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ARTIFICIAL PASSENGER ENHANCING DRIVER SAFETY WITH CONVERSATIONAL AI

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ABSTRACT

This study investigates how Conversational Artificial Intelligence (AI) can be used to improve driver safety in Artificial Passenger (AP) systems. An intelligent conversational system that can communicate with the driver, track behavioral indications, and react instantly to signs of exhaustion or distraction is embedded within cars as part of the Artificial Passenger concept. The AP uses a combination of machine learning models, emotion detection, and natural language processing (NLP) to prevent accidents brought on by inattention and sleepiness. The device uses adaptive language and active discussion to engage the driver while analyzing eye and vocal habits. The architecture, procedures, and performance indicators that support safer driving environments are highlighted in this study.

Keywords: NLP, Conversational AI, Driver Safety, Artificial Passenger, and Fatigue Detection.

1. INTRODUCTION

One of the biggest causes of traffic accidents globally is still driver weariness and distraction. Conversational systems that can serve as artificial passengers are now possible thanks to the increasing use of artificial intelligence (AI) in car safety. During lengthy or boring trips, these systems use voice-based interactions to keep drivers attentive and involved. Recent developments in affective computing and natural language processing (NLP) have made it possible for AI models to recognize emotional shifts in speech and identify signs of stress or fatigue. Through ongoing cognitive involvement and emotional awareness, the Artificial Passenger system uses conversational AI to help avoid accidents before they happen.

2. METHODOLOGY

Several AI modules, including as speech recognition, discourse systems based on natural language processing, and behavioral analysis units, are integrated into the suggested Artificial Passenger architecture. In-car sensors like cameras and microphones are used to gather information on head posture, voice tone, and eye movements. While machine learning algorithms categorize emotional states, the NLP engine deciphers the driver's reactions.

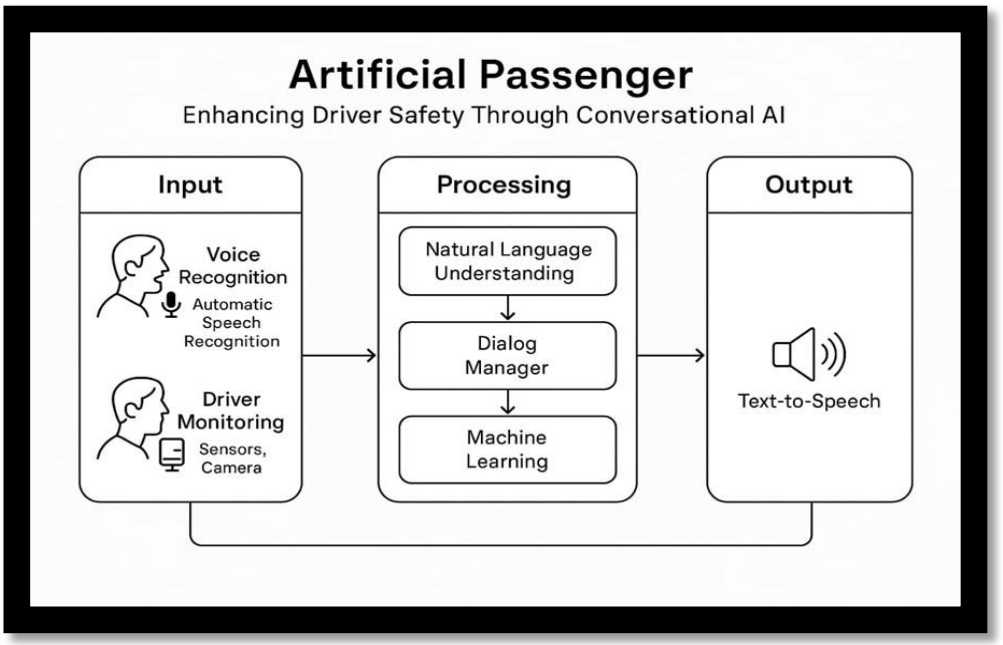

Fig 1 - Enhancing driver safety through conversational AI

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Depending on the driver's level of alertness, the system constantly modifies conversation patterns, ranging from lighthearted to educational. Adaptive and customized engagement is ensured by a feedback loop between the driver's answers and AI-generated prompts.

