

From the Big Dipper to the Big Dipper Navigation

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Abstract: As a student of surveying and mapping, I was also very interested in this seminar and actively enrolled in Academician Yang's lecture. After the lecture, I learned a lot of things I had never heard of before, and had a deeper understanding of the historical process and future development of the surveying and mapping industry. Similarly, I analyzed the differences between the current Beidou navigation system and other navigation systems from the international level. I have a deeper understanding of professional knowledge. Next, I will conclude this paper by watching this lecture and generating my own new knowledge and ideas.

Keywords: Scientist Spirit; Navigation System; Positioning Timing.

1. The Scientist Spirit

Scientists, I believe in everyone's heart is a very sacred profession, because their existence, so that people's lives become extremely rich, it is because of their existence, so many people have a new yearning. They are the boosters of mankind's gradual ascension to glory, and we enjoy the fruits they bring, and how can we ever forget their contributions. This is an unknown force, they are always at the forefront of trying new things, after hundreds of times of exploration and experiments, they can come to some amazing conclusions. Of course, whether we start from individuals, or from nations, or even from mankind as a whole, each of us should generate positive momentum, and each of us should also learn from our predecessors, with a certain scientific spirit, for the benefit of all sides. Similarly, to think in the opposite dimension, if each of us can not surpass the predecessors, then we can say that the human race is not progressing, if each of us only depend on each other's only technology, then we can talk about the deeper level. From the perspective of contemporary college students, we can't guarantee that we are better than our teachers in all aspects, but we should have confidence, maybe we are better than our teachers in some aspects, so each of us should have a positive attitude, dare to question (not without evidence), dare to innovate, and fully absorb knowledge in college life. Make yourself more fulfilling, for their own road to do a solid foundation!

2. Positioning and Navigation Must be the Demand

Positioning and navigation must be required -----PNT is the information cornerstone of national security

PNT system is a space-time system composed of Positioning, Navigation and Timing system, which is the key technology for us to accurately describe space and time in the process of information exchange. We need to know one of its weaknesses: weak signal, poor penetration, easy to be interfered, so that we will have a new breakthrough direction for technology in this area.[1]

First of all, it has a good application in high-speed rail, as former US security aide Rice said: the United States only needs two hours to paralyze a big city like Wuhan. So why do you say that? In big cities, traffic lines are often extremely

dense, and People's Daily travel requires transportation hubs to maintain operation. The existence of navigation systems allows these vehicles to operate normally according to certain lines. However, if there is no positioning and no navigation, where is the destination and who can tell the train? As a result, the transportation hub of the whole city is paralyzed. Then the city will be in dire straits. In addition, it will also have an impact on the country's finance. In the process of listening to the lecture, Academician Yang passed a very simple example: If a country borrows money from another country, if the timing system adopted by the two countries is completely different, then when we calculate the interest, what should we do? This is mixed with the timing system in PNT, which affects the financial problems of the country. Similarly, this example also gives me a deeper and broader understanding of PNT. In terms of power and aviation, take the recently launched Shenzhou 14 manned spacecraft as an example, we all know that in outer space, there are many uncertain factors to happen, so what we need to do is to be able to accurately locate the real-time position of the spacecraft, and if necessary, we can carry out some operations on the ground. Accurate positioning and navigation can make the spacecraft enter the predetermined orbit well and provide good conditions for the subsequent operation in real time. When it comes to outer space, I think there's a lot of space involved in mapping now, like how the "Zhurun" landed safely on a relatively flat place, and in that respect a branch of mapping geodesy which uses a series of methods such as gravity fields to return the correct information to the machine, so that the machine can land smoothly. Finally, it needs accurate time and location information for communication networks and so on.[2]

3. Positioning and Navigation Timing Requirements -- Large National Engineering Requirements

All large-scale engineering construction requires a unified spatial benchmark and positioning. The national boundary division needs the coordinate system of empty one, and the large-scale water conservancy project needs the unified spatial datum, especially the unified elevation datum. Large-scale railway and highway construction projects all need accurate spatial datum, and the construction of the Belt and Road project (railway, highway, air route, sea route,

information highway with the same space-time datum) all need a unified space-time datum.

Positioning and navigation must be the demand - the most commonly used navigation demand (vehicle navigation)

People's Daily travel and the transportation of goods need to monitor the time and location. For example, in the recent Russian-Ukrainian war, I believe that in this special period, the management of transportation plating needs the spatio-temporal information of various carriers. In addition, space-time information is needed for quick handling of important traffic carrier accidents. Intelligent driving must be based on precise location and timing. The core of intelligent transportation is PNT perception and environment awareness, which should be an important part of the research in the field of unmanned driving. And modern logistics must also give high-precision position tracking and time synchronization and so on. All in all, the construction of an independent and controllable historical control infrastructure and satellite navigation system is an inevitable requirement for a major political, economic and national defense power!

