www.ijarp.com ISSN 2456-9992
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International Journal Advanced Research Publication

Research-Article
Volume: 2
Issue: 10

ARKEASE: LOCATION-BASED PARKING SPACE RENTAL AND EV CHARGING PLATFORM

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Article Received	Article Revised	Published
14-10-2026	04-10-2026	24-10-2026

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DOI: https://doi-doi.org/101555/ijarp.9805

ABSTRACT

ParkEase is a proposed web platform that connects drivers seeking parking with land owners offering vacant spaces for short-term rental. The system enables users to discover listed parking spaces within a configurable radius, initially 500 metres, compare prices, check booking availability, and reserve a suitable space for an hourly or daily duration. Owners can publish location details, photographs, access conditions, space dimensions, and optional electric vehicle (EV) charging facilities. Vehicle brand, model, and verified dimensions support preliminary checks of whether a vehicle can fit within the offered space. An EV filter presents connector type, charging power, and availability when supplied by the owner or a connected charging service. Customer, owner, and administrator dashboards support booking management, listing verification, subscription plans, and issue reporting. The design combines location-based discovery with time-slot booking and controlled contact sharing. This paper presents the proposed architecture, methodology, data model, and evaluation plan; no measured deployment results are claimed.

KEYWORDS: Smart Parking, Parking Space Rental, Geolocation, EV Charging, Vehicle Compatibility, Online Booking, Land-Owner Marketplace.

INTRODUCTION

Finding suitable parking near a destination can be difficult when available spaces are scattered or poorly advertised. At the same time, private grounds and vacant land may remain unused during certain hours. ParkEase proposes a digital marketplace through which owners can make eligible spaces discoverable and drivers can arrange parking before arrival.

Unlike a design restricted to a single managed car park, ParkEase supports independently listed spaces. A driver provides a location, parking interval, and vehicle details. The platform filters nearby listings by availability, price, access conditions, and vehicle fit. Map directions help the driver reach the selected entrance. EV drivers can additionally search for a compatible charging facility.

The objectives are to simplify parking discovery, improve visibility of rentable spaces, prevent overlapping reservations, and provide transparent pricing. The system also proposes daily and monthly subscription options for customers and owners. Benefits such as reduced search time and improved space utilisation require validation through an implemented pilot.

Literature Review

Related work provides foundations for parking allocation, occupancy information, navigation, and charging integration. The following review distinguishes the contributions of existing sources from design choices proposed for ParkEase.

Resource Allocation and Reservations

Geng and Cassandras [1] propose a smart parking system that assigns and reserves spaces using a cost function combining proximity and parking cost. Their allocation model is updated as system state changes and addresses reservation conflicts. ParkEase adopts the principle of checking current availability before confirmation, while its proposed scope is a marketplace of owner-listed spaces rather than a central optimisation model for a managed garage.

Smart Parking Services

Lin, Rivano, and Le Mouel [2] survey smart parking solutions and describe the relationship between sensing, information services, and driver assistance. This survey motivates treating reliable availability information as a core requirement. In ParkEase, booking records and owner updates form the initial availability source; physical occupancy sensing is a possible later extension.

Open Parking Lots and Occupancy Technologies

Paidi et al. [3] review sensors, technologies, and applications for open parking lots, considering environmental suitability and expenditure. Their discussion is relevant to vacant outdoor spaces where installation and maintenance conditions vary. ParkEase therefore proposes a software-first pilot and does not assume that every listing has sensors or automatically verified occupancy.

Location and Navigation Services

Google Routes API documentation [4] describes route computation between locations. A route service can support travel directions after a parking space is selected. ParkEase separately calculates geographic proximity for the initial 500-metre discovery radius, because straight-line distance and road travel distance represent different measures.

EV Charging Interoperability

The Open Charge Alliance documents the Open Charge Point Protocol (OCPP) [5] for communication between charging stations and their management systems. It provides a possible integration path for connected chargers. ParkEase initially allows owner-entered charging information; automatic charging status and energy readings require supported hardware and a charging backend.

Research Motivation

The proposed contribution is the combination of nearby vacant-space rental, vehicle-space compatibility, reservation control, optional charging discovery, and owner/customer subscriptions in one workflow. These features define the intended scope; the paper does not claim that each feature is new or that the platform outperforms existing services.

METHODOLOGY

An incremental development approach is proposed. Authentication and owner listings form the first increment, followed by location search, booking management, vehicle compatibility, EV information, subscriptions, and administration. Each increment is reviewed against functional requirements before the next is integrated.

Frontend Development

A responsive frontend using HTML, CSS, and JavaScript, or a component-based framework, presents separate customer, owner, and administrator views. Customers search a map and list view, select dates and duration, view price details, and manage reservations. Owners create listings and update availability. The administrator reviews listings, reported issues, and booking activity. The proposed interface includes a short parking and EV charging animation; animated percentages are labelled as a demonstration unless connected to actual charger telemetry.

