aims to overcome the identified limitations of current OPACs. The approach focuses on design at an innovative level based on a natural language processing capability and real-time interaction to provide a better quality of search, user satisfaction and productivity without needing extremely sophisticated and resource-intensive interfaces. It was built on a library-specific dataset and further optimized using Telegram's API to design an easy-to-navigate working environment suitable for libraries of different types. Thus, given current computational restrictions, Book-Bot proves that maximally effective library automation can occur on commodity hardware. This work aims at disseminating conception about sustainable and user-friendly library technologies so that the future researchers and library policymakers should consider more innovative and scalable practices of using the chatbots in the library systems that enhance users' experience and efficiency.**

***Index Terms*— OPAC, API, Chatbot, AI.**

I. INTRODUCTION

Libraries and other institutions of education have long been considered as source of information, knowledge and skills so vital to the users in their respective fields. However, as the IT development has grown, the former traditional library systems have faced additional challenges in response to the new and varied needs of information consumers particularly those ones that demand instant gratification. Other older systems such as the OPAC have been effective in the management of the library collections, but they have their own weaknesses which involve low interactivity and highly specific and unmalleable search capabilities. These factors lead to less interaction and experience of the users, which becomes an issue in the digital age where usability is valued in addition to the enhancement of the process of information search [1].The drawbacks of the older systems such as OPAC in their functions have also produced a need to have a more adaptive user-friendly system to handle the libraries particularly in the face of the growing usage demands. AI and Chatbots partially address these issues as they are mainly related to the presence of help to such users who want to get the necessary means as soon as possible. Therefore, involving users with AI-powered-chatbots, closed platforms like Telegram and performing those processes that once required a great number of human resources of libraries, etc. According to the nonlinear application of smart technology in libraries, it increases various customer support options, interactivity and accessibility to various types of electronic information - e.g. eBooks and databases - that fulfil the needs of the modern demanding consumer [2].

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These are the user requirements according to which the existing research emphasizes the advantages of the use of AI-based systems within the library setting instead of the shortcomings of the older and more stagnant ones [3]. In that, though, systems such as OPAC and the likes have been considered to be beneficial in cataloguing, it has been noted consistently to be an isolated, bulky and with a narrow search range that impedes information search in a manner [4]. Consequently, AI chatbots result in a superior option of having chatbots and user interface that is more effective than the web interface and API where it is utilized in telegram with having more robust API integration and high user base [5].

This study raises the potential and potential impacts of the use of Telegram AI chatbots in libraries. It gives a thorough discussion on how they can enhance the interaction with the users, better access to the electronic collections or enhance the activities in the library. By incorporating these developments, the research seeks to unveil information on how the application of the AI-based chatbots can be applied in bridging gaps in the traditional Systems in an attempt to enhance accessibility and efficiency within the library as an exemplar of how effectively the system can be extended to other library contexts in a successful manner.

II. Literature Survey

Some of the studies point to the increasing use of Artificial Intelligence (AI) to improve library services. The article by Vijayakumar and Sheshadri [2] addresses the AI technologies, including expert systems, neural networks, NLP, robotics, and image processing, and argues that they can be used in combination to enhance the quality of library services. Omame and Alex-Nmecha [3] perceive AI as a transformative element of librarianship, which empowers expert systems, robots, and virtual reality and promotes librarians instead of dismissing them.

The studies of OPACs indicate usability problems and changing tendencies. Wanigasooriya[6] and Indraji[7] review the concepts and literature about OPAC, and found the limitations of its access and use. According to Rout and Panigrahi [4], there is low utilisation of OPAC in Odisha because of the absence of awareness, strong search, and necessitate guidance, and has to be enhanced urgently through functional improvements. Jetty et al. [8] also focuses on next-generation OPACs (OPAC 2.0), which incorporate Web 2.0 and social networking technologies in order to save time of users, whereas Chintha [9] discusses Web-based OPAC services in India and related institutional and economic issues.

The current literature on AI chatbots and messaging in libraries pays close attention to the recent literature. Research works by Ali and Almarwani [10], Gupta and Kumar [11], and Nandi and Roy [5] survey chatbot applications with the emphasis on better user interaction, automation, and service efficiency and implementation issues. Morgan and Bhat [12] discuss the issue of privacy and security.

