# Proficiency Based Progression to Force Spatial Temporal Data in Mobile Cloud Environment

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## ABSTRACT

Mobile services are increasingly being used in daily life for purpose such as access information, voice (or) face-to-to face interactions. Variety of data are been exchanged frequently to multiple mobile devices at a same time. This gives the way to use cloud, which makes retrieving and storing data in efficient way. Mobile cloud computing integrates several clouds and network technologies to provide continuous functionality, storage, and mobility to serve multitude of mobile devices. It is very special for its nature of providing services to anywhere, anytime based on pay-as-you use principle. In mobile cloud network, the access of spatial temporal data is quite hard due to its complexity and size. Thus its reduces the overall performance of entire network. Here we propose certain process to handle spatial temporal data in fast reliable manner.

**Key words:** Mobile Cloud Computing, Mobility, Pay-As-You-Use, Mobile Services.

## I. INTRODUCTION

Mobile cloud computing provides mobile users with huge amount data storage as well as processing services in clouds, obviating the need to have a powerful device configuration (e.g. CPU speed, memory capacity etc), as all resource-intensive computing can be performed in the cloud. Here the mobile cloud computing allows the user to have data storage and data processing happen outside of the mobile device. This in turn highly useful for the Remote application execution in order to save energy significantly. Mobile application is so popular for its task migration and remote processing. Mobile application makes use of cloud computing environment in order to have infrastructure, platforms and software by cloud providers at low cost and elastically in an on-demand fashion [1]. Mobile cloud computing is the fast growing and promising trend for information access and storing in the fast and reliable manner, at very

low cost to the consumers. Due to this reasons, more than 240 million businesses will use cloud services through mobile devices by 2015.

Mobile cloud computing seems to be a promising trend for the future of mobile computing. This growth in mobile cloud computing will rule the information technology world by 2020 and every piece of data will be transferred and accessed only by Mobile cloud computing. Mobile cloud computing allows its users to store their huge data and to access it through cloud. This in turn makes mobile cloud applications to have their data storage away from the mobile devices and ensures centralized computing platforms located in clouds. This can be accessed over the wireless connection based on a thin native client. Some of the major advantages due to mobile cloud computing includes it requires low band width when comparing with other networks, high bandwidth variability, disconnected form of operation. It requires only low power as well as low resource machines [1].


Figure 1: Mobile Cloud Computing

Mobile devices that run mobile applications are not limited by storage capacity on the devices because their data now is stored on the cloud. Due to this flexible data storage capability, data can be accessed from anywhere, any time without any delay. Due to this reasons the data storage capacity and processing power are consequently increases. This phenomenal growth mobile cloud computing driven by new web standard HTML5, increased mobile broadband coverage and the need for always-on collaborative services for the enterprise. Google's Gmail and Google Voice for iPhone are just two of the well-known mobile cloud apps. Thus, with Mobile cloud computing corporate users can company data, share files. This paper is organized as- section 2 describes Spatio temporal data in mobile cloud environment, section 3 explains accessing Spatio temporal data, section 4 states R-tree based indexing method and section 5 concludes the whole paper.

## II. SPATIO TEMPORAL DATA IN MOBILE CLOUD ENVIRONMENT

Spatial data, also known as geospatial data, is information about a physical object that can be represented by numerical values in a geographic coordinate system. Spatial data represents the location, size and shape of an object on planet Earth such as a building, lake, mountain or township. Spatial data may also include attributes that provide more information about the entity that is being represented. The data structure used to handle spatial data are known as spatial data infrastructure (SDI) which deals geographic data, metadata, users and tools that

are interactively connected in order to use spatial data in an efficient and flexible way. Also known as *geospatial data* or *geographic information* it is the data or information that identifies the geographic location of features and boundaries on Earth, such as natural or constructed features, oceans, and more. Spatial data is usually stored as coordinates and topology, and is data that can be mapped. Spatial data is often accessed, manipulated or analyzed through Geographic Information Systems (GIS) [2].

Temporal data includes information about valid time and transaction time. These attributes can be combined to form bitemporal data. Valid time is the time period during which a fact is true with respect to the real world. Transaction time is the time period during which a fact stored in the database is considered to be true. Bitemporal data combines both Valid and Transaction Time.