4. Positioning and Navigation Development

Since ancient times, the Chinese people for the orientation of the study has never been interrupted, the legend of the Yellow Emperor and Yan Emperor allied forces and Chiyou decisive battle, lost in the fog, nine days Xuan female dream, remote points to the Big Didistar, the Yellow Emperor has a sense of the minister to make the pointing car. The invention of the compass, compass and Sinan in ancient China has left a strong mark on the history of mankind. In the Qin and Han Dynasties: the maritime exchanges between Korea and Japan; Sui, Tang and Five Dynasties: The trade between Arab countries need accurate positioning.

5. Astronomical Positioning Timing

In the Yuan Dynasty, 27 astronomical observation stations were built in Shangdu and other places. The Shoushi Calendar, edited by Guo Shoujing, divides the year into 365.2425 days; It was promulgated in the seventeenth year of the Yuan Dynasty (1280) and lasted for more than 400 years; Ancient people used wisdom to make sundials to observe the length and latitude of the sun's shadow; To measure apparent solar time by observing the direction of the sun's shadow; Now, we can use the pulsar, each pulsar has a unique tangential period to achieve positioning navigation timing, pulsar navigation is not affected by weather, using the pulsar to receive signals for navigation and timing;

6. Matching Navigation

Geomagnetic field, gravity field matching navigation -- underwater matching navigation, here I would like to mention some aspects of ocean mapping. It is reported that on October 2, 2021, a United States "Seawolf-class" attack nuclear submarine "Connecticut" collided with an unidentified object in the South China Sea, causing many injuries. The main reason for this accident is worth pondering, why such a submarine can hit an unknown object without any reason? I think there are still some problems with the details of seafloor navigation, sonar does not work very well in some cases, so it seems that mapping on the seafloor is quite useful! In addition, I believe that most people are not unfamiliar with

positioning, and most people are familiar with the prevention and control missile system on the mainland, but if one day the positioning missile in the ocean accurately hit a certain target, causing shocking results, how will we look at the relationship between mapping and the ocean? In short, I think the ocean is a good platform, but this platform needs a "guard" to check it regularly, so that it can better benefit the people, so it seems that "surveying and mapping" is undoubtedly the primary choice of the guard.

6.1. The Development of the Beidou Navigation Satellite System -- Basic Composition

Space constellation Stationary Orbiting Satellite (GEO) Inclined Synchronous Satellite (IGSO) China Orbiting Satellite (MEO);

Ground control partial master station (MCS) Injection station (MCS) Global monitoring station (MS);

User equipment Beidou user terminal multi-GNSS compatible terminal;

6.2. Development of the Beidou Navigation Satellite System

Unique BDS technology: inter-satellite link - autonomous navigation; Embedded star based augmentation (SBAS); Area short message; Global short message; International search and rescue with reverse link and regional precision single point positioning; Although our Beidou is not as widely used as GPS, some areas of Beidou have indeed surpassed GPS and have many innovations of their own, reflecting the unique strength of Beidou in some areas, so we should have enough confidence in our Beidou system! [3]

6.3. Application of Beidou Satellite Navigation: Surveying and Mapping

The map we see now and the shape of the earth we recognize are actually integrated through certain technical repair. Our earth is not a regular ellipse, we can boil it down to the pear shape. How to realize the irregular surface of the earth, and then draw the ellipsoid, and then expand it into a plane to a planar two-dimensional basis? The resulting map is presented to us. Therefore, we can say that Beidou navigation can be used as the first process of mapping. In addition, the application of Beidou satellite navigation is also reflected in carrier navigation, fine agriculture, oceans, civil aviation, disaster prevention and reduction, disaster relief, safety and other aspects.

From the compass, compass, observatory to today's Beidou, they all reflect the wisdom of ancient Chinese people, showing the contribution of ancient Chinese people to the positioning, navigation and timing of the world. Let us pay attention to "Beidou", apply "Beidou", study "Beidou", and serve "Beidou", even if there are sanctions, feudalism, restrictions by foreign forces. Nor can it hinder the development of China's navigation and positioning system! We should also stand on the shoulders of our ancestors, look higher, take them as an example, and constantly improve ourselves, and we should also strive to devote ourselves to our professional learning, apply our knowledge into practice, and contribute our own strength to our country!

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