[1] Taishi Nemoto *
[2] Takayuki Fujimoto

Proposals for the Construction of Live-Delivered Digital Church and its Mechanism

Journal of Electrical Systems

Abstract: - This paper explores the integration of AI technology and Christian theology through the design and implementation of a live-delivered digital church using AI technology. Particularly since the COVID-19 pandemic, rapidly evolving technologies have significantly impacted religious practices, necessitating new forms of worship. The system proposed in this study aims to provide accurate and unbiased information using a comprehensive knowledge base, including texts from the New Testament, and employing a Retrieval-Augmented Generation (RAG) architecture. It eliminates personal biases and sentiments of religious leaders, delivering consistent and impartial messages to the faithful. This study examines the current state of virtual churches, the integration of AI technology and religious practices, the design, and the mechanism of the proposed system. The virtual church system offers significant technical and accessibility advantages while suggesting challenges in fully replicating the emotional connections of traditional worship. This study provides guidelines for understanding how technology can transform religious practices and presents a comprehensive framework for the future possibilities of AI-assisted religious services.

Keywords: Artificial Intelligence, eXtended Intelligence, Digital Church, Retrieval-Augmented Generation (RAG), Virtual Religious Services.

I. INTRODUCTION

The evolution of technology in modern society affects every aspect of life. Especially since the COVID-19 pandemic, religious activities have not been an exception, with remote worship and online churches that are rapidly spreading. In this context, the fusion of religion and technology creates new possibilities, fundamentally changing the nature of faith. Traditional religions tend to be conservative and cautious about adopting new technologies. However, historically, the Reformation was triggered by the development and spread of printing technology, leading to diverse denominations and interpretations. Similarly, today, the rapid development of AI and its incorporation into theology is being questioned, potentially seen as a "Second Reformation." The purpose of this study is to explore the potential of new religious experiences using AI technology through an interdisciplinary approach combining informatics and theology. Specifically, it examines the construction and impact of a live-delivered digital church using AI technology. This system aims to bring a new form to the practice of traditional faith and provide consistent and accurate information to the faithful. The proposed system is based on the RAG (Retrieval-Augmented Generation) architecture, retrieving information from a pre-constructed knowledge base and integrating it into a generative model to provide accurate and faithful information. This eliminates the personal sentiments and subjectivity of pastors or priests, allowing for the transmission of purely fact-based messages.

II. BACKGROUND

The relationship between religion and technology in modern society is complex. The COVID-19 pandemic has prompted people to transit to online religious activities. This has sparked significant debates across all religions about the validity of online worship. In various denominations such as Catholicism and Protestantism, religious leaders are divided in their response to online religious services. Participants in online worship services have increased explosively, providing a new form of faith for those who previously found it difficult to attend in person. This phenomenon is seen as a clash between religious tradition and the latest technology and also as an innovation in faith within that context. For example, the number of churches conducting online worship, such as the Nagasaki Jerusalem Church and the Nagasaki Baptist Church in Kyushu, Japan, is increasing nationwide. Additionally, efforts for virtual churches using advanced technologies, such as VR churches and online Bible colleges, are increasing. This allows believers to gain immersive worship experiences through 360-degree VR videos, deepening

[1] University of Kochi, Kochi, Kerala, India. nemotouc@gmail.com

[2] Toyo University, Bunkyō, Japan. fujimoto@toyo.jp

* Corresponding Author Email: nemotouc@gmail.com

their faith beyond geographical constraints. On the other hand, in some religions like Islam, the clash between tradition and technology is less likely to happen. For example, in Islam, there is less discussion about evolution, and traditional beliefs are conservatively maintained. Given this background, the challenge of how to incorporate AI technology into religion requires different approaches depending on each religion.