Lee and Park [13], Zhang and Wang [14], and others research the topic of chatbots integration with messaging apps, such as WhatsApp and Telegram, to make chatbots more accessible and user-friendly. Recurring themes are user-centric design, satisfaction and engagement. Reddy and Srinivas [15], Smith and Thompson [16], and Verma and Rao [17] prove the implication of the use of AI chatbots to improve user experience, resource discovery, and quality of interaction. It was also confirmed by comparative and trend-based studies [18,19, 20] that AI-powered chatbots with the help of NLP can greatly enhance library services and define the future of academic libraries.

III. Aim and Objectives

The aim is to develop a bot improving e-resources management, and a Telegram bot for end users for e-resources, students, faculties, and the like.

- Improving Customer Experience: Providing students and researchers with a convenient and user-friendly way to search e-books and above all accessing them should be accomplished in a comfortable manner.
- Addition of a Telegram Bot: Add a Telegram BOT as a supplement to the e-books management system, which, with the familiar messaging application interface, makes the users interact with the e-books in the library. Combined with the existing e-book management system such that the user is able to interact with the library with its e-book collection using the normal Telegram messaging service.
- Allowing Real-Time Availability Checks: Allowing the users to know whether a given e-book is available at that specific time, therefore, improving the process of discovering and borrowing resources.
- Giving Individualized Recommendations: Recommending the e-books that are not only interesting to the users but also are connected to the reader history so as to make the readers more active and read more different e-materials.

IV. Existing Systems

- Traditional OPAC Systems: These systems originated as digital versions of card catalogues, allowing users to search for library materials by author, title, subject, or keyword. They often provide basic information about each item, such as availability and location within the library.
- Web-Based OPACs: With the advent of the internet, OPAC systems transitioned to web- based platforms, offering enhanced accessibility and search functionalities. Users can access these systems remotely, search for materials, place holds, and manage their accounts online.
- Integrated Library Systems (ILS): Many libraries utilize integrated library systems, which incorporate OPAC functionality along with other library management features such as circulation, acquisitions, and cataloguing. These systems streamline library operations and provide a comprehensive solution for managing library resources.
- Mobile Apps: To cater to the growing usage of mobile devices, libraries have developed mobile apps that provide access to OPAC functionalities on smartphones and tablets. These apps often offer features such as barcode scanning for quick access to library materials and push notifications for overdue items

V. Proposed System and Methodology

In educational libraries, chatbots have been employed to assist the end users with searching the required information among the library contents on the topics and providing recommendations about reading and answering questions. In a study [11], chatbot application within academic libraries can address any real-time query by a student and avoid the need to access the analogue services regularly and can assist the users to serve themselves at other instances.In a world where technology continues to reshape our lives, "Book-Bot" emerges as a revolutionary solution to transform the conventional library experience. It will be an AI-based chat robot that provides the functionality of a virtual library assistant, being a convenient and easy-to-use chatbot to access e-resources, check the availability of books, make personalized recommendations, and generate a book transaction. Through Telegram popularity and its availability, Book-Bot guarantees the convenience of communicating with the library materials at any time and at any location. The drawbacks of the traditional OPAC systems are overcome in this innovative method, which meets the requirements of the modern users who need fast, effective, and convenient access to the information. This innovative approach addresses the limitations of traditional OPAC systems and caters to the needs of modern users who demand quick, efficient, and convenient access to information. Figure.1 Illustrates the way the Telegram bot connects with the Library Data Server. The bots that are integrated with the system constitute the end nodes. The Bot will accept the request of the user and forward the request to the data server of the library. Request in the Library Data Server will endeavour to pull out the corresponding data (i.e. e-resources) and it will be relayed back to user through Bot. Depending on the identification of relevant recommendations, the recommendation system will create a list of recommendations.

