**Assignment 3: Literature Review**

**AI Robot using NVIDIA Jetson Nano**

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**1. Introduction**

The integration of artificial intelligence (AI) with robotics has gained recognition in recent years, enabling robots to perform tasks that require cognitive capabilities such as understanding and responding to natural language questions. This literature review aims to provide an overview of the implementation of an AI robot for question answering using the **NVIDIA Jetson Nano board.**

**2. Scope of the Project**

The scope of this project encompasses the development of an AI-powered robot capable of understanding and responding to natural language questions. The chosen hardware platform, the NVIDIA Jetson Nano board, is a widely used, high-performance, energy-efficient solution for edge AI applications. The project aims to explore the potential applications and capabilities of such a system.

**3. Existing Applications of AI Robots with Jetson Nano**

Several studies have demonstrated the versatility of Jetson Nano in enabling AI applications in edge devices. Notable applications include object recognition, gesture recognition, and autonomous navigation. Integration with robotics platforms extends these capabilities, enabling tasks such as object manipulation, autonomous navigation, and natural language processing.

**4. State-of-the-Art in Question Answering Systems**

A review of existing question-answering systems reveals a wide range of approaches, from rule-based systems to advanced machine learning models. Recent advancements in natural language processing, particularly with models like BERT (Bidirectional Encoder Representations from Transformers), have significantly improved the accuracy and understanding of context in question answering systems.

**5. Implementation Process**

* **Hardware Setup**

The Jetson Nano board serves as the foundation for this project. Its capabilities in handling complex AI workloads make it an ideal choice for edge-based robotics applications. Peripherals such as camera (Raspberry pi Camera module V2, Arducam IMX477), microphone and speaker were integrated to the development board for interaction process.

* **Software Stack**

The software stack includes an operating system optimized for the Jetson Nano, such as NVIDIA's **JetPack SDK**, which provides essential libraries and drivers. Additionally, frameworks like **TensorFlow** and **PyTorch** are employed for AI model development.

* **Natural Language Processing Model**

The heart of the system lies in the natural language processing model. Training or fine-tuning an NLP model (e.g. **BERT, GPT**) on a QA dataset to understand and respond to questions. **GPT-3**, developed by OpenAI, represents a cutting-edge advancement in natural language processing.

* **Natural Text-to-Speech Synthesis**

**Amazon Polly**, an advanced text-to-speech (TTS) service, offers lifelike voice synthesis. It converts written text into spoken words, enhancing the interactive capabilities of the AI robot.

**6. Potential Applications**

The project's implementation has broad implications in various fields. Applications range from **educational robots** capable of providing information on a wide array of subjects to **customer service robots** that assist in answering queries in public spaces.

**7. Conclusion**

The literature review provides a comprehensive overview of our research and understandings of technologies relevant to the development of an AI robot using the NVIDIA Jetson Nano board. The project's applications highlight its significance in enhancing human-robot interaction and reducing human effort in different tasks.

**References**

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