III. Purpose

The purpose of this study is to explore the integration of informatics (specifically AI) and Christian theology (faith). Traditional religions are generally conservative and often take a cautious approach to introducing new technologies. However, advances in new technologies often conflict with traditional religious practices. Historically, the Reformation was triggered by the advent and spread of printing technology, leading to appearance of various denominations and interpretations. In modern times, incorporating the rapid development of AI into theology is also an important issue. This study views this as a "Second Reformation" and examines how AI technology can bring new interpretations and practices to theology. Specifically, it aims to build a live-delivered digital church using AI technology and explore its potential and impact. This system seeks a new form of faith by eliminating personal sentiments or subjectivity of pastors or priests, providing accurate and consistent information to the faithful. It is based on the RAG (Retrieval-Augmented Generation) architecture, retrieving information from the knowledge base and integrating it into the generative model to provide faithful and impartial messages. Another purpose of this study is to evaluate the impact of technology on religion and faith. It aims to clarify how AI technology transforms religious practices and the experiences of believers, identifying its benefits and challenges. This understanding will help to see how AI technology promotes the deepening and expansion of faith. Additionally, this study considers the broader impact of the fusion of technology and religion on society.

IV. Precedent Research

Attempts at online church services and creation of digital ministry of church, already take place in many churches. For example, Nagasaki Jerusalem Church, Nagasaki Baptist Church, and Nagasaki Goto Church broadcast services for online worship. These churches connect believers beyond geographical constraints and promote the sharing of faith. As new forms of virtual church services, online Bible colleges and VR church communities using YouTube or social media, are also emerging. This allows believers to join in religious activities accessible anytime and anywhere. Many of these attempts are based on specific principles and church traditions. In contrast, the Catholic Church broadcasts online streaming of masses, focusing on traditional rituals and liturgical rules. Regarding Islam, attempts to stream mosque worship online are also seen, but these are relatively new and not yet widely adopted. These attempts at online worship and digital church services provide believers with new forms of worship practices. However, these attempts also face challenges. For example, ‘online worship’ often lacks interaction among believers compared to in-person worship, making community building difficult in the true sense. Additionally, as a technical issue, it relies on internet connectivity and device environments, meaning not all believers can access it equally. Based on these precedent examples, this study explores the potential of a new form of virtual church utilizing AI technology. In particular, we propose a live-delivered digital church service, clarifying its advantages and challenges to establish new forms of faith.

V. Discussion

This section compares the approaches of traditional worship, online worship, metaverse churches, and the live-delivered digital church system proposed in this study, examining their respective strengths and limitations. Traditional worship takes place in a physical church and involves in-person participation by believers. This form allows for a sense of community and real-time interaction with the pastor (or clergy）, fostering deep emotional connections. However, geographical constraints, travel time, or physical disability can make it difficult for some believers to access to this form. Online worship is a form where services are provided via live streaming or recorded videos broadcast over the internet. This form provides access to a wide range of believers beyond geographical constraints. During the Covid-19 pandemic, many churches adopted online worship service, allowing believers to participate in safely from home. However, online worship often lacks the atmosphere of a physical church and real-time direct interaction with the pastor (or clergy), potentially weakening the sense of community. Metaverse churches use virtual reality (VR) technology, enabling believers to participate in worship service within a virtual space. This form provides a high level of immersion, allowing believers to interact with each other in real-time, regardless of physical distances. While metaverse churches can facilitate new worship experiences beyond various

kinds of physical constraints, they require advanced VR equipment, presenting a high technical barrier. Additionally, some believers may resist engaging in religious practices in VR. The live-delivered digital church proposed in this study utilizes AI technology, providing an environment, which believers can access to anytime. This system is based on the RAG architecture, providing accurate information from the knowledge base in real-time, eliminating personal sentiment or subjectivity of pastors(clergies). This provides original and consistent messages, allowing believers to have personalized faith experiences. Additionally, as it operates 24/7, believers can access it at their convenience. On the other hand, the implementation of the system requires advanced technology, and training and support are needed for believers to get used to the new technology. Moreover, it is challenging to fully replicate the sense of togetherness between believers found in physical churches.

