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FUTURE PROSPECTS IN AGING-FRIENDLY ARCHITECTURAL ENVIRONMENT DESIGN: STRATEGIES FOR ACCESSIBILITY, SUSTAINABILITY, AND USER- CENTRIC INNOVATION

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As the global population continues to age, the need for architectural environments that accommodate elderly users has become increasingly urgent. This paper explores the future prospects for aging-friendly architectural design by examining both public communal spaces and private residential environments. By identifying critical design elements and their potential developments, the study outlines strategies to enhance accessibility, safety, and comfort in the built environment. A structured analysis of spatial adaptations and technological integrations provides insights into the evolution of aging-friendly architectural solutions, supporting a sustainable and inclusive future for an aging society.

Key words: *aging-friendly design, architectural environment, accessibility, universal design, future prospects, environment design.*

INTRODUCTION

The increasing proportion of elderly individuals in societies worldwide has brought new challenges to architectural design. Traditional urban spaces, residential buildings, and public infrastructure often fail to address the needs of aging populations, leading to restricted mobility, safety hazards, and decreased social engagement [1]. As global demographics shift, the future of architectural design must evolve to integrate more effective aging-friendly principles, emphasizing accessibility, inclusivity, and adaptability.

PURPOSE

This study aims to explore the future direction of aging-friendly architectural environments by analyzing current trends and emerging innovations in both public communal spaces and private residential environments. The research highlights design strategies that can enhance the quality of life for elderly individuals, offering a comprehensive framework for architects and urban planners seeking to create inclusive and forward-thinking spaces.

RESULTS AND DISCUSSION

1. Future Prospects for Aging-Friendly Design in Public Communal Spaces

Public communal spaces are essential for promoting mobility, social interaction, and community belonging among elderly populations. As the number of



elderly residents grows, public environments must adapt to offer continuous accessibility, safety, and usability [2].

One of the key innovation is the introduction of **micro-landscape elements**, allowing elderly individuals to engage in gardening activities directly within their residential complexes. These therapeutic spaces not only encourage physical activity but also foster emotional well-being and community connection.

Balcony landscapes should be designed barrier-free, enabling elderly residents with different mobility levels to participate in horticultural and leisure activities without physical obstacles.

Wayfinding systems should avoid an institutional appearance by blending environmental cues with natural design. Use of large, high-contrast fonts and intuitive directional signs will improve navigation for seniors with visual impairments.

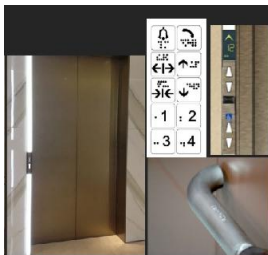
Flooring innovations will be vital: incorporating self-cleaning, anti-slip surfaces and ensuring zero-height transitions between spaces to minimize the risk of falls. This approach creates safer and more comfortable pathways throughout public environments.

Elevator accessibility (fig. 1a) must also evolve. Future elevators should integrate:

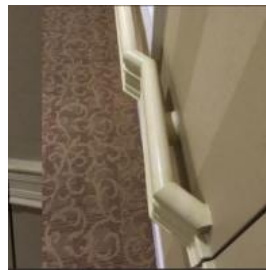
- Rounded corner panels to reduce injury risks;
- Three-sided handrails for stability;
- Braille-integrated control panels for the visually impaired;
- Indirect lighting to avoid glare;
- Control panels and floor indicators positioned at ergonomic heights

for wheelchair users.

Hallways and walkways should be widened and free from obstacles. PVC antibacterial handrails along walls and rounded corners will enhance safety (fig. 1b). Regular resting areas with comfortable seating should be provided, along with personalized storage ledges near doorways for placing small items while unlocking doors.



a



b

Fig. 1. Aging-friendly architectural elements: a – accessible elevator design featuring Braille-integrated control panels, rounded handrails, and indirect lighting to reduce glare; b – wall-mounted antibacterial handrails with rounded edges to enhance safety in public corridors



2. Future Prospects for Aging-Friendly Design in Private Residential Environments

Private residences must be increasingly responsive to the diverse physical, sensory, and cognitive needs of elderly individuals [3]. Future home design will prioritize adaptive layouts, sensor-based solutions, and customizable environments.

Color schemes must be adjusted to improve visibility. Mid-tone palettes that enhance contrast without excessive brightness will help elderly individuals perceive spaces more clearly.

Lighting design will incorporate circadian-responsive systems, which adjust color temperature and brightness throughout the day, supporting natural biological rhythms and reducing visual fatigue.

Entrance areas and hallways should be equipped with motion-activated lighting and ergonomic door handles to enhance safety, especially during night-time movements.

Kitchen spaces should be designed with (fig. 2a):

- Lowered countertops and **base cabinets** (approximately 800 mm) and wall-mounted cabinets (around 1500 mm);
- Pull-down shelving and integrated seating for use during food preparation,
- Touch-sensitive electrical controls that minimize the need for complex or forceful manual operations.

Bathroom designs must prioritize (fig. 2b):

- Zero-threshold showers with built-in drainage systems to eliminate physical barriers;
- Non-slip nanocoated flooring to prevent slips;
- Adjustable-height sinks, grab bars, and foldable seating to accommodate varying mobility needs.



a



b

Fig. 2. Aging-friendly residential adaptations: a – an accessible kitchen design featuring lower cabinets, pull-down shelving, and wheelchair-friendly layouts to enhance usability; b – smart home accessibility features, including low-height control panels, an accessible bathroom with grab bars, and an emergency call button for enhanced safety in aging-friendly environments



Smart emergency response systems will become a crucial feature, including:

- AI-assisted fall detection;
- Automated alerts;
- Remote emergency call options;
- Accessible light switches (at around 1100 mm) and control panels

(around 600 mm) to reduce unnecessary bending and stretching.

CONCLUSIONS

This study underscores the crucial role of aging-friendly architectural design in shaping future living environments. By integrating sustainable technologies, smart systems, and user-centric planning, architects can create spaces that are safe, adaptive, and inclusive for an aging society. Future research should further explore innovations like AI-assisted navigation, adaptive urban infrastructure, and human-centric design to continue advancing aging-friendly architecture.

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ЖЕНЬ Веньхао, ШМЕЛЬОВА-НЕСТЕРЕНКО О.

ПЕРСПЕКТИВИ РОЗВИТКУ ДИЗАЙНУ АРХІТЕКТУРНОГО СЕРЕДОВИЩА ДЛЯ ЛЮДЕЙ ПОХИЛОГО ВІКУ: СТРАТЕГІЇ ДОСТУПНОСТІ, СТАЛОГО РОЗВИТКУ ТА ОРІЄНТАЦІЇ НА КОРИСТУВАЧА

У міру глобального старіння населення зростає й потреба у створенні архітектурного середовища, що враховує потреби людей похилого віку. У цій статті досліджуються перспективи розвитку архітектурного дизайну, орієнтованого на літніх користувачів, шляхом аналізу як громадських просторів, так і приватного житлового середовища. Визначаючи ключові елементи дизайну та можливі напрями їх розвитку, дослідження пропонує стратегії підвищення доступності, безпеки та комфорту в архітектурному середовищі. Структурований аналіз просторових адаптацій і впровадження технологічних інновацій дозволяє глибше зрозуміти еволюцію дизайну, дружнього до людей похилого віку, підтримуючи ідеї сталого розвитку та інклюзивності в умовах старіючого суспільства.

Ключові слова: дизайн для людей похилого віку, архітектурне середовище, доступність, універсальний дизайн, перспективи розвитку, дизайн середовища.