

Advancements And Challenges in Cosmic Exploration

Mingyuan Sun *

Weihai No.1 high school, Weihai, Shandong, 371002, China

* Corresponding Author Email: rise@dishang.com

Abstract. This passage provides readers with a comprehensive overview of cosmic exploration, delving into various aspects such as methodologies, technological tools, historical achievements, and future challenges. It meticulously traces the evolution of exploration techniques over time and elaborates on the sophisticated machinery utilized in cosmic research endeavors. By examining humanity's past achievements, the passage offers valuable insights into the backdrop against which contemporary cosmic exploration operates. Moreover, it sheds light on the potential hurdles and current technological constraints that scientists and researchers face in their quest to unravel the mysteries of the cosmos. Drawing from a diverse array of reputable sources, including the contributions of renowned scientists and researchers, the passage offers a well-rounded understanding of the multifaceted nature of cosmic exploration. Through its discussion of practical drawbacks in modern space exploration and theoretical solutions, it underscores the dynamic interplay between technological advancements and the pursuit of knowledge about the universe. Finally, the passage emphasizes the ongoing advancements in cosmic exploration and the critical importance of overcoming technological limitations to drive future exploration endeavors forward.

Keywords: Cosmic exploration; Space technology; Future challenges.

1. Introduction

From the Apollo 11 landing to the success of the Mars exploration mission to the planned long-term habitation of the Moon, Mars, and other planets, humans continue to march into the unknown depths of the universe.

Space exploration is also important in several ways: it drives scientific and technological innovation, provides insights into changes in the Earth's climate and environment, and opens up new possibilities for the future of human civilization, while also fostering international cooperation and understanding.

In addition, space exploration has provided new perspectives and solutions to address major challenges on Earth, such as resource management, weather prediction, and communications technology. It has also stimulated human curiosity and the spirit of exploration, promoting the development of science and the advancement of human civilization. Space exploration also contributes to the discovery and understanding of other planets and galaxies in the universe, thus expanding humans' knowledge of the universe. By studying matter and phenomena in space, humans can gain a deeper understanding of the origin, evolution, and future destiny of the universe, which is of great significance to the long-term development of humankind.

The origins of space exploration can be traced back to the early 20th century when scientists began to study astrophysics and aerospace engineering. However, the beginnings of modern space exploration can be traced back to the mid-20th century, particularly during the latter part of World War II and the Cold War. During this period, the United States and the Soviet Union competed for space exploration, and in 1957 the Soviet Union launched the world's first artificial satellite, Sputnik 1 [1].

Then, the United States announced in 1961 that it would put a man on the moon within this decade, and successfully achieved this goal in 1969, when Neil Armstrong, an astronaut on the Apollo 11 mission, became the first human being to land on the surface of the moon. Since then, countries have continued to develop and improve space technology, carrying out various activities such as deep space exploration, the construction of the International Space Station, and the exploration of other planets and celestial bodies.

With the continuous development of space technology, mankind is now able to establish a base on the moon. This is the result of the joint efforts of National Aeronautics and Space Administration (NASA) and the Russian Space Agency. Russia successfully sent a cargo spacecraft to the moon on April 24, 2014, and two astronauts on July 11 of the same year. The United States launched a manned spacecraft on July 24, 2016, sending three astronauts into lunar orbit, the first time three people have been put into space at the same time in preparation for the next step in the program [2]. The manned moon landing was a great achievement for mankind. Advances in space exploration technology are also important to humanity. Without this technology, mankind may not have been able to establish a base on the Moon, or Earth for that matter.

Nowadays, with the development of human science and technology, human beings are exploring space more and more, and technology is becoming more and more advanced. However, there are also many shortcomings in human space exploration. On the one hand, the fund of space exploration. On the other hand, the lack of long-term planning and forecasting in space exploration is also a prominent problem that humans need to consider.

Because world population growth rates are greater than zero, the number of humans will increase rapidly in the foreseeable future. Mankind has gradually enhanced its awareness of the population problem and is committed to solving this problem. New inspirations are given continually. This paper will discuss the exploration of the cosmos. This article explores the history of space exploration, current progress, and the challenges humans may face in the future. The goal of this study is to gain a better knowledge of unexplored spaces. Since the moment man first sent things to space, space exploration has been an eternal dream in the hearts of all mankind.

2. Types and Principles of Space Exploration Technologies and Observations

There are many different ways humans use to explore space. Different ways can represent different information in human vision. The more ways humans use, the deeper understanding humans will have of this world.

2.1. High-Resolution Optical Observations

High-resolution optical observation is a relatively special type of optical observation. It utilizes higher-precision instruments to conduct high-resolution imaging of targets to meet the requirements of various special application fields for obtaining information on target characteristics. In the fields of aviation, aerospace, mapping, and military, high-resolution optical observation is indispensable.

It can help mankind obtain important characteristics of the target, such as shape, size, structure, and surface conditions. For example, when a large airliner takes off from the runway, there is a big difference between its tail and front. This difference can usually be obtained with high-resolution imaging instruments.

If it is in space, the difference in brightness between the target and the background is so small that it can be viewed as a monochromatic point source with a size of 10-20 pixels. By analyzing the reflectance and spectral characteristics of different targets, it can be distinguished from the background. For example, if a particular target has distinct optical reflectance characteristics and the background is dark, people can categorize the target based on its reflectance and spectral characteristics.

