The research presented here focuses on a collaborative 3D GIS framework. The design and development have been based on a hybrid or semi-replicated system architecture, designed according to the special requirements of collaborative GIS:

1. A prototype for collaborative GIS framework is designed, developed, tested and deployed, and the capacity of 3D synchronous collaborative modeling and model controlling is built up on top of this framework.
2. Ongoing work focuses on bringing into the system various types of domain-specific 3D models including subsurface models.

**Introduction**

Three-dimensional geographical information system (3D GIS) has been implemented in many areas like urban planning, environmental monitoring, emergency management, geology and mining industry. The vital functional requirements of 3D GIS are to provide spatial query, analysis and visualization to diverse experts, which are geographically dispersed, and maintain a high level of collaboration to support decision making requires that these experts can work together, communicate with each other, exchange and share information for a common task. However, these experts may be geographically dispersed and the traditional 3D GIS systems unable to support collaborative GIS, so the need for a collaborative 3D GIS system arises.

The 3D GIS component may go to local databases or replicated VRML files or X3D files and load from those experts, who may be stakeholders, scientists and urban planners, to make correct decisions. The procedure of 3D GIS component is demonstrated will show how the system will support the collaborative 3D GIS.

**Generic Web based 3D GIS**

3D data repository stores 3D data including 3D data files or 3D database.

3D data modeling used in Web enabled 3D system is to parse, transfer and reconstruct 3D data with XML, or GIS, encoded data from 3D data repository into 3D GIS framework. Through 3D high level API, 3D data is interpreted into 3D/2D information structures (comparing to external XML documents).

The problem of 3D GIS is called synchronous collaborative 3D GIS is the context of this research.

**Collaboration Component**

**Hybrid Architecture Model**

Synchronous collaborative GIS application is composed with several components: business logic component, rendering component, collaborative component, and interface component, etc.

Some components have to be shared between clients, for instance, RDBMS, can handle collaborative functions like the centralized collaborative component and GIS components.

**Event Distributing Process**

1. Event messages which could be just 3D transformation tasks are first triggered and sent to the collaboration component at the same time.
2. Collaboration component validates and sends them to the collaborative server in the server-side.
3. The collaborative server distributes the messages to the collaborative component of every client.
4. The distributed messages are finally sent to the 3D GIS component to carry out the events involving local client data.
5. The 3D GIS component may go to local database or XML data models and local databases.

**Framework**

GeoLink is a lightweight, object-oriented and extensible framework. The framework was composed of three tiers, replicated data tier, shared server tier and data tier.

This client consists of several components including GIS component, collaborative component, and multimedia/conferencing component, etc. The shared server consists of two servers: Data Proxy Server and Collaborative Server. The two servers are run as a cluster of servers, and are shared by all clients. The Data Proxy Server handles data related issues such as data source connection, data consistency handling, data access and retrieve, etc. The Collaborative Server handles voice messaging, multimedia/conferencing, etc. The Data Proxy Server and Collaborative Server are configured as a single node client-server architecture. The Data Proxy Server and Collaborative Server are configured through adding two components separately in the Shared Server Tier and the Replicated Client Tier.

Collaborative component and collaborative server.

**Experience**

GeoLink client includes two important components, collaboration component and 3D GIS components. Collaboration component provides collaborative work space in which users can view participants name, manage shared data source, assign users access and floor operation privileges, and chat with text.

3D GIS component provides basic 3D functions with collaborative features, like shared 3D view point.

**Summary**

The outputs of the research could potentially have a significant impact on collaborative 3D GIS, spatial decision support systems, etc. Based on a hybrid or semi-replicated system architecture, designed according to the special requirements of collaborative GIS:

1. A prototype for collaborative GIS framework is designed, developed, tested and deployed, and the capacity of 3D synchronous collaborative modeling and model controlling is built up on top of this framework.
2. Ongoing work focuses on bringing into the system various types of domain-specific 3D models including subsurface models.