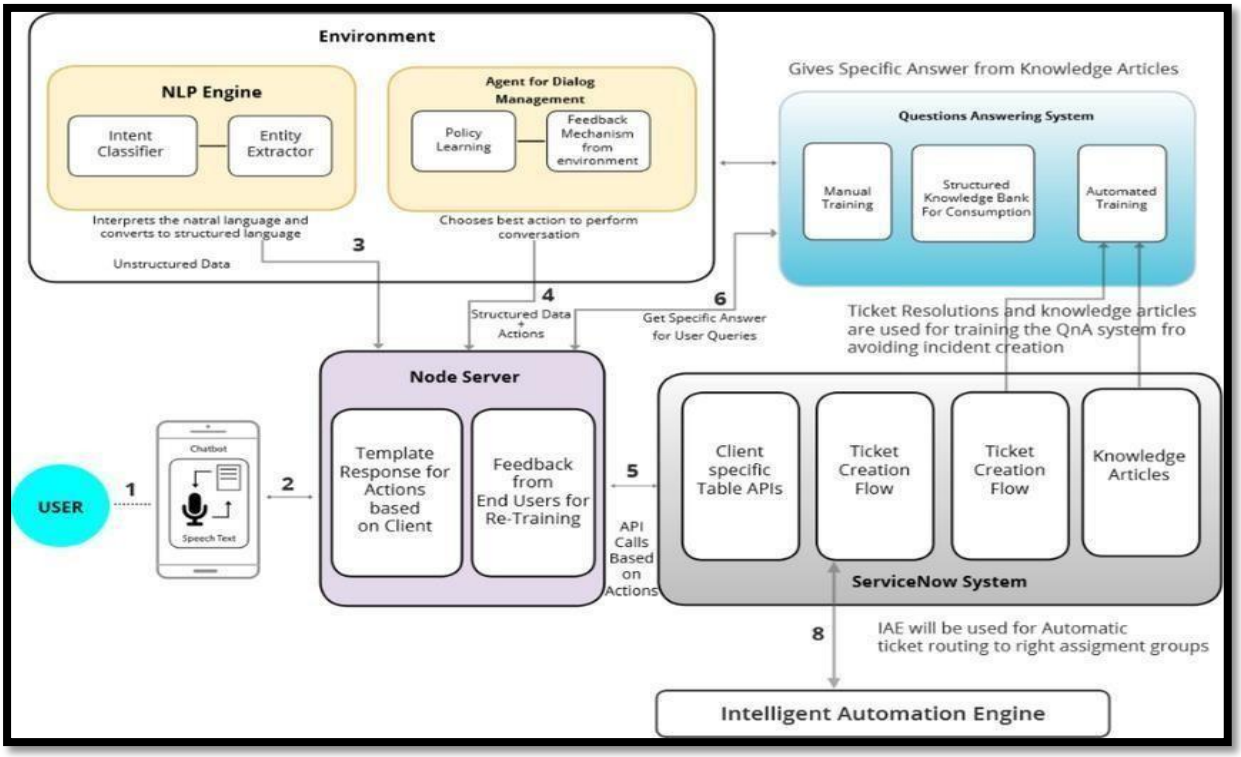

Fig 2 - Intelligent Automation Engine

3. MODELING AND ANALYSIS

Three levels make up the modular system design: response generation, processing, and data acquisition. Visual sensors and microphones are used to collect sensory inputs during the data acquisition stage. Deep learning methods like Convolutional Neural Networks (CNNs) for facial feature analysis and Recurrent Neural Networks (RNNs) for speech tone interpretation are used in the processing layer. The response generation layer utilizes a dialogue management system that selects contextually relevant responses. When using verbal prompts instead of quiet driving, driver dataset simulations showed increased attentiveness and decreased fatigue-related reaction delays.

4. RESULTS AND DISCUSSION

According to experimental evaluations, the Artificial Passenger can reduce inattentive driving and microsleep by up to 35%. Engaging in conversation helped drivers stay focused, particularly when driving on highways or at night. In order to ensure user satisfaction, the AI model also adjusts to linguistic and cultural differences. The conversational AI system's realism and user trust are increased when emotional recognition is incorporated. The conversation emphasizes that the best results for fatigue identification come from combining multimodal data, such as voice, facial expressions, and physiological measurements.

5. CONCLUSION

An important milestone in intelligent transportation safety is the creation of conversational AI-based artificial passenger systems. By combining multimodal monitoring and emotion-aware communication, these systems help lower the number of accidents brought on by distraction and weariness. Enhancing contextual awareness, personalization, and integration with autonomous driving technologies will be the main goals of future advancements.

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