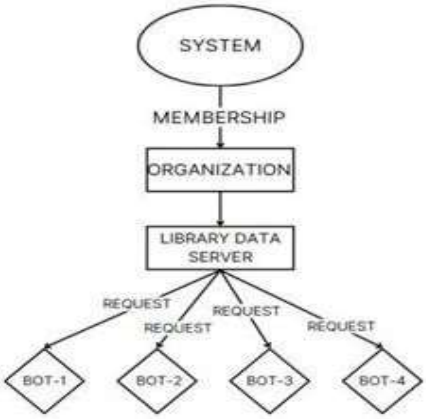

Figure 1. Block Diagram for Book-Bot

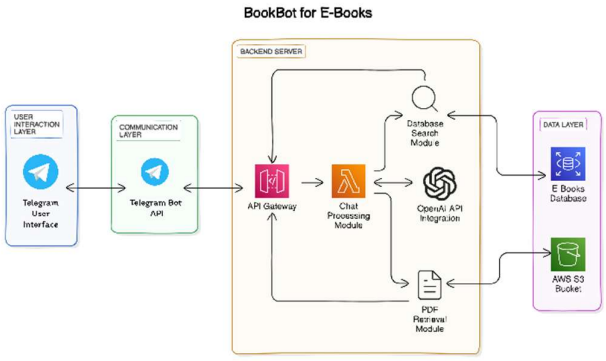

Figure 2. System Internal Flow

This smooth combination allows retrieval and delivery of information in an efficient way. It is also elaborated in Figure 2 that shows internal flow of the Book-Bot system. Telegram User Interface is where the users interface with the system using Telegram. Telegram Bot API is an interface between the Telegram application and the

server. The API Gateway will serve as an endpoint and send the requests of the Telegram Bot API to other services as shown in Figure 3. Chat Processing Module processes messages posted by the users and supports the OpenAI API. The OpenAI API Integration allows smart responses or processing with the OpenAI model, such as search query or response. Database Search Module uses the E-Books Database to retrieve and obtain the results. PDf Retrieval Module will retrieve PDF e-books in the storage. E-Books Database and AWS S3 Bucket Data Layer and Data store respectively hold metadata and content concerning the e-books respectively and the real e-book files (PDF) that can be accessed and delivered to the users.Overall, the flow is given as: users interact with the bot, API Gateway forwards the requests, Chat is processed with AI and searches the database and finally E-books are retrieved (if needed) from AWS as shown in Figure 4.

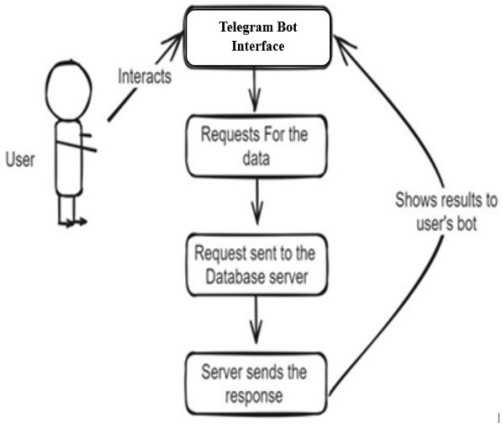

Figure 3. Module 1- Telegram bot

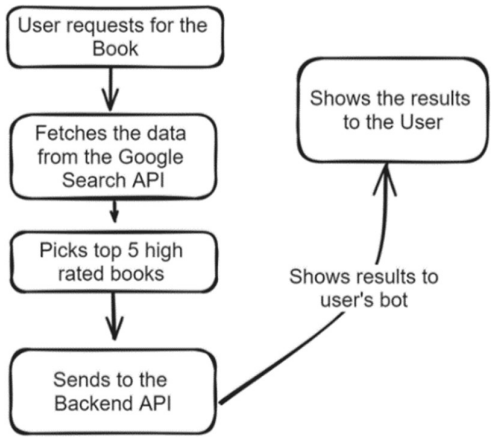

Figure 4. Module 2: Recommendation System

This flow ensures efficient handling of user requests, providing both the list of available e-books and specific PDFs through the Telegram bot.

A. Using Information Literacy in Addressing Failures and Flaws of Traditional Library Systems (OPAC)

The point of the existing research and Book-Bot case that is highlighted is that current models of OPAC are obsolete. As highlighted in most of the studies undertaken in relation to it [9, 10], OPAC systems are bulky, interactive as well as slow in comparison with, say, current artificial intelligent-based systems.

In this case, the utility of Book-Bot lies in the fact that it may serve as a front-end to the OPAC systems, or even substitute them with a more natural language-based perusal. The opportunity to use the Telegram API and Natural Language Processing to find library material is exploited by Book-Bot, which enables users to search in easier English. Switching to an AI-driven chatbot (instead of a form-based Search Engine) alters the workflows and the instructional system of interactions dramatically and addresses the usability and accessibility concerns identified in the literature.