VI. Developmental Procedure

This study adopts a series of methods to design and implement a live-delivered digital church utilizing AI technology. First, development begins with construction of a knowledge base. The knowledge base includes biblical texts, religious doctrines, historical religious documents, and academic explanations, collected from reliable sources and digitized into a database. This knowledge base is regularly updated to maintain the latest information, ensuring that accurate information is always delivered to the faithful. Second, we starts to develop the information retrieval module. The information retrieval module extracts relevant information from the knowledge base in response to questions or requests by believers. This module adopts natural language processing technology to accurately understand believers' questions and quickly provide them with appropriate information. The retrieved information is then passed to the generation module to be presented in an easy-to-understand form for the believers. The generation module explains about the information received from the information retrieval module in easy-to-understand manner to the believers. At this stage, the Retrieval-Augmented Generation (RAG) architecture is used to ensure the fidelity and accuracy of the information. The generation module has the role to ensure that the text generated by AI is consistent and free from any third party’s sentimentality and subjectivity. The generated text is presented to believers, in interactive form, allowing for back-and-forth messages.

Third, we implement a virtual pastor using AI technology. This virtual pastor is in the digital church 24/7, providing an environment where believers can access it anytime. The virtual pastor responds to believers' questions in real-time and leads worship services and delivers sermons. Fourth, we also develop a worship archive function, storing past worship services and events for believers to view anytime. This archive function let believers repeatedly learn important sermons or educational content.

Fifth, usability tests and interviews take place to evaluate the proposed system. Upon the usability test, actual believers use the system, and their experiences and convenience are evaluated. With interviews, detailed opinions on believers' experiences, satisfaction, and areas for system improvement are collected. Based on these feedbacks, system improvements are made to make it more user-friendly and beneficial for believers. Finally, quantitative and qualitative data are collected and analyzed to evaluate the effectiveness of the proposed system. Quantitative data includes metrics such as usage frequency, satisfaction, and response speed to requests from believers. Qualitative data includes analyzing believers' opinions and impressions collected through interviews and questionnaires answers to clarify the system's strengths and challenges. Based on this, the advantages and limitations of the proposed system are comprehensively observed, and we make suggestions for future improvements. The New Testament is positioned at the center of the knowledge base. The New Testament is the foundation of Christian faith and doctrine, and its textual accuracy and credibility are widely recognized in religious studies and theology. The New Testament text provides diverse perspectives to believers, including multiple translations and interpretations. This diversity is important in AI-generated sermons and education, serving as a rich resource for believers to deepen their faith. Based on the reliability and credibility of the New Testament, AI can provide consistent and accurate messages to believers.

VII. System Proposal

The proposed system is a live-delivered digital church utilizing AI technology. By AI technology, the digital church opens 24/7, providing an environment where believers can access it anytime. The AI-driven virtual pastor leads worship services in real-time and responds to believers' questions. This enables the delivery of unbiased and consistent messages free from the pastor's subjectivity and sentimentality. The core system is a knowledge base. This knowledge base includes biblical texts, religious doctrines, historical religious documents, and academic explanations. The information retrieval module extracts appropriate information from the knowledge base, and the

generation module explains it clearly to the believers. Using AI technology, the virtual pastor leads real-time worship services and interacts with believers. This system is based on the RAG architecture, retrieving information from a pre-constructed knowledge base and integrating it into the generative model to provide faithful and accurate information. This eliminates personal sentiments and subjectivity of pastors, allowing for the transmission of purely fact-based messages. Furthermore, the proposed system enables the provision of personalized content. I provides personalized content based on believers' past activities and interests. For example, it recommends sermons or Bible passages based on themes that the believer has shown interest in previously. Additionally, the system offers real-time responses to believers' questions and promotes interaction among believers as a part of interactive approach of worship services. The proposed system aims to realize new religious experiences through the hybridization of technology and faith. The live-delivered digital church provides consistent and accurate information to believers, enabling interactive and personalized faith experiences. This promotes the deepening faith and networking with other believers, providing accessible faith experiences to a larger number of people.

