Huerta, Schade, Granell (Eds): Connecting a Digital Europe through Location and Place. Proceedings of the AGILE'2014 International Conference on Geographic Information Science, Castellón, June, 3-6, 2014. ISBN: 978-90-816960-4-3

Spatiotemporal Data Complexity in electronic Airport Layout Plan and its visualization

Shyam Parhi
Airport Engineering Division
AAS-100
Federal Aviation Administration
Washington DC 20591
USA
Email: shyam.parhi@faa.gov

Abstract

Airports GIS is a web portal consisting of a few application modules. It allows authorized users of FAA (Federal Aviation Administration) to submit changes to airport data. One of these applications is electronic Airport Layout Plan (eALP). The main purpose of building this application is to replace the paper copy version of ALP by digital copy. The visualization of the digital copy on the computer screen poses lot of challenges. Spatiotemporal nature of data brings added complexity.

Keywords: Airport, GIS, spatiotemporal, visualization

1 Introduction

Airports GIS can be accessed from internet at airports-gis.faa.gov by authorized users. It consists of several applications and the number of applications is growing every year. One important application discussed here is electronic Airport Layout Plan (eALP). The whole idea of creating such application is to move from paper copy to digital display which brings about lots of challenges that are discussed here. The data is geospatial and temporal and the data needs to be visualized as best as possible and as accurately as possible.

2 electronic Airport Layout Plan

The eALP helps support Next Generation (NextGen) of air transportation which is an FAA wide initiative. Hence it is not surprized that the whole effort needs enterprise level workflow and its implementation at enterprise level as well. Also to safeguard data and retain its integrity, one has to keep in mind some sort of digital signature as we are moving away from paper version.

2.1 Some Basics about eALP

There are approximately over 13,ooo airports and 5800 heliports in USA. Some of their classifications are large hub, small hub, and towered airports. Some are NPIAS (National Plan of Integrated Airport Systems) airports funded by FAA, and others are non NPIAS. NPIAS airports get grants from FAA for different activities on the airport. One of the requirements for these airports to get grants is to prepare and update their Airport Layout plan. However, airport data is changing from time to time. For example, a new runway or taxiway construction requires an update on ALP. It is very difficult to maintain paper copies of ALPs. Since these copies are housed at multiple locations, the data for a specific feature may vary in different locations. This spatiotemporal nature of data can be easily handled through eALP and versioning of eALPs. The data has to be visualized using certain software. Typically we use ESRI product to visualize such data. Some data is needed to be displayed with great accuracy up to under a foot. This requires good visualization techniques and tools.

.

2.2 Dataflow for an Enterprise Model

The dataflow for any enterprise model is crucial. It needs completely different architecture to build an enterprise level application. The simple reason behind such dataflow is that the activities related to specific data are processed at district, region, and headquarters level. Sometimes it has to be coordinated through different lines of business. At times data has to be updated dynamically through web services. All these have to be considered for a good design of enterprise system. Some data are interrelated due to their inherent nature. This needs special attention.

2.3 How data is processed

The Airport data passes through various steps before it is gathered for building eALP. First, the data is entered in the Airports GIS by Airports using a separate Survey module, also available at Airports GIS. The surveyor for a particular Airport uploads data, say for a construction project, to the Airports GIS portal along with some Statement of Work (SOW). This SOW is verified by Airport District Office. The data provider also submits geo-referenced imagery which could be aerial, satellite, or LIDAR along with a plan for these imageries. National Geodetic Survey validates and verifies the

safety critical data. Once the data is verified, it is stored at NASR (National Airspace System Resources) database which is used by all Lines of Business. This verified data is assembled for the purpose of initiating eALP process. This process has many mandatory and a few voluntary steps.

2.4 How data is reviewed

This process is very important. The data is reviewed first at Airport level. Then the system sends one automatic email to Airport District Office to review it. The process is repeated for respective Regions and headquarter. There are some security measures in place so that the data cannot be altered by an unauthorized person. The industry standard convention of using digital signature protects the data. Sometimes the coordination process needs significant discussion with other Lines of Business. This is facilitated by application. There is also some kind of comment board to gather comments and replies at the same time. The coordination process plays significant role as there may arise complete disagreement on some specific feature of eALP among two Lines of Business. Resolving them through traditional methods does not work. The application provides necessary Graphical User Interface to help coordinate the process easily. The delegation process is also implemented. In a vast organization like FAA, one person cannot be designated permanently to perform some task. The delegation process plays a great role in accelerating some tasks and meeting deadlines.

2.5 Technical Challenges

We have lot of technical challenges for implementation of eALP. It is specially complicated when different lines of business own different environments of the same application. For example, one Line of Business develops the application whereas another Line of Business deploys it so that it is accessible to authorized users via internet. Temporality is a big piece in the development of eALP. Data is changing continuously on the airports. How can paper copies keep track of all these changes? When one talks about eALP, one has to realize that temporary storage of data at enterprise level, applied programmatically for all airports, and deletion of some data when they are not used or will not be used in future, pose significant challenge in building eALP. A lot of architectural and design changes are required. Also, we have been using ESRI viewer to visualize the data on the airport. Each software has its own limitation. The integration of any visualization tool with the application brings more challenges.

3. Conclusion

The eALP was recently deployed into production system. However, it is still in the pilot phase. We learned a lot from our pilot phase program. We now know the expectations of airports is that the eALP generated as a pdf file from a process in Airports GIS should look like almost legacy ALP, even if the display on the computer screen can be made better than the look and feel of legacy ALP. That needs lot of work which we plan to complete this year. We will continue to improve the spatiotemporal portion of eALP in next few months. We are also improving ESRI's ArcGIS viewer capability by custom modifying some of its portions. Three dimensional capability of viewing a taxiway or runway or a building is still not available in the existing eALP.

.