## ARCHITECTUE OF MOBILE CLOUD COMPUTING

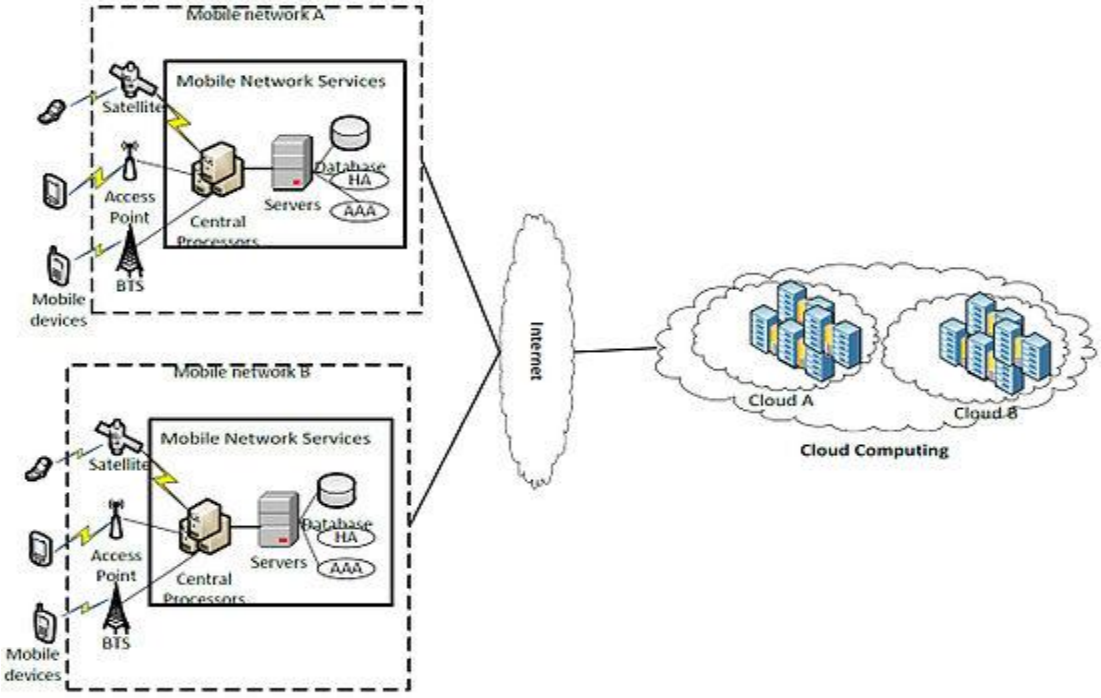


Figure 2: Architecture of Mobile Cloud Computing

A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. GIS applications are tools that allow users to create interactive queries (user-created searches), analyze spatial information, edit data in maps, and present the results of all these operations.

Mobile cloud computing are used in variety of areas such as,

- Mobile Commerce: M-commerce allows business models for commerce using mobile devices. Examples: Mobile financial, mobile advertising, mobile shopping.

- Mobile Learning: M-learning combines e-learning and mobility Enhanced communication quality between students and teachers [2].
- Mobile Healthcare: M-healthcare is to minimize the limitations of traditional medical treatment (e.g. Small storage, security/privacy, medical errors,). M-healthcare provides mobile users with convenient access to resources (e.g. medical records)
- Mobile Gaming: M-game is a high potential market generating revenues for service providers.

## III. ACCESSING SPATIO-TEMPORAL DATA FROM MOBILE CLOUD ENVIRONMENT

### SPATIO-TEMPORAL STORAGE AND INDEXING

Spatio-temporal databases store data from real world applications which are continuously varying in space and time. Since they are continuously varying, they generate a huge volume of data compared to the traditional DB applications [5]. Hence they need to be managed efficiently, in order to process the information in a timely manner. Moreover, unlike traditional DBMS operations, in Spatio-temporal operations, both the cost of I/O, as well as the cost of computation is quite high. Hence efficient storage and indexing techniques are very much important in handling and processing this kind of data [3].

### INDEXING METHODS

In order to keep the I/O cost minimal, it is very important to come up well paginated indexing techniques which will have low space requirements and optimal data clustering on the storage media [5]. Multi-dimensional spatial indexing techniques can be utilized to provide support for Spatio-temporal indexing, with time treated as an extra dimension on top of the spatial object. Another form of Spatio-temporal indexing is using partitioning where partitioning is based on the ``dimensional dominance" of the data under consideration, a space- and time-dominant partitioning approaches are also considered depending upon characteristics of application under consideration [3].

## IV. R-TREE BASED INDEXING METHOD

In R-tree based indexing approach, Spatio-temporal indexing is implemented over a spatial indexing technique that stores information about spatial objects by referencing their Minimum Bounding Rectangle (MBR). Each node of a tree has entries of the form (R, P), where R is a rectangle that covers all the rectangles of the child nodes, and P is a pointer that either points to a child node or a leaf node provides a 3D, visualization of Rtree, provides a 2D visualization of MBR and its corresponding R-tree [4].

To provide optimal storage a technique called , called the MR-Tree is used where subsequent images are allowed to reference parts of the original R-Tree structure of previous image, by sharing sub trees which indexes spatial information.

