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Geographic Information System Data Analysis

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August 7, 1995

ABSTRACT

Data was collected in order to further NASA Langley Research Center's Geographic Information System(GIS). Information on LaRC's communication, electrical, and facility configurations was collected. Existing data was corrected through verification, resulting in more accurate databases. In addition, Global Positioning System(GPS) points were used in order to accurately impose buildings on digitized images. Overall, this project will help the Imaging and CADD Technology Team(ICTT) prove GIS to be a valuable resource for LaRC.

INTRODUCTION

Geographic Information System(GIS) is an integrated system of computer hardware, software, and trained personnel linking topographic, demographic, utility, facility, image, and other resource data that is geographically referenced. In other words, the data is being related to images, maps, or easily understood graphics. GIS can support decision making in areas such as planning design, maintenance, and repair. It can allow for increased efficiency and accuracy and also provide improved decision making tools. The import and export of database, computer aided design, spreadsheet, word processing applications, and electronic images make GIS a valuable resource for organizing and displaying data.

In order to facilitate the implementation of NASA Langley Research Center's GIS, communication, electrical, and facility configuration information was collected.

PROCEDURE

The initial project for the Imaging and CADD Technology Team's (ICTT) summer students was the exterior verification of NASA Langley facilities. Original building brochure drawings, obtained from AutoCAD files and aerial photography, were used in recording outside measurements. Each building had specific measurements which needed to be taken. These were labeled on a hard copy drawing and given to teams made up of three people. A World Wide Web building locator, on ICTT's homepage, was needed to locate LaRC facilities. Far too often, buildings could not be found on a conventional map and the locator proved to be a useful and time efficient source. Once actual verification began, digital measuring devices were used. However, factors, such as low batteries and noise, made these tools inaccurate and unpredictable; therefore measuring tapes were ultimately used. The results were then recorded and were later transferred to the drawings and compared to the original brochures for any discrepancies. Once the nearly two hundred facilities associated with the NASA Langley Research Center were measured, the next phase of the summer project began. This involved the use of the Global Positioning System (GPS). The GPS, developed by the Department of Defense, is a system of 24 functional satellites operating in six orbital planes which can give exact positioning of any object using X-Y coordinates and GPS points through a signal from a transmitter. Teams used fluorescent paint to mark GPS points from where the signal would be transmitted. By tracking the signal transmitted from the point, GPS uses time and known variables in order to determine the coordinates of each points placed next to the building. The

Standard Positioning Service (SPS), a subsidiary of GPS, allows for horizontal accuracy of 100 meters, vertical accuracy of 140 meters, and timing accuracy of 340 nanoseconds.

Another vital part of the project dealt with interior verification of the Langley facilities. This involved going to each room and noting whether a room was a conference room or office, the type of flooring in the room, phone and video jack locations, and the configuration of each room. In a few buildings, room configurations were wrong and changes on the floorplans were made. A major part of the interior verification was the locating of the IDF/BDF systems. These systems are the power source of each facility. IDF (Intermediate Distribution Frames) deals with the phone jacks and the associated currents. Similarly, BDF's (Building Distribution Frames) involve the circuits and electrical aspects of a facility.

Using original floorplans information was transferred onto "D" size floorplans to indicate where the jacks should be located (Figure A). This verification process was not difficult to complete. Problems arose only when rooms had been reconfigured or if furniture, such as book shelves, file cabinets and desks covered the jacks.

Following the completion of both interior and exterior verification, video footage was taken from each facility. Conference rooms, IDF/BDF systems and the exterior characteristics of each facility were recorded. This would later be implemented into the GIS. The possible additional use of this footage would be a multimedia tour of NASA Langley Research Center facilities.

Finally, having gathered all the information, the process of data entry began. Several students trained in the use of Microsoft Access entered the information into a custom form in the database (Figure B). The buildings and room numbers were entered along with all information gathered for each room.

RESULTS

Many inconsistencies were found while trying to locate buildings using the current NASA Langley facility maps. Some buildings indicated on the map were no longer there due to removal or relocation. In other cases, new buildings had not yet been added to the facility map.

Once the buildings were located and measured it was found that original building measurements were not consistent with the actual building measurements. Many buildings dimensions varied from a few inches to a few feet. As mentioned before, due to construction, remodeling or relocation of personnel, results varied when gathering IDF/BDF, phone and network jack information. While the IDF/BDF 's for the most part were consistent with floor plans, many of the phone jacks were not and were reconfigured on drawings giving an accurate account of where each jack was located.

There were also many structural changes in buildings. New rooms were added and walls had been rearranged. These changes were noted on the plans. After all these changes were made, the above information was entered into a database making this information accurate and organized to make it possible to obtain in time of need. The final result is a new updated database and drawing with all vital information needed to support the implementation of the GIS.

CONCLUSION

The gathering of information and use of the GPS unit on facilities at LaRC was used by the Imaging and CADD Technology Team (ICTT) in an effort to correct the electronic Master Plan, Building Brochure, and associated databases. After exterior verifications, interior details, and master plans have been digitized they will be translated to the GIS, which allows the user to obtain information through a visual image of LaRC and its facilities. ICTT also uses GIS for space utilization as well as emergency response. The information gathered will eventually make the GIS an even more efficient and accurate tool to be used at Langley.

