



International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

e-Patta: Electronic Land Record Management System

Mrs. M Saranaya¹, Ashwin Kumaar D², Krishna Bharathi P³, Hak Ashiq M⁴, Dharaneesh S⁵

saranayait@siet.ac.in

ashwinkumaar877@gmail.com

krishnabharathi350@gmail.com

thakashiq@gmail.com

dharaaneesh104@gmail.com

Sri Shakthi Institute of Engineering and Technology, Coimbatore. Department of IT, Sri Shakthi Institute of Engineering and Technology, Coimbatore.

ABSTRACT:

The e-Patta: Electronic Land Record Management System is a digital platform designed to modernize and streamline the management of land ownership records. Traditional manual land record systems often face issues such as data inconsistency, limited accessibility, and vulnerability to tampering. The proposed system integrates Geographic Information System (GIS) and PostGIS-enabled databases to provide an accurate, transparent, and user-friendly method for maintaining and visualizing land data.

The e-Patta system allows users to search land details using parameters such as district, village, and survey number, and displays property boundaries on an interactive map similar to Tamil Nadu's Tamil Nilam portal. Each land parcel is associated with key details such as owner name, patta number, survey number, and geographic boundaries. The frontend is developed using HTML, CSS, and Leaflet.js for map visualization, while the backend uses Node.js and Express to connect to a PostgreSQL/PostGIS database.

This project aims to enhance transparency, data security, and ease of access for citizens and government officials alike. By digitalizing and spatially linking land records, the system contributes toward efficient land administration, fraud prevention, and improved public service delivery.

INTRODUCTION:

The e-Patta: Electronic Land Record Management System is a comprehensive digital solution designed to modernize and streamline the maintenance of land ownership records. It integrates Geographic Information System (GIS) technology with a PostgreSQL/PostGIS spatial database and a Node.js (Express) backend to ensure accurate, transparent, and easily accessible land information. Through a user-friendly interface, citizens and officials can search by district, village, or survey number to view detailed records such as owner name, patta number, and land boundaries, displayed interactively using Leaflet.js maps. The system not only reduces manual errors and administrative delays but also prevents duplication and fraudulent manipulation of records. By providing a centralized and spatially enabled database, e-Patta supports efficient decision-making, promotes transparency in land administration, and aligns with the Digital India initiative to improve governance through technology-driven public services.

e-Patta: Electronic Land Record Management System

Main Page Description

The main page of the **e-Patta: Electronic Land Record Management System** acts as the central interface where users can easily access and view land details through an interactive and user-friendly layout. It includes a header displaying the project title and a search panel that allows users to select a **district**, **village**, and enter a **survey number** to retrieve specific land records. Once the search button is clicked, the system connects to the backend server and fetches data from the **PostgreSQL/PostGIS** database. The corresponding land parcel is displayed on an interactive **Leaflet.js** map, clearly showing its boundary. When a user clicks on a plot, a popup appears displaying essential details such as the **owner's name**, **patta number**, **survey number**, **village**, and **district**. The map supports zooming, panning, and easy navigation, making it simple to explore different areas. Overall, the main page provides a clean, intuitive, and dynamic interface that combines data retrieval, geospatial visualization, and information display, making land management more transparent and accessible.

Survey Entry Page description

The **Survey Entry Page** in the *e-Patta: Electronic Land Record Management System* is designed for administrators or authorized officials to add, update, and manage land record details in the database. This page provides a simple data entry form where users can input essential land information such as **district, village, survey number, owner name, patta number**, and the **geographical boundary coordinates** of the land. Once the details are entered, the system validates the data and stores it securely in the **PostgreSQL/PostGIS** database. The page ensures accuracy by allowing the entry of spatial data that defines the land's exact location and boundaries. It acts as the backend interface for maintaining up-to-date and error-free records that are later displayed on the main map page. Through this feature, e-Patta enables efficient land record management, easy updates, and seamless integration between data entry and visualization, ensuring transparency and consistency across the system.

