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State-of-the-Art in Urgent Flatmate Matching Systems: A Multi-Dimensional Compatibility Approach

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Abstract— Finding a suitable flat or PG is challenging because users must choose both a suitable accommodation and compatible roommates. This review paper is based on the Knowledge-Based Stable Roommates approach and extends it into a practical framework called Flat-Match. The proposed framework combines accommodation filtering with lifestyle compatibility by considering factors such as budget, location, room type, cleanliness, smoking habits, sleep schedule, study habits, and move-in date.

Unlike traditional rental platforms, Flat-Match provides personalized recommendations, ranked alternatives, conflict detection, and a temporary Flat Lock feature for reserving available rooms. This paper does not present experimental results; instead, it identifies the research gap between roommate matching and real-world accommodation discovery. The proposed framework offers a foundation for developing an intelligent, explainable, and user-friendly shared accommodation platform.

Keywords— Flat-Match, Shared Accommodation, Roommate Matching, Compatibility, Stable Roommates

I INTRODUCTION

A. Background

Roommate allocation is traditionally treated as a matching problem based on personal preferences. The **Stable Roommates Problem** and its extensions, such as SRTI, focus on creating mutually acceptable pairings. Later research, including the work of **Fidan and Erdem**, considers everyday lifestyle factors such as cleanliness, smoking, study habits, sleeping schedules, and social preferences. This shows that effective roommate matching should consider **multiple compatibility factors**, not just basic preferences.

The **FlatMatch** research extends this idea to shared accommodation by combining **accommodation requirements** such as budget, location, room type, and move-in date with **personal lifestyle compatibility**. The review therefore examines existing roommate and accommodation matching approaches, identifies their limitations and research gaps, and proposes an integrated framework for personalized and reliable flatmate matching.

II. REVIEW METHODOLOGY

A. Literature Basis

The review is mainly based on Fidan and Erdem's "Knowledge-Based Stable Roommates Problem: A Real-World Application," which extends SRTI using lifestyle criteria, personal preferences, and weighted matching. Earlier SRTI-ASP and related stable-roommate research are also considered. These studies provide the foundation for the proposed FlatMatch framework.

B. Thematic Classification

The literature is grouped into two themes: knowledge-based roommate matching and shared accommodation matching. The first focuses on stability and lifestyle compatibility, while the second adds budget, location, room type, vacancy, and recommendations. FlatMatch connects both to provide integrated accommodation and flatmate matching.

Table I
Thematic Distribution of the Reviewed Studies

Theme	Literature Provides	FlatMatch Extension
Stable Matching	SRTI and stability	Compatibility matching
Lifestyle	Personal living criteria	Lifestyle + property factors
Personalization	Weights and preferences	User-defined priorities
Constraints	Hard/weak constraints	Essential requirements
Workflow	Questionnaire + matching	Search + ranking + Flat Lock

III. KNOWLEDGE-BASED STABLE ROOMMATE MATCHING

SRTI supports realistic roommate matching by allowing **ties, incomplete preferences, and domain-specific criteria**. The reviewed study extends this approach using weighted lifestyle factors such as **smoking, cleanliness, room environment, sleep habits, and study habits**. Personalized-SRTI considers each person's priorities, while Most-SRTI uses ordered criteria and constraints. These approaches provide a useful foundation for **personalized compatibility matching in FlatMatch**.

IV. FINDINGS FROM THE REVIEWED REAL-WORLD STUDY

Surveys involving **156 and 81 students** identified important roommate criteria, particularly smoking, cleanliness, room environment, sleep habits, and study habits. Evaluation also showed greater selection of personalized matching in the reported study, although the results are study-specific. The findings support using a **short, priority-based questionnaire** in FlatMatch.

V. COMPARATIVE SYNTHESIS

The reviewed approaches show that detailed personalization improves compatibility but increases computational effort as users and criteria grow. Therefore, FlatMatch can use **basic filtering first, followed by weighted compatibility ranking**.

Aspect	Findings	FlatMatch Impliction
Criteria selection	Lifestyle factors were important	Use focused questions
Preference collection	Users have different priorities	Allow personal weights
Matching	Personalized matching was preferred in the study	Provide compatibility-based results
Scalability	Complexity increases with users and criteria.	Use staged filtering

VI. RESEARCH GAPS AND PROPOSED SOLUTIONS

A. Roommate Matching and Accommodation Discovery Are Separate

The reviewed model mainly focuses on roommate assignment and does not cover the complete accommodation discovery process, including rent, deposit, location, room type, facilities, distance, and vacancy. FlatMatch addresses this gap by connecting property suitability and roommate compatibility, where a property must first meet essential accommodation requirements before detailed roommate matching is performed.