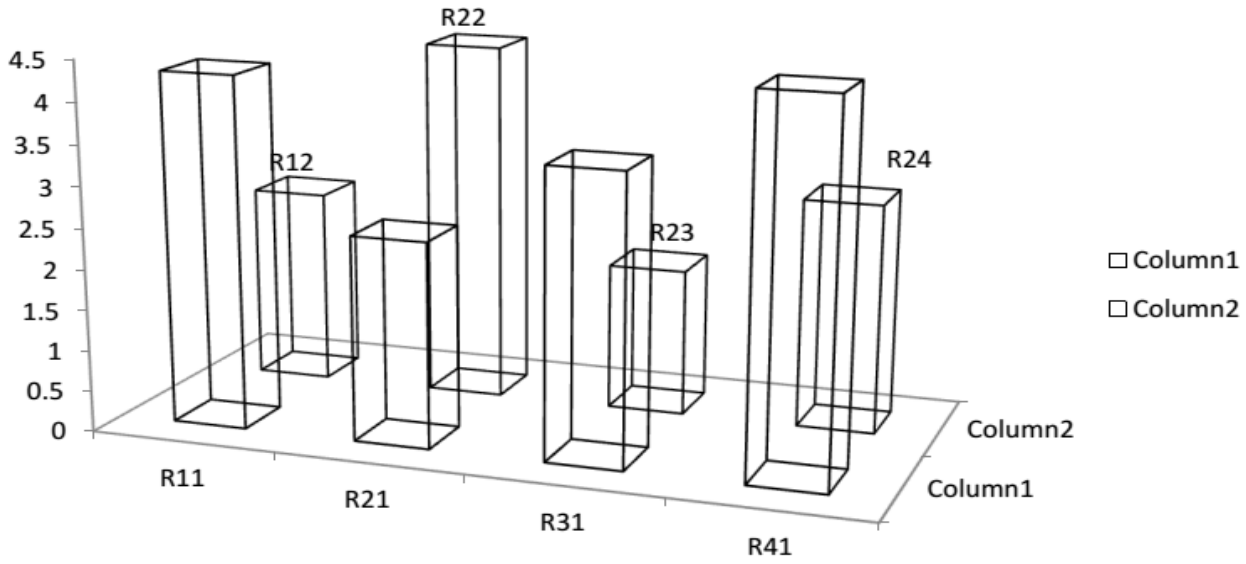


Figure 3: 3D visualization of R-tree

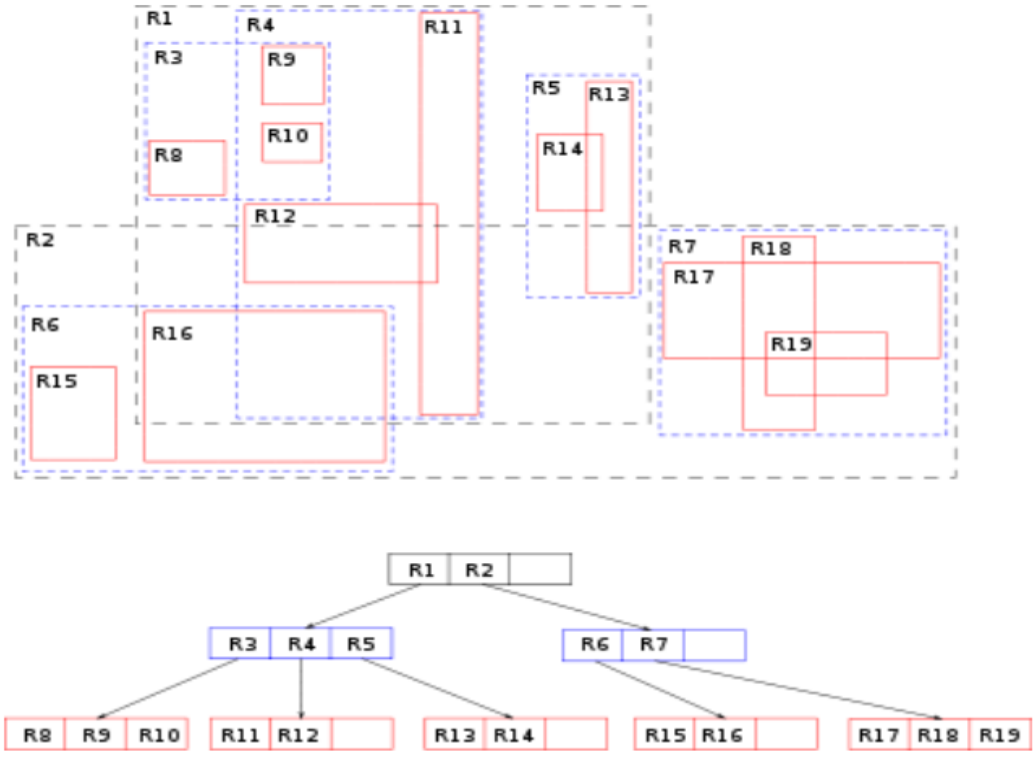


Figure 4: R-tree for a 2D rectangle as MBR.

## V. CONCLUSION

Mobile cloud computing plays a vital role in handling huge volume of variety of data. Spatial and temporal data are high complex data to handle and this can be easily accessed with the help of cloud, where the mobile users are easy access of data from anywhere they are. Spatiotemporal databases manage data whose geometry (position and/or extent) changes over time. Due to vast development mobile usage for every purpose, users are moving along from traditional PCs toward smart phones and other mobile platforms. This in turn created a need cloud computing that integrates with mobile platforms. The latest trend in improving the performance of query processing in Spatio-temporal DBMS systems involve solving the queries using a parallelized scheme. This can be achieved by the cloud computing infrastructures. While there has been a large amount of research for indexing spatial and temporal data, indexing spatiotemporal data is an area still under research.

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