B. Intelligent UI and User Engagement with Solutions

Another important sphere of concern in the available literature is interaction with users who want to be better engaged through the intelligent chatbots. The research conducted by [15, 16] indicates that the application of chatbots improves the user experience through the immediate response and other relevant services as determined by the user activity profiles. The given results can be directly used in terms of the work on the Book-Bot project.The Book-Bot will be made to apply intelligent learning algorithms to not just respond to the queries that may be posed by the user at any given moment but also recommend books and other materials of learning. This demonstrates that with a re-examination of the process of communication with users, Book-Bot will improve its recommendations, thereby boosting satisfaction. This level of personalization, which is supported by the above literature [13], fills a blank that is not being filled in the current libraries where services are primarily centred on newsletter searches as well as canned search queries that are not interactive[21,22].

C. Using Telegram for Cross Device Access and Reaching the Users

The major breakthrough of the Book-Bot project is the decision to use Telegram as the primary platform of introducing AI services into libraries. Although the available literature acknowledges the opportunity of messaging applications to offer easy access to digital services [12, 17], almost no papers are research-specifically

dedicated to the application of the Telegram in libraries. Telegram cross-device messaging is also used to the benefit of the Book-Bot, where it can be integrated with a variety of gadgets (smartphones, tablets, PCs, etc.), hence becoming more reachable and convenient. The given selection of the platform can be deemed as the tendency consistent with the findings in the literature concerning the emphasis on the provision of library services via the most convenient and efficient means of communication. Telegram bot Module: This is an interactive Telegram bot, and only ultimate solution to the OPAC. This is where the users make their query where they request their requests. After they make demands regarding the any of the book, the request will be redirected to the cloud database. After that, the backend will select the requested query and works on it and selects the results to be transmitted to the user.

D. Increasing Search Quality through Natural Language Processing (NLP)

Natural Language Processing (NLP) is frequently used in research, and a number of studies [9, 13] demonstrate the effectiveness of NLP in enhancing the search results in AI chatbots. Nevertheless, some accuracy threats are also identified in the literature concerning complex or unclear queries.The Book-Bot project will directly address this weakness by using better NLP algorithms[23,24] to process complex queries so that users are able to provide more accurate searches and also able to make more sense out of natural language problems through the Book-Bot. This is the same ability as demonstrated in literature that indicates that users are more pleased with the AI chatbots such as the LibAI than the traditional OPAC systems.
Recommendation system Module: The add-on of the system is the one that would do the suggested alternative e-books to the user when the user is in need of alternatives to the e-book he is requesting. This makes use of Google search API and directly retrieves the top 5 high rated books that correspond to the category of the books that are being requested.

VI. TECHNOLOGY USED

The project makes use of Tailwind to style the frontend and offer a fast and efficient approach to the design of responsive interfaces. Python is used on the backend where the bot logic is developed and different components are integrated because it is versatile and easy to use. The selected web framework is Flask because it is a lightweight and simple framework that is simple to learn and therefore suitable in developing RESTful APIs with which the bot interacts. To communicate, The Telegram Business API has been used to communicate along with Twilio Sandbox to develop and test with the provision of a few free Telegrams. Supabase is used to store data in the cloud, as it is a powerful and scalable system.

VII. RESULTS

Figure 5. A Book Request for a Database Management System

Figure 6. BCI Input and Output Devices Equipment Request

Figure 7. The third image representing this concept is termed Programming Skill Enhancement Query

The developed and improved AI components are all represented in the Book-Bot AI library assistant application and have been tried out successfully. The BOT was implemented on the Telegram platform and used Telegram API to provide real-time library support. In line with various situations, the effectiveness with which the bot was able to direct the users in retrieving the right books in line with their search queries was investigated. Here, as shown in Figure 5, the search term used by a user was 'Database Management Systems written by Henry Korth'. The bot would gather the book titles that were of relevance to the search query carried out and provided the links to the resources.

Here the demonstration of the ability of the bot to connect the user keywords to the textual data available and give him/her a variety of related books is made. In the second case, as shown in Figure 6, the user was searching the materials about Brain-Computer Interfaces. The BOT was also functional as it presented a list of the most useful resources, their titles and links to the additional reading. The fact that the number of sources retrieved is the same can testify that the tool is as effective in searching materials in other fields. Finally, one of the users who claimed being a beginner in the field of programming used the bot and requested some books to become a better programmer. The bot instantly gave a list of options of simple programming manuals to more complicated ones. The proposition of appropriate books presents the way the chatbot can respond to the real and required sophistication of studying on the part of the client as shown in Figure 7.

