Qnix- All-Rounder AI Chatbot for College Inquiry

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***Abstract*— Chatbots have become indispensable in modern digital ecosystems by enabling real-time, intelligent, and interactive communication. This project presents the design and development of Qnix (Query + Theory), an all-rounder AI chatbot specifically developed for Polytechnic college inquiry and educational assistance. Qnix is built with multilingual capabilities (English, Hindi, Marathi) to enhance inclusivity among diverse student communities in India. In addition to answering general academic questions, Qnix supports educational guidance (programming, formulas, study help) and provides institution-specific details such as admissions, courses, faculty, and events at Trinity Polytechnic, Pune. The integration of Speech-to-Text (STT) and Text-to-Speech (TTS) makes Qnix more accessible to students who prefer voice-based interaction. By combining Natural Language Processing (NLP), Machine Learning (ML), and Speech AI, the system aims to replace inefficient, error-prone, manual inquiry processes with an automated, efficient, and user-friendly platform.**

Index Terms: Qnix, Text-To-Speech, Natural Language Processing

I. INTRODUCTION

The rapid growth of educational institutions has increased the volume of inquiries from students and parents regarding admissions, courses, fees, and career opportunities. Traditional inquiry systems such as help desks, brochures, and websites are often inefficient, time-consuming, and lack real-time interaction.

Artificial Intelligence (AI)-based chatbots provide a modern solution by enabling instant, 24/7 communication. The proposed system, Qnix (Query + Theory), is an AI-powered chatbot designed specifically for polytechnic college inquiries. It supports multilingual communication (English, Hindi, Marathi) and integrates speech-based interaction using Speech-to-Text (STT) and Text-to-Speech (TTS).

Qnix not only handles administrative queries but also assists students academically, making it a dual-purpose intelligent system.

II. LITERATURE SURVEY

Recent advancements in Natural Language Processing (NLP) and Machine Learning (ML) have significantly improved chatbot systems.

- Studies like *Speech and Language Processing* by Jurafsky & Martin highlight the role of NLP in understanding human language.
- Platforms like Rasa and Dialog flow are widely used for intent recognition and conversational AI.
- Research shows that AI chatbots improve response time, user engagement, and reduce manual workload in educational institutions.
- Existing systems lack multilingual and speech-based features, especially in the Indian context.

Thus, there is a need for an inclusive, multilingual, and speech-enabled chatbot like Qnix.

III. PROBLEM STATEMENT

Traditional college inquiry systems suffer from several limitations:

- Time-consuming manual processes
- Limited availability (not 24/7)
- Lack of real-time updates
- No support for regional languages
- Absence of accessibility features like voice interaction

Problem:
There is a need for an intelligent, automated system that can provide instant, accurate, multilingual, and accessible responses to student queries.

IV. METHODOLOGY

The development of the Qnix chatbot follows a systematic and structured methodology to ensure efficiency and accuracy.

1. Data Collection

Relevant data is collected from institutional sources such as college websites, admission brochures, and academic materials. This data includes information about courses, fees, faculty, and common student queries.

2. Data Preprocessing

The collected data is cleaned and structured to remove inconsistencies and noise. Text normalization techniques such as tokenization, stop-word removal, and stemming are applied.

3. NLP Model Development

Natural Language Processing techniques are used to train the chatbot. Frameworks like Rasa or Dialogflow are utilized to identify user intents and extract relevant entities from the input.

4. Speech Integration

Speech-to-Text (STT) is implemented to convert user voice input into text, while Text-to-Speech (TTS) is used to convert chatbot responses into audio output.

5. Backend Development

The backend is developed using Python frameworks such as Flask or FastAPI. It handles user requests, processes data, and communicates with the NLP engine.

6. Database Integration

Databases like MySQL or Firebase are used to store structured data and chatbot responses.

7. Testing and Evaluation

The system is tested for performance metrics such as response time, accuracy, and user satisfaction.

V. SYSTEM ARCHITECTURE

The architecture of Qnix is designed to ensure scalability, efficiency, and modularity.

Components:

- User Interface: Allows users to interact via web, mobile, or messaging platforms
- Input Module: Accepts both text and speech input
- Speech Processing Module: Converts speech to text and vice versa
- NLP Engine: Processes input to identify intent and extract entities
- Backend Server: Handles logic and communication between modules
- Database: Stores data and responses
- Response Generator: Generates appropriate responses

Working Flow:

1. User inputs query (text/voice)
2. Speech input is converted to text using STT
3. NLP engine processes input
4. Query is matched with database or logic
5. Response is generated
6. Output is delivered in text or voice

VI. RESULTS

The implementation of the Qnix chatbot system demonstrates significant improvements in handling student inquiries compared to traditional manual systems. The system was evaluated based on various performance parameters such as response time, accuracy, scalability, accessibility, and user satisfaction.