Backend Development

A server-side API, for example Node.js with Express, manages authentication, permissions, listing validation, geographic search, pricing, and booking transitions. Customer and owner access is restricted to their own records. Input validation, password hashing, secure sessions, rate limiting, and audit records support application security. The selected technology stack is a proposal and must be confirmed against the implemented project.

Database and Availability Management

A relational database stores users, vehicles, listings, physical spaces, time-slot bookings, charging facilities, subscription plans, and issue reports. A transaction checks the requested interval and reserves capacity atomically. Availability reflects confirmed bookings and owner updates; it is not a claim of sensor-verified physical vacancy. Cancelled or expired reservations release capacity according to the booking policy.

Location Search and Vehicle Compatibility

The system obtains a permitted device location or accepts a manually entered destination. Geographic distance is calculated and eligible listings within 500 metres are returned. Drivers choose fuel type, brand, and model. Verified vehicle dimensions are compared with usable bay dimensions, entrance width, and height limits, allowing clearance for access. If dimensions or access measurements are missing, the system marks fit as unverified and requests owner confirmation.

EV Charging, Subscriptions, and Safety

EV listings record connector type, power rating, operating hours, tariff, and whether simultaneous charging and parking is permitted. Charging reservations use separate capacity checks where needed. Daily and monthly plans can be configured for both user roles with explicit benefits and expiry dates. Owners undergo listing review, while customers can report unsafe conditions or inaccurate listings. Contact details are disclosed under a defined booking/contact policy.

System Architecture and Analysis

The proposed system uses a three-tier architecture. The presentation layer manages user interaction; the application layer handles discovery and reservations; the data layer maintains persistent records. External map and payment services are accessed through controlled backend integrations where appropriate.

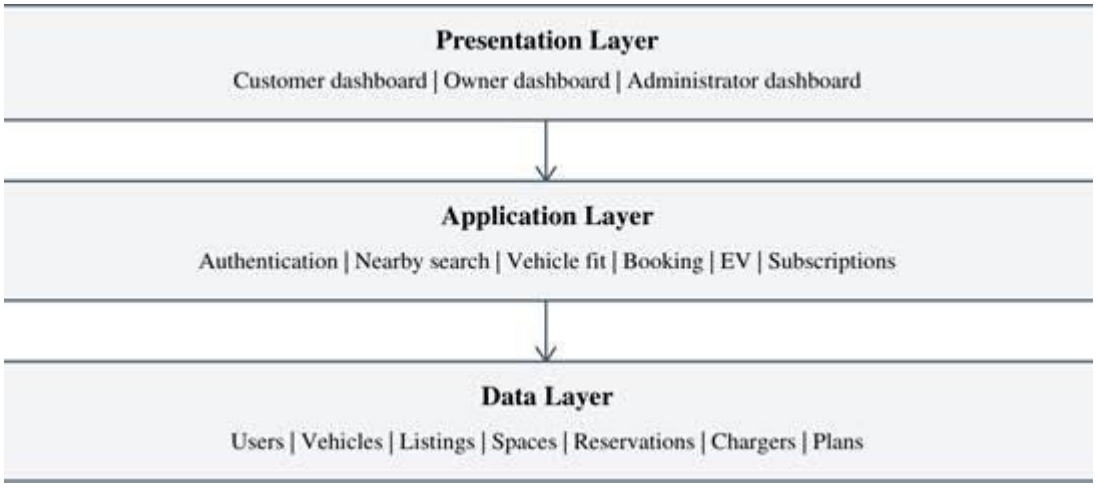


Fig. 1. Proposed ParkEase three-tier architecture.

Core Data Relationships

User / Vehicle: A customer can register multiple vehicles; an owner can publish multiple listings.

Listing / Space: Each listing identifies a location and one or more reservable bays or capacity units.

Booking: Connects a customer, vehicle, space, start/end time, price, and booking status.

Charger / Plan: Charging facilities belong to listings; subscriptions associate a user with a plan and validity period.

Reservation and Matching Rules

Two reservations overlap when start_new < end_existing and end_new > start_existing. A capacity-one space cannot accept two active bookings with overlapping intervals. Confirmation must use a database transaction or equivalent concurrency control. The 500-metre radius is a discovery default and may be expanded when no suitable listing is found.

Vehicle fit requires usable length and width to exceed vehicle dimensions plus configured clearance. Height, entrance width, approach conditions, and turning space are checked where known. Search ranking can use distance, total price, compatibility, and listing quality; the ranking weights must be documented and evaluated.

RESULTS AND DISCUSSION

User-provided screenshots document the ParkEase local demonstration interface (Appendix A). They show parking and EV selection, sign-in, search filters, sample listings, a simulated route and wallet controls. These screens demonstrate interface design; deployment, payment completion and measured performance have not been verified. The evaluation plan below remains to be executed.