Apart from the research oriented skills acquired this summer, the Imaging and CADD Technology Team's summer student learned three valuable lessons in the form of teamwork, communication, and organization. From the onset of the data collection, teamwork was implemented into the daily schedule. Teams measured buildings, completed interior verification, and video taped the exterior of buildings.

Communication was a vital part of each team's success. Ideas and methods had to be properly conveyed between team members and problem resolution was achievable only through appropriate communication. Finally, organization was a high priority. It was imperative to maintain the drawings, database, information, and floorplans in an orderly fashion. Each of these aforementioned qualities has helped develop the overall, individual character of each LARSS summer student.

BI209T-8 IMAGING AND CADD TECHNOLOGY TEAM (FIGURE A)

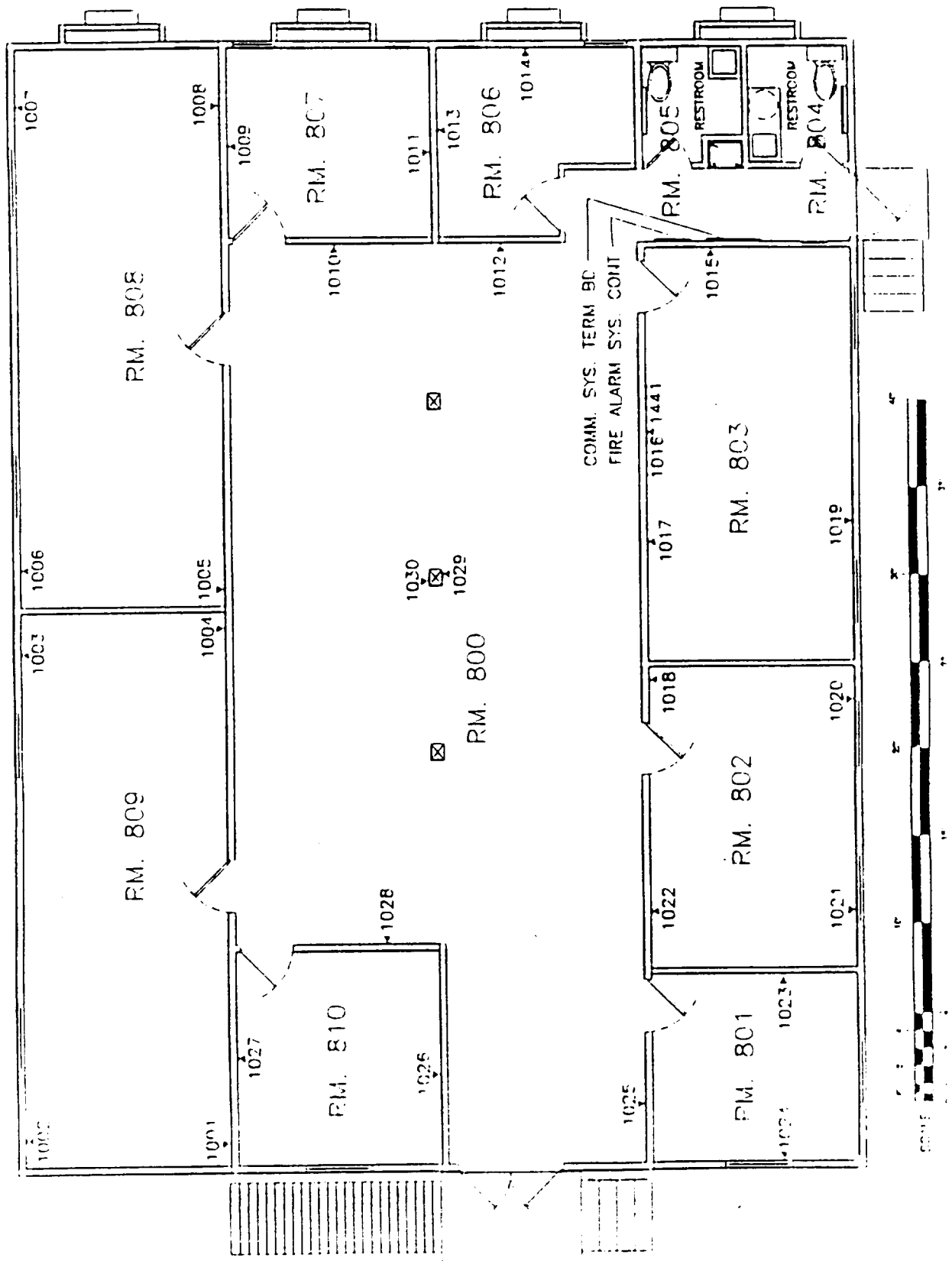


Figure B

Jacks Form

[REDACTED]	1293A
[REDACTED]	01
[REDACTED]	1001
[REDACTED]	HIGH
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	CARPET
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	1293A
[REDACTED]	01
[REDACTED]	1062
[REDACTED]	HIGH
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	CARPET

Conference Room:

Notes:

Building Number: 1293A

Room Number: 01A

Jack Number: 1002

Confidence Level: HIGH

Jack was absent from original DB:

Jack in DB but was not in room:

Video Jack Number:

Video Confidence:

Flooring: PLASTIC

Conference Room:

Notes:

Building Number: 1293A

Room Number: 02

Jack Number: 1003

Confidence Level: HIGH

Jack was absent from original DB:

Jack in DB but was not in room:

Video Jack Number:

