

Assessment of the Land Cover Suitability in Elderly-Friendly Tourist Areas, Using A Convolutional Neural Network

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Abstract

Purpose - This study aimed to identify land cover in tourist areas of Indonesia popular among elderly individuals. However, many of these locations do not meet the requirements to be considered elderly-friendly tourist sites. By detecting the land cover, we can determine which tourist sites suit elderly visitors., it is important to ensure that tourist destinations meet the criteria for being elderly-friendly. **Design/methodology/approach** - This study utilized a dataset of 420 UAV imagery taken from www.openaerialmap.org. The dataset was processed using a Convolutional Neural Network (CNN), specifically the YOLOv6 model. YOLOv6 is a deep-learning model renowned for its speed and accuracy in object detection. It is a CNN architecture that can generate real-time object predictions in a single feedforward, making it advantageous over other models. YOLOv6 can detect objects in various scales and aspects without the need for resampling. In this study, the YOLOv6 architecture was used to detect seven classes of land cover. The data was split into training and testing sets with a ratio of 80:20. The model produced an accuracy rate of 85,10%. **Findings** - Indonesia's tourist sites are not entirely friendly towards the elderly, as many locations lack accessibility for this age group. Elderly tourism offers engaging activities for those with reduced activity levels. **Originality/value** - At present, there are no established standards for identifying tourist locations that are elderly-friendly. This model leverages the power of artificial intelligence to determine the suitability of tourist sites and represents a revolutionary development in tourism science.

Keywords: Artificial Intelligence, Convolutional Neural Network, Elderly Tourism, Land Cover, Sustainable Tourism

INTRODUCTION

The rise in elderly tourism underscores the critical need for tourist destinations to be more accessible and tailored to the needs of senior travelers (Ahmad, & Suhardi, 2020). This demographic shift has brought a renewed focus on ensuring that travel experiences are not only enjoyable but also accessible and comfortable for elderly visitors. Despite Indonesia's status as a highly sought-after tourist destination, many of its attractions lack the necessary features to be considered elderly-friendly. Barriers such as difficult terrain, inadequate facilities, and poor accessibility can make travel challenging for older individuals, who often have specific mobility and comfort requirements.

This study is driven by the goal of identifying and evaluating the land cover of tourist destinations across Indonesia to assess their appropriateness and accessibility for elderly tourists (Jamal, & Watt, 2019). Land cover, which refers to the physical surface characteristics of a location, plays a crucial role in determining how suitable a site is for older visitors. Factors such as walkability, availability

of resting areas, and the presence of smooth pathways significantly impact the overall accessibility and experience of elderly tourists.

By analyzing land cover, the research seeks to highlight both the strengths and weaknesses of existing tourist destinations from the perspective of elderly visitors. For instance, certain types of terrain, such as steep hills or rocky pathways, may not be suitable for older individuals who may have limited mobility. Conversely, sites with level grounds, shade, and accessible facilities can greatly enhance the comfort and safety of elderly travelers.

Furthermore, the study emphasizes the need to create and implement standards for elderly-friendly tourism infrastructure (Misra, & Datta, 2020). While Indonesia offers a wide variety of natural and cultural attractions, not all of them currently meet the needs of elderly tourists. Identifying these gaps through a comprehensive land cover analysis allows stakeholders, such as tourism planners and local governments, to develop strategies that can improve the inclusivity and accessibility of tourist destinations.

Enhancing the accessibility of tourist sites not only benefits the elderly but also promotes sustainable tourism. When destinations are designed with accessibility in mind, they become more inclusive for all visitors, including those with disabilities or families with young children. Additionally, the growing market of elderly tourists represents a valuable opportunity for sustainable economic growth in the tourism sector. By catering to this demographic, Indonesia can strengthen its tourism industry while promoting inclusivity and respect for the diverse needs of travelers.

In conclusion, this research aims to contribute to the sustainable development of Indonesia's tourism sector by ensuring that its destinations are elderly-friendly. A detailed analysis of land cover will provide valuable insights into how sites can be improved to better serve elderly tourists. This approach aligns with broader efforts to promote sustainable tourism by making destinations more accessible, inclusive, and enjoyable for all visitors, regardless of age or ability.

METHODS

This section provides a comprehensive overview of the methodology, focusing on the use of UAV imagery and the application of a Convolutional Neural Network (CNN) for detecting land cover (Wang, & Ma, 2020). The research utilized a dataset comprising 420 UAV images, which were sourced from www.openaerialmap.org. These images served as the foundation for analyzing the land cover of various tourist sites. The primary objective was to assess these sites in terms of their accessibility and suitability for elderly visitors. To achieve this, the study employed a CNN model, specifically YOLOv6, which is distinguished for its efficiency and precision in real-time object detection. Unlike other object detection models that may require resampling, YOLOv6 can make simultaneous predictions across multiple objects, regardless of their size and orientation, making it particularly suitable for analyzing diverse land cover in tourist areas.

The process of data preparation and model training involved dividing the dataset into two subsets: 80% of the images were allocated for training the model, while the remaining 20% were used for testing and validation. The goal was to train the YOLOv6 model to detect seven specific classes of land cover that are commonly found in tourist destinations, with the intention of evaluating their accessibility features. The model demonstrated a high level of accuracy, achieving an 85.10% accuracy rate in detecting and classifying these land cover types. This result indicates that the YOLOv6 model is effective and reliable for land cover detection in the context of evaluating the

suitability of tourist sites for elderly individuals. Such a high level of accuracy reinforces the model's potential to contribute significantly to sustainable tourism development by identifying areas that require improvement for better accessibility and inclusivity.