The instruments and imaging modalities used for high-resolution optical observations are varied. In imaging, focal plane array or non-focal plane array imaging, near-infrared optical imaging, multi-spectral imaging, three-dimensional stereo imaging, spectral imaging and other technologies can be used; in obtaining target characteristic information, visible - near-infrared - mid-infrared - ultraviolet - X-ray and other wavelengths of the spectrum to obtain the target characteristics of the information; in the acquisition of the target size, based on the close-up photogrammetry techniques (such as digital In terms of acquiring target size, high-resolution optical observation of small targets based on near-field photogrammetry (such as digital photogrammetry) can be used; in terms of acquiring target

three-dimensional shape, three-dimensional stereo imaging technology based on computer-aided design can be used; in terms of acquiring target spectral information, spectral detection technology based on spectral analysis and spectral reconstruction can be used. In terms of acquiring target spectral information, spectral detection technology based on spectral analysis and spectral reconstruction can be adopted [3].

2.2. Accomplishments of Human Exploration

Since mankind entered the space age, the cause of human space exploration has made unprecedented achievements. Although human space exploration is still in its infancy, it has already made great achievements.

Since mankind first landed on Mars, there have been more than 600 successful Mars exploration missions. This means that people have successfully landed on the surface of Mars and conducted a series of scientific experiments on it. These scientific experiments have confirmed the possible existence of life on Mars and whether the same organisms exist on Earth.

On the Moon, humans have completed more than 40 lunar exploration missions [4]. One of these was in 2011 when humans launched a probe into the back of the Moon. This mission confirmed that there is a large amount of water and ice on the Moon and that there are many craters on the surface of the Moon, which suggests that there may be liquid water in the interior of the Moon.

In addition, many exploration missions have been carried out on other celestial bodies in the solar system. These exploration missions include probes and rovers to extrasolar planets as well as satellite launches, landings, and exploration.

Currently, humans have launched more than 300 spacecraft, most of which are related to space exploration. For example, humans have launched 39 Mars probes and 43 Jupiter probes; they have also launched several interstellar probes and space telescopes; and they have sent probes and spacecraft to other planets [5].

Over the past few decades, humans have explored about 500 planets associated with the solar system. These include planets such as Venus, Mercury, Mars, Jupiter, and Saturn; the Moon, the asteroid belt, comets, and outer solar system bodies; and several rocky planets and moons where life may exist.

Although mankind does not yet have a complete understanding of all the planets and their moons in the solar system, it has acquired a lot of knowledge about the solar system.

3. Challenges To Space Exploration Technologies and Observation Technologies

At present, space science and technology have entered a new stage of synergistic development in multiple fields such as deep space exploration and space environment monitoring. As the main research direction of space-based space technology, space exploration technology and observation technology are also facing a series of new challenges.

3.1. Changes in the Earth's environment

The space environment is an important factor affecting the survival and development of mankind, and in recent years, with the intensification of multiple pressures such as global climate change and resource and environmental problems, global air and space security has been subjected to great challenges. At present, humankind has entered the era of deep space exploration and a new phase of international cooperation in space science and technology.

For example, the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) are cooperating in the implementation of the "Artemis" program, which is scheduled to launch the first Earth-orbiting satellite in 2024 and the first Earth-orbiting satellite in 2028. The National Aeronautics and Space Administration (NASA) has launched a 10-year, \$17 billion International Space Station program to be completed by 2026 [6].

In addition, the Japan Aerospace Exploration Agency (JAXA) is implementing a mission called "Asteroid Redirection Test" to study the potential threat that asteroids may pose. Japan also plans to launch a small satellite to explore the surface of the Moon. The European Space Agency (ESA) is carrying out a "second chance" program to Mars, in cooperation with Russia, the United Kingdom, the United States, and other countries.

3.2. Space Security Threats

Space security is another serious challenge to space exploration. In recent years, the United States, Russia, and other countries have had several incidents of space arms race, and military confrontation in space has entered a new phase. In the upcoming space arms control negotiations between the United States and Russia, the two sides agreed to deploy military orbiting satellites to each other's territory and to monitor each other for military purposes.

4. Future Development and Application Value

As countries attach importance to and increase investment in space exploration, space exploration will have more applications in the future. For example, during the epidemic, a team of Chinese scientists used low-orbit satellites and other platforms to track and study the new coronavirus; China's Beidou-3 satellite system has completed its global networking; and the United States is also stepping up the use of its network of communications satellites to monitor the new coronavirus.

In addition to the exploration of human beings themselves, space exploration will also play an important role in social governance, disaster early warning, and other areas. For example, scientists in China have proposed a "star chain" program, aimed at raising the number of satellites from the current 50,000 to more than 300,000, which can significantly improve the monitoring and early warning capabilities; U.S. scientists are also researching the existing satellites for upgrading and transforming the formation of a similar to the "Star Chain". The United States scientists are also studying the upgrading of existing satellites to form a network similar to the "Star Chain", which is used to disseminate meteorological warning information [7].

5. Conclusion

The main body of this paper is about the exploration of the cosmos, it concludes with the ways to explore and the machines that humans use to detect, accomplishments of human exploration, the challenges that humans are facing, and the future development of space development.

The paper shows the glory of cosmic exploration for mankind and the reason humans need to keep their efforts to explore space. As time passes, when the population of mankind increases to the limit that the Earth can support, the importance of space exploration will be further strengthened.

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