Team Name : Sol 3

Team Leader Name : Rohith K

Problem Statement : Current GIS systems require deep domain knowledge and manual operation to perform spatial analysis like buffer zones, land use overlays, or nearest feature queries. They lack intuitive, intelligent interfaces to help non-experts perform complex spatial workflows.

Team Members

Team Leader:

Name: Rohith K
College: Aarupadai Veedu Institute of Technology, Chennai

Team Member-1:

Name: Ajayraj TP
College: SRM Arts and Scienece College, Chennai

Team Member-2:

Name: Hemalatha T
College: Aarupadai Veedu Institute of Technology, Chennai

Brief about the Idea:

Problem: Traditional GIS tools require manual spatial querying, coding knowledge, and deep domain expertise. Most users struggle with accessing insights from spatial datasets effectively.

Our Solution: Build an LLM-powered Geospatial Assistant that:

- Understands natural language spatial questions
- Uses Chain-of-Thought reasoning to break tasks into spatial operations
- Automatically executes spatial workflows using PostGIS + PyQGIS
- Visualizes the result in an interactive, web-based map dashboard

Brief about the Idea:

- GeoChain is an AI-powered spatial analysis assistant using Chain-of-Thought LLMs to automate complex GIS tasks.
- Enables natural-language interaction with geospatial datasets for non-experts and experts alike.
- Combines the power of LLMs, LangChain, PostGIS, and PyQGIS to interpret and execute spatial queries like buffer, overlay, nearest feature, etc.
- Outputs are shown via a web interface with interactive maps and downloadable data.
- Designed for urban planning, disaster response, environmental analysis, and more.

- How different is it from existing systems?

  •Traditional GIS tools are manual, expert-driven, and require complex command inputs.

  •Current AI systems lack spatial awareness or step-by-step geoprocessing capabilities.

  •No existing system provides a chain-of-thought spatial assistant that combines reasoning + execution.

- How will it solve the problem?

  •Bridges the gap between human language and geospatial data processing.

  •Allows decision-makers to query spatial data without writing SQL or using GIS software.

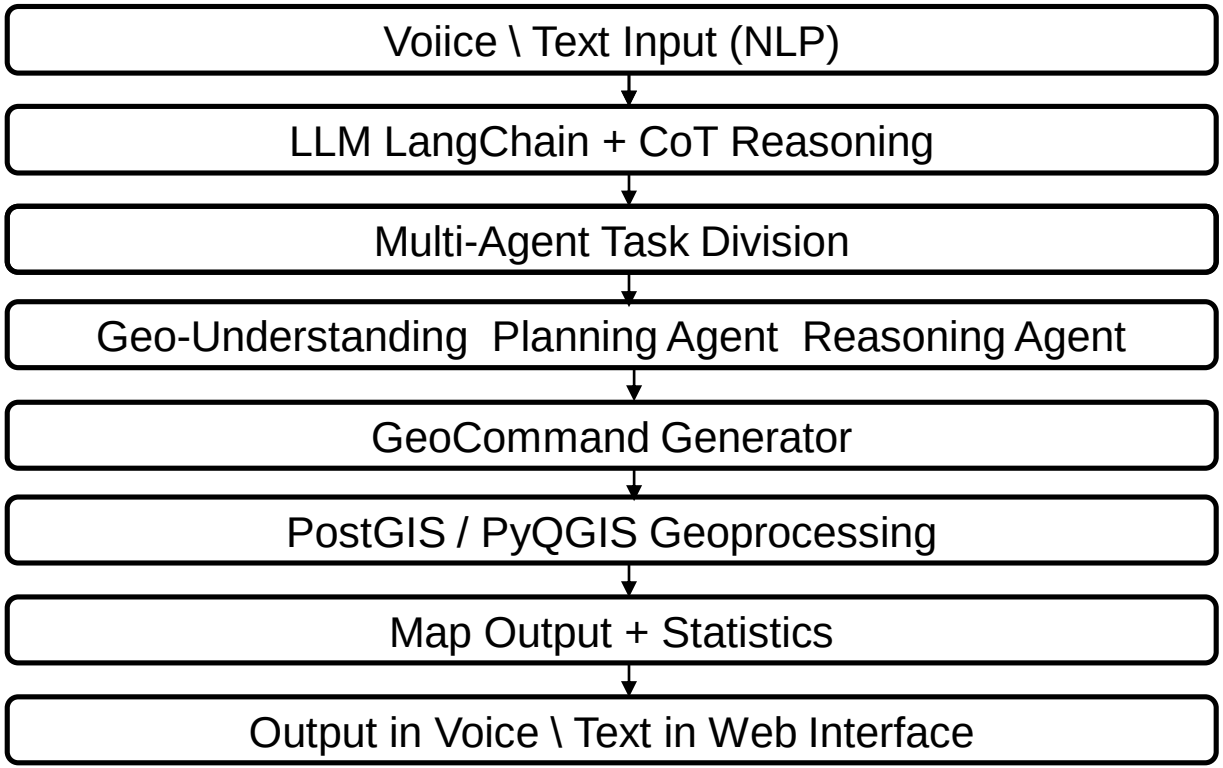
  •Enables real-time spatial insights even in rural or disaster-affected areas.