B. No Joint Person-to-Person and Person-to-Property Matching

FlatMatch uses a layered approach to find both a suitable place and roommate by first applying essential property filters, then evaluating lifestyle compatibility, and finally ranking feasible combinations with clear reasons for the recommendations.

C. Vacancy, Move-In Date and Urgency

A stable roommate match may be mathematically suitable but impractical if no room is available. FlatMatch therefore treats vacancy and move-in date as dynamic factors, allowing listings to be classified as currently available, upcoming, or unavailable, with the move-in date considered as either a hard or soft requirement.

D. Ranked Alternatives and Explainability

Users often need multiple options because their first choice may become unavailable or be rejected. FlatMatch therefore provides ranked candidates and alternatives, along with simple explanations such as “budget and location match” and identifies key conflicts such as incompatible smoking or cleanliness preferences.

E. End-to-End Workflow

The reviewed research demonstrates questionnaires, formal matching and evaluation, but it is not an end-to-end accommodation platform" "FlatMatch extends the workflow to registration, profile creation, property listing, search, filtering, matching, comparison, communication, vacancy confirmation and temporary reservation. ""This turns the matching method into one part of a broader shared-accommodation application."

VII. PROPOSED FLATMATCH FRAMEWORK

A. Conceptual Model

FlatMatch is proposed as a **Progressive Web Application** connecting users, accommodations, and compatible flatmates. It considers **budget, location, move-in date, room requirements, and lifestyle preferences**.

B. Functional Workflow

The workflow includes **registration → preference collection → hard filtering → compatibility analysis → conflict detection → ranked recommendations → communication → temporary Flat Lock**. Flat Lock temporarily reserves an accommodation to reduce multiple simultaneous claims.

C. Main Data Elements

Entity	Key Information	Purpose
User	Profile, budget, location, date	User requirements
Lifestyle	Sleep, cleanliness, food	Compatibility
Accommodation	Rent, location, room, vacancy	Property suitability
Preference	Priority of criteria	Personalized ranking
Conflict	Incompatible conditions	Explains mismatch
Flat Lock	User, property, expiry	User, property, expiry

D. Matching Logic

FlatMatch uses a two-stage matching process. First, hard constraints remove unsuitable options. Then, the remaining options are ranked using lifestyle compatibility, accommodation suitability, and personal preferences with configurable weights.

The system also provides explainable results, showing compatible factors such as budget, location, sleep schedule, and cleanliness, along with any conflicts such as smoking preferences.

VII. PROPOSED SYSTEM ARCHITECTURE AND TECHNOLOGY

FlatMatch uses a **Progressive Web Application (PWA)** with **HTML, CSS, JavaScript**, and a **Python/Django backend**. **MySQL/SQLite** can be used for storage, with **VS Code and GitHub** for development.

The system follows separate **UI, application, matching, and database layers**. Core modules include **authentication, preferences, accommodation, vacancy, compatibility matching, conflict detection, recommendations, communication, Flat Lock, and administration**.

VIII. SYSTEM ARCHITECTURE AND TECHNOLOGY

FlatMatch will use **HTML, CSS and JavaScript** for the interface, **Python/Django** for backend services and **MySQL/SQLite** for storage. Core modules include **authentication, preferences, accommodation, matching, conflict detection, recommendations, communication, Flat Lock and administration**.

IX. EVALUATION FRAMEWORK

As this is a framework paper, no new FlatMatch performance results are reported. Future testing can evaluate:

Area	Metrics
Recommendation	Precision@K, Recall@K, NDCG@K
Compatibility	User suitability rating
Constraints	Violation rate
Conflicts	Precision, Recall, F1
Usability	SUS, satisfaction
Performance	Response time

X. DISCUSSION

The reviewed research shows that roommate matching improves when **lifestyle preferences and individual priorities** are considered. FlatMatch extends this concept by combining **roommate compatibility with accommodation suitability and availability**. Hard constraints handle essential requirements, while personalized ranking handles lifestyle preferences.

XI. LIMITATIONS AND FUTURE RESEARCH

The review mainly builds on **knowledge-based stable roommate research**, and the proposed FlatMatch framework has not yet been experimentally validated. Future research can explore **hybrid matching, dynamic vacancies, explainable recommendations, privacy, fairness, user feedback, and larger datasets**.

XII. CONCLUSION

The reviewed research shows that roommate matching depends on multiple factors such as cleanliness, smoking, sleep and study habits, and individual preferences rather than simple rankings. Personalized-SRTI and Most-SRTI provide different approaches to compatibility, but their integration with property-level accommodation search remains limited. FlatMatch addresses this gap by combining roommate compatibility, property suitability, accommodation constraints, vacancy, ranked alternatives, conflict explanations, and a time-bound Flat Lock process. Future evaluation can determine whether this integrated approach improves shared-accommodation matching compared with conventional methods.

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