Map display page description

The **Map Display Page** of the *e-Patta: Electronic Land Record Management System* serves as the visual component of the application, where users can view and explore land details through an interactive geographic interface. It integrates **Leaflet.js** with spatial data from the **PostgreSQL/PostGIS** database to display accurate land parcel boundaries on a digital map. When a user searches for a land record using the district, village, or survey number, the corresponding land area is highlighted on the map with clearly defined borders. Clicking on a plot opens an information popup showing details such as the **owner's name, patta number, survey number, village, and district**. The page supports standard map interactions like zooming, panning, and boundary highlighting, allowing users to examine land locations in detail. Designed for clarity and responsiveness, the map display page provides a realistic and user-friendly visualization of land records, making it easier to understand spatial relationships and enhancing transparency in land information management.

FUNDAMENTAL TECHNIQUE:

e-Patta: Electronic Land Record Management System

1. Geographic Information System (GIS)

The foundation of the e-Patta system is based on GIS technology, which enables the capture, storage, analysis, and visualization of spatial data related to land parcels. GIS allows land boundaries to be represented accurately on digital maps, making it easier to identify, locate, and analyze property details.

2. Spatial Database Management (PostgreSQL/PostGIS)

The system uses PostgreSQL as the primary database for storing land information, and the PostGIS extension is employed to manage spatial (geometric) data. PostGIS supports geometry types such as polygons and provides spatial functions that help retrieve and display land boundaries based on location coordinates.

3. Web Backend Development (Node.js and Express.js)

The backend of e-Patta is developed using Node.js with the Express.js framework, which facilitates communication between the web interface and the database. It handles API requests from the frontend, processes queries, and retrieves relevant land data from the database for display on the map.

4. Frontend Development (HTML, CSS, and JavaScript)

The user interface is built using standard web technologies—HTML for structure, CSS for styling, and JavaScript for dynamic interactions. These tools ensure that the system is responsive, easy to navigate, and accessible on different devices.

5. Interactive Map Visualization (Leaflet.js)

The system integrates Leaflet.js, a lightweight JavaScript library for interactive maps. It displays land parcels as polygons on the map, allowing users to zoom, pan, and click to view detailed information such as the owner's name, patta number, survey number, village, and district.

6. Data Validation and Integration

Before saving any record, the system validates user inputs to ensure data accuracy and consistency. It integrates spatial and textual data seamlessly, allowing both administrative users and citizens to interact with the same reliable dataset.

Proposed Methods

1. Data Collection

The first step in the e-Patta system involves collecting land record information from government sources and existing patta registers. This includes details such as owner name, survey number, patta number, village, district, and land boundaries. Geographic coordinates for land parcels are also collected or digitized to enable accurate spatial representation on the map.

2. Database Design and Implementation

The collected data is stored in a PostgreSQL database, extended with PostGIS to handle spatial data. Tables are designed to include both textual information (owner, patta number, survey number, village, district) and geometric data (land boundaries). This ensures efficient storage, retrieval, and management of land records, supporting complex spatial queries.

3. Backend Development

The backend is developed using Node.js and Express.js, which handle API requests from the frontend. The server processes user queries, communicates with the database, and returns the relevant land information. This layer ensures secure and structured access to the data while maintaining integrity and performance.

4. Frontend Design

A responsive web interface is created using HTML, CSS, and JavaScript. Users can interact with the system through intuitive forms and search panels, where they can enter details such as district, village, and survey number to retrieve land records. The design focuses on clarity and ease of use for both citizens and administrators.

5. Map Integration and Visualization

The system uses Leaflet.js to display land parcels on an interactive map. Land boundaries are rendered as polygons, and clicking on a plot shows detailed information in a popup. The map supports zooming, panning, and highlighting features, allowing users to explore land records spatially and interactively.

6. Data Validation and Security

Input validation is implemented to ensure accuracy of data entry and prevent errors. Security measures, such as restricted access for administrative functions and sanitized API queries, are included to protect sensitive land information from unauthorized access or tampering.

7. System Testing and Deployment

Finally, the system is tested for functionality, usability, and performance. Test cases include searching for records, adding new entries, and displaying maps correctly. After testing, the system is deployed on a server, making it accessible to users through a web browser.

RESULTS AND DISCUSSIONS:

Results

The developed *e-Patta Land Information System* successfully integrates spatial and non-spatial land data using a PostgreSQL/PostGIS database and a Leaflet-based web interface. The system allows users to select a district, village, and survey number to retrieve specific land details. When the search button is clicked, the application fetches the matching record from the database and displays the corresponding land boundary on an interactive map. Each plot is visualized as a polygon, and when selected, it shows details such as the owner's name, patta number, survey number, village, and district in a popup window. The map interface works smoothly and accurately, replicating the style of the Tamil Nilam portal.