- USP (Unique Selling Proposition):
  - First system to use LLM + Chain-of-Thought reasoning + geoprocessing orchestration.
  - Plug-and-play over PostGIS/QGIS — minimal setup, works with existing infrastructure.
  - Flexible interface for voice, web, or app integration — accessible to all.

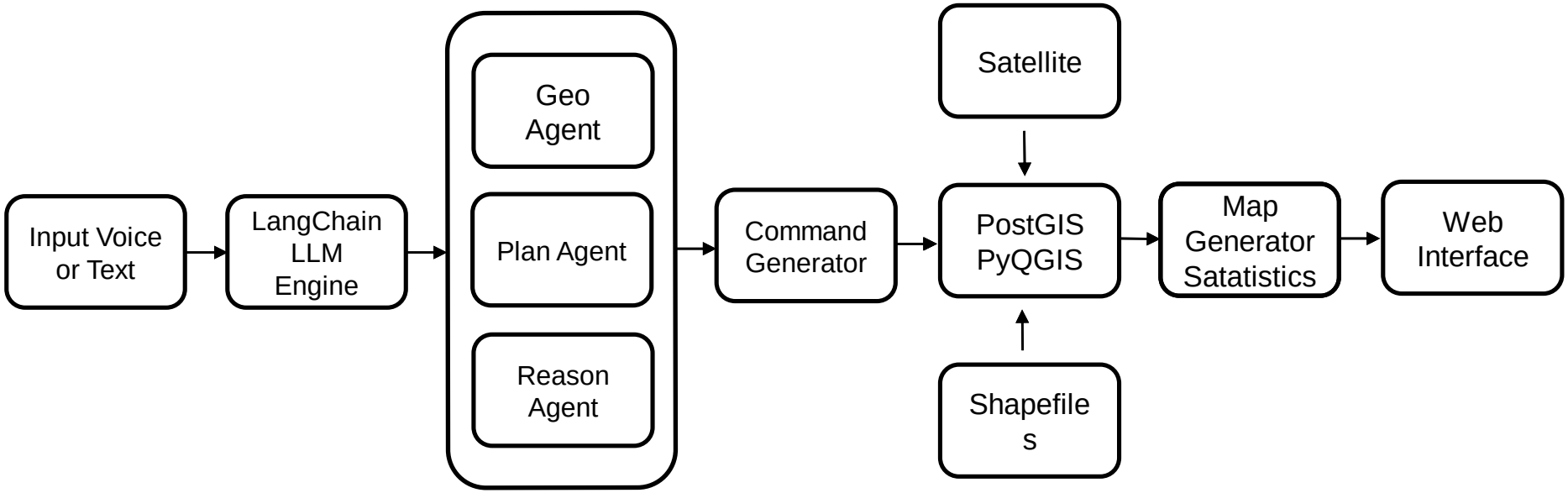
List of features offered by the solution

- LLM-Powered Reasoning — Chain-of-Thought logic breaks queries into spatial operations.
- PostGIS + QGIS Integration — Executes actual geospatial tasks (buffer, clip, intersect).
- Natural Language Interface — Accepts voice or typed queries.
- Auto-SQL Generation — Translates reasoning steps into optimized PostGIS queries.
- Map-based Visual Output — Results shown on an interactive map with stats.
- Downloadable Outputs — Export results as GeoJSON, shapefile, or CSV.
- Extensible Workflow — Add new spatial tools (e.g., proximity analysis, hotspot mapping).
- Web & Cloud Ready — Deployable via Streamlit, FastAPI, GCP, or AWS.

Process flow diagram or Use-case diagram



Architecture diagram of the proposed solution



Technologies to be used in the solution:

- Backend:
  - LangChain – LLM workflow orchestration
  - Llama / Gemini Pro – Large Language Models with CoT support
  - PostGIS – Spatial database
  - PyQGIS – Python APIs for QGIS geoprocessing
  - GDAL / OGR – Spatial file operations
- Frontend:
  - Streamlit + FastAPI – User interface & APIs
  - Leaflet.js – Interactive map rendering
  - gTTS / SpeechRecognition – voice interface
- Deployment:
  - Google Cloud Platform / AWS EC2

इसरो isro

Powered by H2S

BHARATIYA ANTARIKSH HACKATHON 2025

THANK YOU