Observations

- Precision of Recommendations: The recommendations produced by the Book-Bot controlled to only pertinent books, i. e. when the keywords in the user queries were entered. This has simplified the provision of the required correct media in attaining the optimum end product in the perspective of the user.
- User-friendliness: Since the users can use links in the form of the bot recommendation to different books databases, the video demonstrates how the bot is an information intermediary
- Flexibility in Queries: The BOT was able to handle anything, such a technical subject as "Brain-Computer Interfaces" or even simple programming tools, and it demonstrated the flexibility of the method.

The results of this study indicate that the proposed model, the Book-Bot, can add value to conventional library services by providing immediate, Artificial Intelligence-based book suggestions for a wide array of subjects. That the bot was able to successfully handle several queries makes the use of the bot essential to modern libraries as it guarantees engagement and efficient access to resources.

VIII. ADVANTAGES

- Easy to Interact Interface: The Telegram bot is a very easy to use and familiar interface; students can easily use the library e-resources without having to learn how to use a new system.
- Individualized Recommendations: With the use of AI, the bot will have the ability to make personalized recommendations, depending on the search history and preferences of the user, which will improve the process of discovering related resources.
- Accessibility: The Telegram bot is available at any place so that students can be able to access library facilities whenever they wish regardless of associated spaces with poor internet connectivity.
- Convenience: Telegram is a popular messaging application and it offers students with a convenient platform to request and access e-resources on their mobile phones at any given time and at any given place.
- Effective Resource Administration: The bot saves time by ensuring that students and library professionals spend less time on accessing e-resources and automatically performing routine functions, as well as granting instant-access to materials.
- Real-Time Help: The bot will be able to provide instant help and support as a responsive and reliable resource, which students need to access library materials quickly.

IX. APPLICATIONS

- Library Resource Access: Empowers students to access e-resources without any complexity and hassle in libraries using a familiar Telegram interface, which improves the accessibility and usability of library services.
- Educational Institutes: Can be incorporated in schools, colleges, and universities to oust the old OPAC system and provide students with a new and efficient solution.
- Remote Learning Support: This helps in remote learning by allowing students to retrieve the required academic programs wherever it is needed and this would help them to keep learning even after they are out of the physical library.

- Resource Recommendation: Provides personalized recommendations for resources, aiding students in discovering additional materials relevant to their studies and research.
- User Engagement: Increases student participation in library materials by increasing their interactions via an interactive, easy to use platform and entices them to explore and use the materials available to them even more frequently.

X. CONCLUSION

The paper has thus undertaken literature survey in determining how AI-based chatbots and the Telegram platform in particular can be integrated in the existing library systems. The results provided by the study appear to be the clear description of the cons of the traditional OPAC: specifically, the lack of interactivity, and the issues with the discovery of the resources. This survey demonstrates the urgency of such new projects as the Book-Bot project as it indicates the obvious advancement of the AI technology evolution and its applicability to the learning environment[18,19].

The Book-Bot will overcome the above obstacles by aiming to integrate natural language processing, offer user conversations based on the individual needs, and make library services more effective. The review further highlighted availability and cross-platform as the most desirable platform to be used to provide these services using Telegram. As an illustration, the precautions safeguarding the data security and personal information of users in the Book-Bot system are related to the issues that can be critical with the AI utilization[11,12]. In such a way, the Book-Bot contributes to the introduction of innovations into library work, addressing high purchasing and distributing book resources to satisfy the needs of users of diverse types, enhancing the organization of work and the experience of users. Similar investigations as well as empirical research on the particular issue of user engagement and satisfaction will contribute to the knowledge and practice development in the future to provide the most optimal systems by using artificial intelligence to libraries[20,21].

FUTURE SCOPE

The future perspective of the Telegram Book-Bot is in the overall plan of increasing the ease and accessibility of the e-resources and PDFs to those in need of information on different book subjects. Using the Google search and OpenAI functions of a Telegram platform, the BOT is supposed to enable users with useful educational material that will encourage the promotion of lifelong learning and sharing of knowledge.

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