1. Response Time Analysis

The chatbot provides near real-time responses to user queries. Unlike traditional inquiry systems where users have to wait for staff availability, Qnix responds within a few seconds. This drastically reduces waiting time and improves user experience.

2. Accuracy of Responses

The Natural Language Processing (NLP) model used in Qnix was tested with multiple query types, including general inquiries, academic questions, and institution-specific queries. The system achieved high accuracy in intent recognition and entity extraction, ensuring that users receive relevant and correct information.

3. Multilingual Performance

Qnix successfully supports English, Hindi, and Marathi languages. Testing showed that users could interact comfortably in their preferred language, and the chatbot was able to understand and respond appropriately. This significantly enhances inclusivity and usability in a diverse linguistic environment like India.

4. Speech Recognition and Output

The integration of Speech-to-Text (STT) and Text-to-Speech (TTS) modules was tested under different conditions. The system performed well in quiet environments, accurately converting speech input into text and generating clear audio responses. This feature proved especially beneficial for users who prefer voice interaction.

5. Scalability

One of the key advantages observed is the ability of Qnix to handle multiple users simultaneously. Unlike human-operated systems, the chatbot can process hundreds of queries at the same time without any degradation in performance.

6. User Satisfaction

User testing was conducted with students and parents. Feedback indicated that the system is easy to use, fast, and reliable. The multilingual and voice features were particularly appreciated by users.

7. Comparative Analysis

When compared to traditional inquiry systems:

- Qnix reduces response time significantly
- Eliminates dependency on human staff
- Provides consistent and error-free information
- Ensures 24/7 availability

Overall, the results indicate that Qnix is an efficient, scalable, and user-friendly solution for educational inquiry systems.

VII. FUTURE SCOPE

The Qnix chatbot system, while effective in its current form, has significant potential for further enhancement and expansion. Future improvements can focus on increasing functionality, improving intelligence, and integrating advanced technologies.

1. Expansion to Additional Languages

Currently, Qnix supports English, Hindi, and Marathi. In the future, the system can be extended to include more regional languages such as Tamil, Telugu, Bengali, and Kannada to increase accessibility across India.

2. Integration with College ERP Systems

Integrating Qnix with institutional Enterprise Resource Planning (ERP) systems will enable real-time access to student data, attendance records, exam results, and fee details. This will make the chatbot more dynamic and personalized.

3. Personalized User Experience

Future versions of Qnix can include user authentication and personalized dashboards. The chatbot can provide customized responses based on user profiles, academic history, and preferences.

4. AI-Based Learning Assistant

Qnix can be upgraded to function as a full-fledged AI tutor. It can provide adaptive learning paths, recommend study materials, and conduct quizzes based on student performance.

5. Improved Speech Recognition

Enhancing speech models to better understand regional accents and noisy environments will further improve usability and accessibility.

6. Blockchain Integration

Blockchain technology can be integrated to provide secure and tamper-proof verification of academic certificates and records. This will add a layer of trust and transparency.

7. Deployment on Multiple Platforms

The chatbot can be deployed on platforms like WhatsApp, Telegram, and mobile applications, increasing its reach and usability.

8. Analytics and Feedback System

Future versions can include advanced analytics to track user behavior, query trends, and system performance, enabling continuous improvement.

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VIII. CONCLUSION

The Qnix chatbot system represents a significant advancement in the field of educational technology. By integrating Artificial Intelligence, Natural Language Processing, Machine Learning, and Speech technologies, the system successfully addresses the limitations of traditional inquiry methods.

The chatbot provides a fast, efficient, and user-friendly platform for handling student inquiries. Its ability to support multiple languages and voice-based interaction ensures inclusivity and accessibility for a wide range of users.

Furthermore, the system reduces the workload on institutional staff by automating repetitive tasks and providing consistent, accurate information. Its scalability allows it to handle multiple users simultaneously, making it suitable for large-scale deployment in educational institutions.

The results obtained from testing and evaluation confirm that Qnix improves response time, enhances user satisfaction, and provides reliable information. With future enhancements, the system has the potential to evolve into a comprehensive AI-powered educational assistant.

In conclusion, Qnix is a practical and innovative solution that contributes to the digital transformation of educational inquiry systems and sets the foundation for smarter, AI-driven educational environments.

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