Functional Evaluation Plan

Nearby search: Use known coordinates inside/outside the configured radius. Return only eligible, approved listings and handle location permission denial.

Vehicle fit: Test suitable, oversized, and unknown-dimension vehicles. Reject known incompatibility and label missing data as unverified.

Booking control: Submit concurrent reservations for one space and interval. Confirm at most one; correctly release cancelled or expired holds.

EV discovery: Filter by connector and charging schedule. Prevent a parking-only booking from implying a charging reservation.

Pricing / Plans: Check hourly/daily boundaries, plan expiry, and price snapshots. Display the total and any separate charging tariff before confirmation.

Role permissions: Attempt cross-account listing and booking changes. Deny unauthorised operations and record administrative actions.

Performance and Usability Measures

Record the median and 95th-percentile search and booking response times at stated concurrency levels. Measure confirmed reservation conflicts, stale listing reports, failed API requests, and successful task completion. Compare the time required to find a suitable space with a documented baseline. Results should specify sample size, test environment, measurement interval, and participant consent where applicable.

Expected Benefits and Limitations

The integrated workflow is intended to make listed spaces easier to find and allow owners to manage rental periods consistently. Vehicle checks may reduce unsuitable bookings when measurements are accurate. EV filters may help drivers locate compatible facilities. These expected benefits depend on trustworthy owner data, sufficient local listings, reliable internet access, and clear cancellation rules.

The initial platform cannot guarantee physical vacancy, site safety, or charging progress without verified observations or connected equipment. Pilot evaluation should examine no-shows, overstays, outdated listings, access difficulties, and charging availability. Photographs and owner-entered dimensions support decisions but do not replace on-site verification.

CONCLUSION

ParkEase proposes a location-based marketplace for renting vacant parking spaces and discovering optional EV charging facilities. It connects customers with land owners through searchable listings, time-slot reservations, and role-specific dashboards. The initial discovery radius of 500 metres supports local search, while hourly and daily booking options address different parking needs.

The proposed vehicle selection workflow records brand, model, and relevant dimensions so that the platform can assess preliminary space compatibility. Charging details add connector

and power information to parking discovery. Daily and monthly subscriptions for customers and owners provide an additional configurable service model. Administrative review, issue reporting, and controlled contact disclosure support accountable operation.

The architecture emphasises transactional booking control, clear availability sources, and separation of simulated visuals from measured data. This document presents design and evaluation requirements rather than an experimentally validated implementation. A working pilot is required to establish response time, booking reliability, user satisfaction, and the effect on parking search effort.

FUTURE SCOPE

Future development can include verified sensor-based occupancy updates, connected charger integration, waitlists, multilingual interfaces, improved accessibility information, and demand forecasting. Charging telemetry should be obtained through compatible infrastructure before showing actual live percentages or energy consumption. Payment settlement, refunds, and subscription billing can be added after operational policies are defined.

Deployment and Evaluation Roadmap

First, implement and validate authentication, listings, and the booking transaction. Next, verify geographic filtering and vehicle measurement data with a small set of owner-approved sites. Add EV information and subscription functions after core reservations are reliable. Finally, run a documented pilot with real search and booking tasks, record failures and user feedback, and publish measured results with their limitations.

Project Contribution

The intended contribution is a unified workflow that makes dispersed, owner-listed parking spaces discoverable alongside optional charging facilities. Its practical value depends on accurate data and dependable reservation management. By reusing existing spaces, ParkEase has the potential to support more efficient local mobility and infrastructure use; environmental or economic improvements should be assessed rather than assumed.

REFERENCES

1. Y. Geng and C. G. Cassandras, "New Smart Parking System Based on Resource Allocation and Reservations," IEEE Transactions on Intelligent Transportation Systems, vol. 14, no. 3, pp. 1129-1139,2013. DOI:10.1109/TITS.2013.2252428.Author-hosted paper: https://people.bu.edu/cgc/Published/TITSprint_09_13.pdf
2. T. Lin, H. Rivano, and F. Le Mouel, "A Survey of Smart Parking Solutions," IEEE Transactions on Intelligent Transportation Systems, vol. 18, no. 12, 2017. DOI: 10.1109/TITS.2017.2685143. https://doi.org/10.1109/TITS.2017.2685143
3. V. Paidi, H. Fleyeh, J. Hakansson, and R. G. Nyberg, "Smart parking sensors, technologies and applications for open parking lots: a review," IET Intelligent Transport Systems, 2018.DOI: 10.1049/iet-its.2017.0406. https://doi.org/10.1049/iet-its.2017.0406
4. Google for Developers, "Compute Routes Overview," Routes API documentation. Accessed:9 October 2026.https://developers.google.com/maps/documentation/routes/compute-route-over
5. Open Charge Alliance, "Open Charge Point Protocol," official protocol information. Accessed: 9 October 2026. https://openchargealliance.org/protocols/open-charge-point-protocol/