W5. Write a short (1000 word) essay summarizing what you learned in this course. Include a paragraph (100-words) suggesting specific improvements to future offerings.

SUMMARIZATION

Csci 5980 From GPS & Google Earth to Spatial Computing introduced the fundamental knowledge about GIS and geo-spatial concepts. Many GIS related concepts, as well as algorithms and data structures were introduced in this course. This course is very useful since spatial computing is very popular in the IT industry. A lot of spatial computing applications have been come to our life and reform the way of our life. Many famous applications also integrated geo-spatial techniques into their applications, such as Facebook and twitter.

In the course, Prof. Shashi introduced many spatial news, which motivated me and broad my horizon. The course has been well designed and closely related to the textbook. In the chapter one, it mainly introduced the idea about GIS. First, the concept of GIS: a computer-based information system that store, process, and manipulate geospatial data. And then, it introduced GIS functionality and came with a case study. Spatial data and database also covered in chapter one. Raster data and vector data are two common used data type in GIS. Finally, hardware support is the last topic in this chapter and it gave me a brief overview of hardware directly relevant to GIS. Chapter two is a kind of review class for me. It mainly talks about the concepts of database and relational database. Chapter three brought me a lot of fundamental spatial concepts, like Euclidean space, set-based geometry of space, topology of space, network spaces, metric spaces, and fractal geometry. For our group, we are both computer science backgrounds and have no prior GIS knowledge. This chapter is really useful for learning, especially the part about topology of space. This course introduced topological transformations as well as a lot of examples, which were really helpful for me to understand this new concept. The network spaces have many concepts, which are similar to the concepts in the data structure of computer science. Chapter 4 introduced the models of geospatial information, which define the relationship between geographic environment and the representation of that environment within a computer. The most impressive part about this chapter is field operation and spatial operation. Chapter 5 introduced representation and algorithms for geospatial information. In the part of discrete Euclidean plane, Green-Yao algorithm and Douglas-Peucker algorithm were introduced for handling of segment intersections and discretizing a curve respectively. The spaghetti model and the EER diagram were also introduced in the spatial object domain. Many fundamental geometric algorithms like point-in-polygon, collinearity, point on segment, and segment intersection. Chapter 6 introduced many fundamental spatial data structures. This chapter begins by

introducing some basic data structures and index methods for general-purpose databases, and then focus on efficient spatial data retrieval. For the general database structures and access methods, it likes a review for the data structure of computer science course. It first talks about file organization and then introduced index. B-Trees and B+ tree are also covered as an index structure that handles multi-level index and modification of structure. Details about search, insert, and delete are also covered in the course. For spatial indexes, a lot of data structures were introduced in the class. R-tree and R+ tree were two most common structures for indexing complex spatial objects. After the course, I have a better understanding about R-tree and R+ tree data structures. The R-tree structure is the most important access methods in the area of Spatial Data Management. The R-tree comprises a generalization of the B+ tree structure for multiple dimensions. The splitting criteria are as the following: linear split, quadratic split, and exponential split. R-tree had already been used in many areas. For example, it can be used for processing spatial queries. It also can be used in spatio-temporal database, multimedia database and data warehousing and data mining. Chapter 7 is about architectures, which are the overall structure and organization of the different parts of the system. Two important characteristics of GIS architectures are modularity and interoperability. Many GIS architectures like hybrid, integrated, and composable architectures were introduced. Distributed systems and distributed databases were also covered. In the last topic of the chapter, it uses a picture to clearly illustrate the concept of location aware computing. Chapter 8 talks about the user interfaces. The interface application for GIS is a combination of cartography, HCI and geovisualization. For developing GIS interfaces, prototyping, design rationale, and design analysis, those three engineering techniques are used in order to increasing formality. Chapter 9 covered topics about spatial reasoning, spatial information imperfection, qualitative and quantitative approaches to uncertainty, and applications of uncertainty in GIS. Chapter 10 introduced basic concepts involved in introducing time into GIS. Due to dynamic geographic entities are characterized not only by spatial attributes, but also by temporal references, a spatiotemporal information system must manage data about time-varying real world entities. In temporal information systems, tuple timestamping is introduced. In spatiotemporal information systems, bitemporal array is introduced.

Suggestions for the course

Not only the textbook gave us an introduction about GIS, but also the course labs are very helpful for me to have a deep understand many ideas introduced in our course. Especially the labs related to the spatial queries. The web labs are also very interesting. Many interesting assignments were assigned as web labs. Most of the labs are motivated us to find out many relevant knowledge about GIS. The course

needs a lot of reading and writing. The Encyclopedia of GIS is a great book collects a lot of GIS related papers. Reading this book broad our horizons about GIS and motivate us some new ideas about our project. I think we should keep these things in the future. In the class, Prof. Shashi encourages us to talk with our classmates. However, I still feel that we need more interaction among classmates. Maybe, besides doing a group-two project, we can also develop an even larger group project, so that more students can take part in the discussions and share their ideas and knowledge. For the class content, I think there are too much concepts in the class, I would prefer more basis on experiments and projects. Because I feel like by doing an experiment or a project would learn more in depth and more impressive.