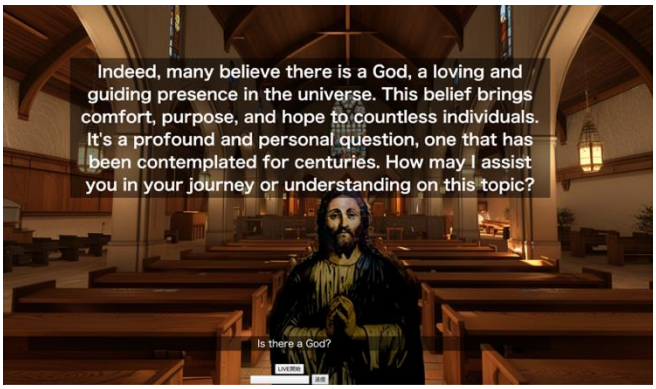

Fig1. Image of a live-delivered digital church

VIII. SYSTEM COMPONENTS

This study focuses on live-delivered digital churches, particularly referencing the AI dialogue system (AITuber) using YouTube Live. The digital church system aims to provide accurate and consistent religious knowledge while interacting with believers in real-time. The following explains the primary system components.

(1) YouTube Live is used as the platform for the digital church. Believers can participate in worship services here and post questions and comments via chat.

(2) The YouTube Data API is used to retrieve chat data from YouTube Live and incorporate it into the system. It retrieves and processes questions or messages from believers in real-time.

(3) The information retrieval module analyses questions/messages from believers and retrieves appropriate information from the knowledge base. It uses natural language processing (NLP) technology to accurately understand the believers' intentions.

(4) The knowledge base is a database that stores accurate and reliable information, including biblical texts, religious doctrines, historical religious documents, and academic explanations. Using the RAG architecture, it quickly provides appropriate information.

(5) The generation module generates natural and consistent responses based on the information provided by the information retrieval module. Utilizing the RAG architecture, it provides accurate information to believers.

(6) VOICEVOX: OICEVOX: A text-to-speech engine that converts generated text into speech. This allows the virtual pastor to provide responses audibly.

Here is the detail of the mechanisms for a live-delivered digital church. The core part of this system is users' participating in YouTube live streams and posting questions and comments via chat. The YouTube Data API retrieves chat messages in real-time and passes them to the information retrieval module. The information retrieval module uses NLP technology to analyze questions/messages and extract appropriate information from the knowledge base. The knowledge base includes digitized and regularly updated texts from the Bible, religious doctrines, historical religious documents, and academic explanations, and they are updated regularly. Next, the generation module creates consistent and accurate responses based on the information provided by the information retrieval module. Using the RAG architecture ensures the fidelity of the information. The generated text is sent to a text-to-speech engine called VOICEVOX, which converts it into natural-sounding speech. he virtual pastor,

functioning as an AITuber here, then responds to users audibly, engaging in real-time dialogue through live streaming. This process gives believers the sensation as if they had a conversation with a real pastor. This series of processes allows the digital church to provide accurate and consistent religious information to believers 24/7, enabling an interactive religious practices. Believers can deepen their faith at their own pace and participate in religious communities beyond geographical constraints. The following shows a use case.

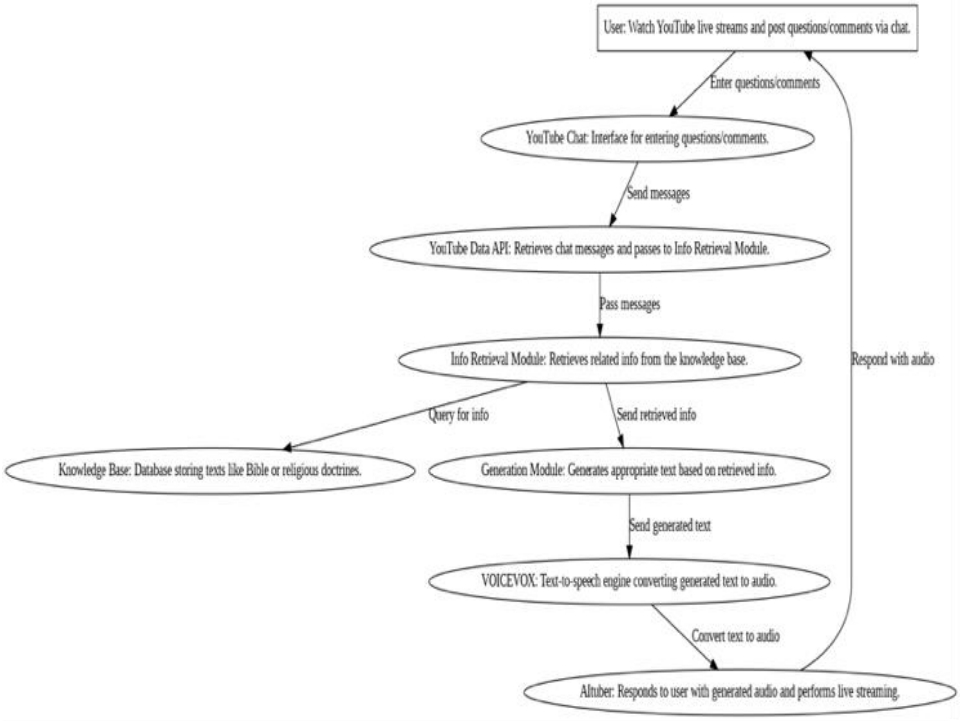

Fig2. Use Case of Proposed System

IX. CONCLUSION

The live-delivered digital church is a system that provides new religious experiences through the fusion of technology and worship services. The RAG architecture provides believers with consistent and accurate information, enabling interactive and personalized worship practices. It is important to explore how AI technology will contribute to deepening faith and networking between believers in future religious practices. This system provides believers with accessible environments, enabling the faith sharing beyond geographical constraints. Additionally, interactive worship services by virtual pastors strengthens bond between believers and reinforces faith-based communities. As technology evolves, the functions of digital churches are expected to further develop, enabling diverse worshipping experiences. Through this study, it will be clarified how the fusion of technology and worship practices transforms believers' experiences and how it impacts on future religious practices. The proposed system aims to let the believers deepen their faith and network with other believers, providing accessible worshipping experiences to more large number of people. As technology evolves, the functions of digital churches are expected to further diversify, providing more fulfilling religious experiences to believers. This leads to enable worship practices to have a broader societal impact and begin the new chapter for the future of religion. This study comprehensively understand the role of technology in future religious experiences and provide guidelines for exploring new possibilities in worship practices. Additionally, it considers the broader influence of the fusion of technology and religion on society, and proposes specific methods to help believers deepen their faith and network in their communities.

REFERENCES

[1] Chen, Jiawei, et al. "Benchmarking large language models in retrieval-augmented generation." Proceedings of the AAAI Conference on Artificial Intelligence. Vol. 38. No. 16. 2024.

[2] Tay, Aaron. "The Power of Retrieval Augmented Generation (RAG) LLM-based Academic Search Engines." Hong Kong University of Science and Technology Library, 2023.

[3] Naidoo, Marilyn. "Being a Digital Church in the Transition to Post-COVID-19 Pandemic Era." Pharos Journal of Theology, vol. 104, 2023.

[4] Campbell, Heidi A. "When the Church Went Digital: Professor Leads Research on the Rise of Remote Worship." Department of Communication & Journalism, Texas A&M University, 2023.
[5] Prochaska, James O., Carlo C. DiClemente, and John C. Norcross. "In search of how people change: applications to addictive behaviors." 1997.
[6] Hiramatsu, Ayako. "A Research of Social Game Users' Attitude to" Gacha" Probability Announcement." 2019 8th International Congress on Advanced Applied Informatics (IIAI-AAI). IEEE, 2019.
[7] Nemoto, Taishi, and Fujimoto Takayuki. "Research on Interactive Systems Based on Artificial Personality Concept." Telematique 22.01 (2023): p.860-p.869.
[8] Singarimbun, Kartika. "E-Church as a virtual service communities during COVID-19 pandemics." Jurnal Komunikasi Ikatan Sarjana Komunikasi Indonesia 6.1 (2021): 96-106.
[9] Jun, Guichun. "Virtual reality church as a new mission frontier in the metaverse: Exploring theological controversies and missional potential of virtual reality church." Transformation 37.4 (2020): 297-305.
[10] Russell, Sonia L. "Effects of a virtual church on the perceived spiritual well-being of the elderly: A qualitative study of participants in a virtual religious community." (2016).
[11] Nemoto, Taishi, and Fujimoto Takayuki. "A classification and analysis focusing on attempts to give a computer a personality: A technological history of chatbots as simple artificial intelligence", Innovations in Applied Informatics and Media Engineering Vol. 677, pp. 74–89, 2023.