Discussions

The system demonstrates the effective use of open-source GIS technologies for building a digital land information platform. The results confirm that spatial data can be efficiently stored, queried, and visualized through a web-based interface. The project highlights the capability of PostGIS to manage geospatial data and the flexibility of Leaflet.js to render it interactively. The combination of these tools makes the system lightweight, scalable, and cost-effective.

The developed application performs similarly to the Tamil Nilam Geo-Information portal by providing map-based visualization of land details. It successfully bridges the gap between tabular land records and spatial visualization, allowing easier access to property data. However, the system's performance and accuracy depend on the quality of the input spatial data. Future enhancements could include adding taluk and district boundary layers, integrating cadastral maps, enabling secure user logins, and providing patta download options. Overall, the project demonstrates that modern GIS and web technologies can be effectively used to create accessible and transparent e-governance solutions for land management.

Conclusion And Future Enhancements:

Conclusion

The *e-Patta Land Information System* successfully demonstrates the integration of spatial and non-spatial land data using open-source GIS and web technologies. The system allows users to search land records by district, village, and survey number, and visualize the corresponding land boundaries on an interactive map. It provides clear and accurate information such as the owner's name, patta number, survey number, village, and district. The use of PostGIS for spatial data storage and Leaflet.js for map rendering ensures that the system performs efficiently and accurately. The project effectively replicates the basic functionality of the Tamil Nilam Geo Information portal, showing that a cost-effective and scalable solution can be developed using freely available tools.

The project also illustrates the importance of digital transformation in land management. By linking database records with geographic boundaries, the system enhances transparency, accessibility, and usability of land information for both citizens and government officials. Overall, the project achieves its objective of creating an interactive, reliable, and user-friendly platform for land record visualization.

Future Enhancements

In the future, the system can be expanded to include additional features and improvements. One major enhancement would be integrating cadastral maps and satellite imagery to provide more realistic and detailed land visualizations. The application can also include user authentication and role-based access control to allow secure login for government officials and citizens. Another enhancement could be enabling digital certificate-based patta downloads and real-time data updates from the revenue department. Performance can be further improved by adding spatial indexing and optimizing database queries for larger datasets. The system can also support mobile responsiveness, allowing users to access land information from smartphones and tablets. In addition, integration with other government databases such as property tax or registration records could create a complete e-governance solution. These improvements would make the e-Patta system more robust, efficient, and closer to a real-world government-grade GIS platform.

REFERENCES:

1. OpenStreetMap Contributors, *OpenStreetMap Data and Tile Service*, <https://www.openstreetmap.org>, Accessed 2025.
2. Leaflet.js Documentation, *An Open-Source JavaScript Library for Interactive Maps*, <https://leafletjs.com>, Accessed 2025.
3. PostgreSQL Global Development Group, *PostgreSQL 17 Documentation*, <https://www.postgresql.org/docs/>, Accessed 2025.
4. PostGIS Project Team, *PostGIS: Spatial and Geographic Objects for PostgreSQL*, <https://postgis.net>, Accessed 2025.
5. Government of Tamil Nadu, *Tamil Nilam – Land Records Information Portal*, <https://tamilnilam.tn.gov.in>, Accessed 2025.
6. Express.js Team, *Express – Fast, Unopinionated, Minimalist Web Framework for Node.js*, <https://expressjs.com>, Accessed 2025.
7. GeoJSON Specification, *The GeoJSON Format for Encoding a Variety of Geographic Data Structures*, Internet Engineering Task Force (IETF), <https://geojson.org>, Accessed 2025.
8. MDN Web Docs, *Fetch API – Working with HTTP Requests in JavaScript*, Mozilla Developer Network, <https://developer.mozilla.org>, Accessed 2025.
9. Prasad, S., & Kumar, R. (2023). *Design and Implementation of Web-Based GIS Applications Using Open-Source Tools*. *International Journal of Advanced Research in Computer Science*, 14(2), 45–52.
10. Srivastava, A. (2022). *E-Governance and Digital Land Management Systems in India: A Review of Tamil Nadu's Initiatives*. *Journal of Geospatial Information Technology*, 10(4), 60–68.