RESULTS

The findings from the application of the YOLOv6 model reveal significant gaps in the accessibility of many tourist sites across Indonesia, particularly in their ability to accommodate elderly visitors. The analysis shows that a considerable number of these locations lack the necessary infrastructure to support the needs of older adults, especially in terms of mobility and comfort. This deficiency is most evident in aspects such as uneven terrain, lack of proper walkways, and insufficient facilities like resting areas and ramps, which are crucial for elderly travelers who may experience mobility challenges. Consequently, these limitations hinder the ability of elderly individuals to fully enjoy and engage with the tourist sites.

The results of this study emphasize an urgent need for enhancements in the infrastructure and land cover of these destinations to better serve the elderly demographic. Given that elderly tourists often require specific accommodations to facilitate safe and comfortable movement, improving the physical environment of tourist sites becomes imperative. This could involve installing smooth pathways, ensuring accessible entry and exit points, and providing appropriate facilities that cater to the unique needs of older visitors. By focusing on making these adjustments, tourist sites can become more inclusive, offering elderly individuals the opportunity to explore and enjoy these destinations without facing accessibility barriers.

Such improvements are particularly important for the promotion of elderly tourism, which encourages travel activities for those with reduced mobility or other age-related limitations. Elderly tourism not only contributes to the well-being and social engagement of older individuals but also has the potential to foster sustainable tourism practices that are inclusive of all age groups. By addressing the current shortcomings in accessibility, the tourism industry in Indonesia can expand its reach to accommodate a growing elderly population, thereby enhancing the overall experience for these visitors and promoting a more age-friendly approach to tourism development.

DISCUSSION

This section delves into the broader implications of the study's findings for the development of elderly tourism and sustainable tourism as a whole. The research highlights a critical gap in the current tourism infrastructure, which often fails to meet the needs of elderly travelers. Although the elderly demographic is expanding rapidly, many tourist destinations lack the necessary features to be considered elderly-friendly. These include elements like smooth pathways, accessible facilities, and resting areas, all of which play a vital role in enabling older individuals to enjoy their travel experiences comfortably and safely. As a result, there is a pressing need for tourism development policies that emphasize inclusivity and accessibility for this segment of the population.

A key part of addressing this gap is setting clear standards for what constitutes an elderly-friendly tourist site. At present, many tourism destinations lack a unified framework to guide the development of infrastructure that meets the needs of older visitors. The absence of such standards makes it difficult to evaluate the accessibility and suitability of tourist sites for elderly travelers. Consequently, elderly tourists often face challenges when navigating these locations, such as uneven terrain, long distances without resting points, and lack of signage that accounts for potential visual or mobility impairments. Developing universal standards can ensure that all destinations take

into consideration the specific requirements of elderly travelers, enhancing both their experience and safety.

The study's use of artificial intelligence (AI) offers a promising solution to bridge this gap in accessibility standards (Zeng, & Wang, 2017). By employing the YOLOv6 model, which is designed for efficient and accurate object detection, researchers can rapidly assess the land cover and physical layout of tourist sites. This AI-driven approach enables a detailed analysis of how suitable a site is for elderly visitors by identifying key features such as pathways, ramps, and other accessibility-related infrastructure. The use of AI not only speeds up the process of evaluation but also provides a level of precision that may be difficult to achieve through manual assessments alone.

Furthermore, this research contributes to the broader goal of sustainable tourism development by focusing on inclusivity and accessibility. Sustainable tourism is not just about preserving natural resources and local cultures; it also involves ensuring that all travelers, regardless of age or ability, can access and enjoy tourism destinations. The integration of AI in the evaluation of tourist sites aligns with sustainable tourism practices by promoting a more comprehensive approach to inclusivity, where the needs of elderly travelers are addressed alongside other considerations.

Moreover, the innovative application of AI in this context highlights its potential for broader use in tourism planning and development. The YOLOv6 model's capability to detect and classify land cover features makes it a valuable tool for planners, policymakers, and developers who seek to make informed decisions about improving tourist site accessibility. The model's ability to process large volumes of data efficiently means that a wide range of sites can be assessed in a relatively short period, allowing for timely interventions and enhancements to be made.

In summary, this study not only identifies the current shortcomings in elderly-friendly tourism infrastructure but also demonstrates how AI can be leveraged to address these issues effectively. By providing a novel and efficient way to assess land cover and accessibility, the research paves the way for more inclusive tourism development. This ultimately aligns with the principles of sustainable tourism by advocating for the creation of tourist destinations that are accessible to all, regardless of age, thereby improving the overall travel experience for elderly tourists and contributing to a more inclusive and sustainable tourism industry.

CONCLUSION

The study concludes that there is a notable lack of established criteria and standards for identifying tourist sites that are truly elderly-friendly. This gap in the tourism sector highlights the need for a systematic approach to evaluating and enhancing the accessibility of destinations for elderly travelers. The absence of such standards makes it challenging to ensure that tourist sites are designed or adapted to meet the specific needs of older visitors, who often require easier access, safer walkways, and adequate resting facilities. As a result, the current infrastructure of many tourist destinations may not sufficiently cater to the comfort and safety requirements of elderly tourists, underscoring the need for improvements in both planning and implementation.

By utilizing artificial intelligence to analyze land cover, this study offers a significant contribution to advancing the development of elderly-friendly tourism. The use of the YOLOv6 model demonstrates how AI can be effectively employed to assess the physical features and accessibility of tourist sites, offering a powerful tool for improving their suitability for elderly travelers. This approach provides a foundation for establishing a comprehensive framework to better evaluate and

enhance tourism destinations. However, further research is recommended to refine this model, ensuring it can accurately and efficiently assess the specific needs of elderly visitors. Such future studies would aid in establishing thorough and comprehensive guidelines that promote inclusive tourism, ultimately making travel experiences more enjoyable and accessible for the elderly population.

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