



Autonomous Droid for Terrestrial Research and Intelligence (ATRi)

Ramesh Kumar V*

Founder & CEO, Grahaa Space (Akshath Aerospace Private Limited), Bangalore, Karnataka, India

ORCID: 0000-0003-2665-5294

Loganathan Muthusamy†

MD, Grahaa Space (Akshath Aerospace Private Limited), Bangalore, Karnataka, India

ORCID: 0009-0008-9997-9453

Abstract: ATRi (Autonomous droid for Terrestrial Research and Intelligence) is an autonomous and sentient droid designed to assist space crews with various activities and experiments. The artificially intelligent droid autonomously navigates inside crewed space capsules and utilizes voice and visual recognition algorithms to receive commands, record basic readings, and assist the crew in performing various experiments. ATRi's machine learning algorithms can be tailored to the specific astronaut(s) it will accompany in the space capsule. This personalized approach not only assists astronauts but also fosters a sense of companionship. This paper provides details about the physical and algorithmic characteristics of the droid and outlines how it can be trained and deployed in any crewed space capsule. The droid will be powered by a sentient program that incorporates visual recognition (including facial recognition and video recording capabilities), natural language processing, voice recognition, and speech synthesis. Six microphones and two cameras are embedded to capture audio/voice commands and visuals. While the current version of the droid is fixed to the space capsule, future iterations are envisioned to be highly mobile in zero-gravity environments within any crewed space capsule. This mobility is facilitated by a sophisticated motion control system that enables the droid to align in any direction, rotate, and navigate inside the crewed space module. In addition to assisting the crew, ATRi will document all activities inside the capsule through photos and videos. It can process images and videos, automatically categorize them, and periodically communicate the information to ground control.

Table of Contents

1. Introduction.....	1
2. Functionality and Autonomy.....	1
3. Personalized Interaction.....	2
4. Technical Specification.....	2
5. Documentation and Communication.....	2
6. Conclusion.....	2
7. Biography.....	2

1. Introduction

ATRi, an acronym for Autonomous droid for Terrestrial Research and Intelligence, represents a groundbreaking development in the realm of autonomous and sentient robotic systems. This cutting-edge droid is meticulously designed to serve as an invaluable companion to space crews, contributing to a myriad of activities and experiments within the confined and challenging environments of crewed space capsules.

2. Functionality and Autonomy

At the core of ATRi's capabilities lies its autonomy. The droid autonomously navigates the interior of crewed space capsules, employing advanced voice and visual recognition algorithms. This sophisticated technology

*Founder & CEO, Grahaa Space (Akshath Aerospace Private Limited), Bangalore, Karnataka, India; Member of Task Force on Technology, Innovation, R&D. **Corresponding Author: ramesh@grahaa.com**

†Mission Director, Grahaa Space (Akshath Aerospace Private Limited), Bangalore, Karnataka, India. **Contact: md@grahaa.com**

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allows ATRi to seamlessly interpret and execute commands, record essential readings, and actively participate in various experiments, providing crucial support to the space crew.

3. Personalized Interaction

One distinguishing feature of ATRi is its adaptability through machine learning algorithms. These algorithms can be specifically tailored to the individual astronaut(s) sharing space with the droid. This personalized approach not only enhances the efficiency of assistance but also fosters a unique companionship between the astronauts and their robotic counterpart. This aspect adds a psychological dimension to the droid's role, creating a sense of familiarity and reliability among the crew members.

4. Technical Specification

ATRi is powered by a sentient program that incorporates an array of advanced features, including visual recognition with facial recognition capabilities, video recording, natural language processing, voice recognition, and speech synthesis. The integration of six microphones and two cameras enables ATRi to capture and interpret audio and visual cues with remarkable precision. While the current iteration of ATRi is designed to remain stationary within the space capsule, the roadmap for future versions envisions enhanced mobility. In the microgravity environment of a crewed space capsule, ATRi is expected to navigate freely using a sophisticated motion control system. This system allows the droid to align itself in any direction, rotate, and move effortlessly throughout the space module, further expanding its utility and versatility.

5. Documentation and Communication

Beyond its role in assisting the crew, ATRi serves as a meticulous documentarian of activities inside the capsule. Equipped with the capability to capture photos and videos, the droid not only records but also processes and categorizes this visual data automatically. Periodic communication with ground control ensures that the documented information is relayed in real-time, providing an additional layer of connectivity between the space mission and mission control.

6. Conclusion

In conclusion, ATRi emerges as a multifaceted asset to space exploration, combining advanced artificial intelligence, adaptability through machine learning, and a range of technical capabilities. It's potential to revolutionize crewed space missions by offering personalized support, fostering companionship, and enhancing the efficiency of experiments positions ATRi at the forefront of innovative technological contributions to space exploration. As we look towards the future, the evolution of ATRi promises even greater mobility and functionality, paving the way for new horizons in autonomous robotic assistance in the cosmos.

7. Biography

Ramesh Kumar V: Ramesh Kumar V, an accomplished entrepreneur, serves as the Founder and CEO of Grahaa Space. With a background in electrical engineering and an MBA from Manipal University, he brings a wealth of expertise to his role. Over the course of his illustrious 16-year career, Ramesh has successfully established three startups, two in India and one in Singapore, amassing a combined revenue exceeding half a million dollars. Furthermore, his contributions extend beyond entrepreneurship, as evidenced by his co-authorship of five technical books utilized in distance learning programs at numerous universities.

Loganathan Muthusamy: Dr. Loganathan Muthusamy, an ex-ISRO professional, boasts a rich career spanning all phases of space missions, from ground segment applications to spacecraft mission planning, launch pad systems, space control stations, and payload processing centers. Currently serving as the Director of SRMSat at SRM University and the Director of Space Program at NMIT, Dr. Muthusamy is a seasoned leader contributing significantly to satellite technology and space exploration. His background in the Indian Space Research Organisation (ISRO) adds a valuable dimension to his expertise in advancing space-related initiatives.
