Design of general aviation airspace planning and management system based on Google Earth

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Abstract: By studying the classification and use characteristics of navigable airspace, studying the methods and standards of all kinds of navigable airspace planning, determining all kinds of key parameters of navigable airspace, constructing the navigable airspace planning and management system based on Ge, providing corresponding technical reference and effective management means for the planning of navigable airspace, and solving the problems of airspace planning, efficient use of airspace and low altitude supervision Question.

1. Introduction  
With the rapid development of China's civil aviation industry, the number of aircraft is increasing, and the scale of airport construction is growing, and the speed of new airport construction is accelerating. At present, the site selection of airport, the installation of navigation station, and the evaluation of obstacles are still in the field test, In the stage of "drawing on paper", even if the electronic map is used to express the airport, navigation station and obstacles, it is limited to two-dimensional presentation, which is not only not intuitive, but also requires a lot of work[1]. Flight program design and airport managers usually use manual working diagram method to analyze and calculate, and build sand table model to show[2]. Due to the complexity of calculation, large measurement error, it is easy to make mistakes, and consumes a lot of human and material resources.

2. General idea  
Building the general aviation airspace planning and management system based on Ge can not only save the cost of building sand table model, but also make it convenient for users to build airport, runway, set positioning point, route, obstacle, airspace, etc. on their own[3]. It can also dynamically simulate and display the movement track of aircraft target, overlook the airport from multiple angles, roam dynamically according to flight procedures, and observe the shielding effect of navigation station, etc[4][5]. These technologies can not be achieved by traditional sand table. They not only provide simulation tools for civil aviation flight program design department to design and evaluate flight programs, but also improve the important teaching means for air traffic control department to carry out relevant flight program technology training and virtual reality experience[6].
3. Main research contents

3.1 Realize the classification of all kinds of navigable flight airspace
At present, China's navigable low altitude airspace is classified into controlled airspace, surveillance airspace, reporting airspace and visual flight route. Instrument flight and visual flight are allowed in the control airspace, and visual flight is allowed in the monitoring and reporting airspace and visual flight route. By studying the characteristics of all kinds of flight in general aviation, the scope of use and capability requirements are determined. For example, in specific flights such as flight transition training, oil pipeline patrol, highway rescue, urban patrol, the feasibility of airspace division, requirements for airborne equipment, the use of navigation equipment, and the determination of possible navigation specifications.

3.2 Determine the characteristics of airspace use for all kinds of general aviation and determine the width of the reserve
According to the use characteristics of all kinds of flight airspace at present, the method of airspace planning under visual and instrument conditions is defined, the different airspace types of all kinds of navigable flights and the operation forms of existing general aviation are determined, the application degree, method and method of flight operation are determined, so as to make them conform to the principles of safety, effectiveness and economy, and finally the required navigation equipment and airspace protection are determined Area width.

3.3 Research on methods and standards for airspace planning of all kinds of navigable flights
According to different types of navigable flight, establish the basic data of navigable airport area, flight area and operation area, program airspace standard, width in program design, reduction method, turning protection area and other key technologies, and formulate corresponding airspace planning methods and standards to meet the approach and departure procedures, approach procedures, and 3 turns of visual and instrument flight of different navigable flight operations Field cruise procedure, hover waiting procedure and other requirements for all kinds of general aviation flight.

4. System implementation

4.1 Basic data processing
1. Airports and airspace
   In the airport drop-down menu, select an airport, such as zytl. In the "airspace information maintenance" area, select the "add" button to create a new airspace, as shown below:

   ![Figure 1. Airports and airspace](image.png)
2. Airspace management

Airspace is connected by multiple turning points. After adding routes, it is necessary to determine the turning points that make up the airspace. Select the "approach control area" just added, and operate the turning point in the "airspace data maintenance" area on the right.

![Figure 2. Airspace management](image)

3. Airspace type information

Load and manage the airspace information in the airspace information management module

![Figure 3. Airspace type information](image)

4.2 System realization effect

Through the loading and processing of basic information, the final effect is as follows:
5. Conclusion

Through this system, we can provide the corresponding technical reference and effective management means for the planning of navigable airspace, improve the efficiency and rationality of the planning of navigable airspace, fully tap the airspace resources of our country, expand the airspace of navigable flight, effectively solve the difficulties of the planning of navigable airspace, the efficient use of airspace, flight safety and low altitude supervision, and break through the technology of the development of navigable low altitude airspace Bottleneck, to promote the rapid development of general aviation services.
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Reference
[1] Ren song. Capacity evaluation of planning airspace sector based on mathematical methods [J]. Science and technology innovation and application, 2020 (16): 19-21 + 24
[2] Zhang Jianxiang, Gan Xusheng, sun Jingjuan, Yang Guozhou. Research on numerical simulation algorithm of training airspace dynamic planning [J]. Progress of aviation engineering, 2020,11 (02): 199-206
[3] Ma Jinhu. Airspace planning in air traffic management [J]. Science and technology horizon, 2020 (08): 214-216
[4] Tian Yong, sun Mengyuan, Wan Lili. Evaluation index system of airspace planning and operation in terminal area [J]. System engineering and electronic technology, 2020,42 (04): 851-862
[5] Wang Jianzhong, Zhang Baocheng. Design of route intersection angle based on double optimization model [J]. Science and technology and engineering, 2019,19 (36): 394-398
[6] Javier A Pérez-Castón,Fernando G Comendador,Álvaro Rodriguez-Sanz,Rosa M Arnaldo Valdés,Gonzalo Agueda. RPAS integration in non-segregated airspace: Safety metrics for tactical planning[J]. SAGE Publications,2019,233(16).