

Accelerating Moving Walkways: Revolutionizing Urban Mobility

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Abstract – As urban populations continue to grow and cities become more congested, finding efficient solutions for urban mobility is a critical challenge. This abstract explores the concept of accelerating moving walkways as a potential solution to revolutionize urban mobility. The need for policies that promote sustainable mobility and urban regeneration to improve quality of life and public health. It highlights the importance of integrated multimodal networked public transport and the shift towards multi-mobility modes and public transport in reducing the negative impacts of private car dependence in developed cities. The re-discovery of pedestrianism as a crucial acting pedestrian facilities and highlights previous efforts utilizing optimization models to determine optimal locations for accelerated moving walkways in an urban network. By focusing on the concept of accelerating moving walkways, this abstract aims to shed light on how this innovative approach can revolutionize urban mobility. The need for sustainable and integrated urban mobility solutions to address the challenges of growing populations and congestion in cities.

Keywords—acceleration, variable speeds, metro cities, pedestrian transportation, urban mobility.

I. INTRODUCTION

In today's fast-paced world, the need for efficient and sustainable urban transportation solutions is more pressing than ever. As cities become increasingly congested and the environmental impact of traditional vehicles becomes apparent, innovative alternatives are being explored. One such solution that has gained attention is the concept of accelerating moving walkways. These high-speed walkways, capable of varying speeds, have the potential to revolutionize pedestrian transportation in metro cities. In this article, we will delve into the concept, feasibility, and advantages of accelerating moving walkways, highlighting their potential to transform urban mobility.

II. THE HISTORY OF MOVING WALKWAYS

The concept of moving walkways is not new, with its origins dating back to the late 19th century. The first moving walkways were unveiled at the Chicago World's Columbian Exposition in 1893, followed by their appearance at the 1900 Paris Exposition Universelle. These early versions showcased the potential of these transportation systems, but they remained largely confined to controlled environments such as airports, train stations, and theme parks.

III. THE POTENTIAL OF ACCELERATING MOVING WALKWAYS

- Accelerating moving walkways present an dimension to pedestrian transportation in urban centers. Combining the convenience of traditional walkways with variable speeds, these walkways can match the average speed of commuting in congested cities. With speeds of up to 15km/h (9.3 mph), these walkways offer an efficient alternative for short to medium-distance travel.
- Benefits and Advantages of Accelerating Moving Walkways
- The adoption of accelerating moving walkways in metro cities offers several benefits and advantages, both for individuals and the environment. The key advantages include:
 - Efficiency and Speed: With variable speeds, accelerating moving walkways enable pedestrians to travel at a faster pace, reducing travel times and increasing overall efficiency.
 - Capacity and Throughput: These walkways have a high passenger capacity, capable of carrying up to 7,000 passengers per hour. This capacity surpasses that of traditional roadways, which can accommodate only 750 to 1,800 vehicles.
 - Space Optimization: Moving walkways are narrower than roads, requiring a width of only 1.2 meters (4 ft) compared to the 2.5 to 3.5 meters (8.2 ft to 11.5 ft) needed for road lanes. This space efficiency allows for the integration of

other modes of transportation, such as bicycles, alongside the walkways.

- **Energy Efficiency:** Accelerating moving walkways operate on electricity, making them a sustainable and eco-friendly transportation option. They consume less energy compared to buses or other motorized forms of transportation.

IV. A CASE STUDY: GENEVA'S MOVING WALKWAY NETWORK

To assess the feasibility and potential of accelerating moving walkways, researchers at the École Polytechnique Fédérale de Lausanne (EPFL) conducted a comprehensive study. Using Geneva as a case study, they analyzed the city's road network, demand, and energy consumption to design an optimal network of moving walkways.

The proposed network comprises a small ring around a car-free urban center, extending along primary roads with 47 different links and 10 gates. The total length of the network is 32 kilometers, with 37 intersections utilizing bridges and underpasses to ensure seamless connectivity.

V. FEASIBILITY AND CHALLENGES OF IMPLEMENTING ACCELERATING MOVING WALKWAYS

While the concept of accelerating moving walkways holds promise for enhancing urban mobility, there are several considerations and challenges that must be addressed before their widespread implementation. These include:

- 1. Construction Costs:** The initial construction costs of accelerating moving walkways can be substantial, comparable to building a new tramline. However, with large-scale implementation and advancements in technology, these costs could potentially be reduced.
- 2. Maintenance and Reliability:** Like any transportation system, moving walkways require regular maintenance to ensure their proper functioning. Preventive maintenance and timely repairs are essential to minimize disruptions and maximize reliability.
- 3. Weather Conditions:** Outdoor moving walkways are exposed to various weather conditions, including rain, snow, and extreme temperatures. Design considerations must account for weatherproofing and the ability to operate effectively under different climatic conditions.
- 4. User Acceptance and Behavior:** The successful implementation of accelerating moving walkways depends on user acceptance and behavior. Pedestrians need to embrace the concept, understand how to navigate the walkways, and use them efficiently to optimize throughput and minimize congestion.

VI. ADVANTAGES OF ACCELERATING MOVING WALKWAYS

- One of the key advantages of accelerating moving walkways is their narrow width compared to traditional roads. Measuring just 1.20 meters across, these walkways leave ample space for other modes of transport, such as bicycles. This efficient use of space allows for the integration of various transportation options within urban centers.
- In terms of capacity, accelerating moving walkways outperform traditional roadways. With the ability to handle up to 7,000 passengers per hour, these walkways far surpass the capacity of buses and private vehicles. This increased efficiency not only reduces congestion but also promotes sustainable urban mobility.

VII. ENERGY EFFICIENCY AND SUSTAINABILITY

- Moving walkways offer significant energy efficiency advantages over traditional buses and private vehicles. As entirely electric systems, they produce lower emissions and contribute to a greener urban environment. Additionally, their operating costs are comparable to buses, making them an economically viable alternative.
- While the initial construction costs of installing a network of accelerating moving walkways may be high, the EPFL researchers believe that the long-term benefits outweigh the negatives. As with any infrastructure project, the cost can be reduced with scale, making large and highly congested cities the ideal candidates for implementing this innovative transportation solution.

VIII. INTEGRATION WITH EXISTING INFRASTRUCTURE

One of the key considerations in the implementation of accelerating moving walkways is their integration with existing infrastructure. The EPFL study emphasizes that these walkways can coexist with sidewalks, bicycle paths, and dedicated lanes for delivery vehicles. By utilizing the existing parking lane for the installation of moving walkways, the network can seamlessly integrate into the urban landscape.

IX. CHALLENGES AND FUTURE CONSIDERATIONS

- While the concept of accelerating moving walkways holds great promise for urban mobility, several challenges need to be addressed. Maintenance, weather resistance, and potential breakdowns are important factors to consider. Additionally, cultural acceptance and a paradigm shift in how people perceive transportation will be crucial for the successful implementation of these walkways.
- Urban planners and policymakers play a vital role in evaluating the feasibility and potential of accelerating moving walkways in their respective cities. By considering the unique needs and characteristics of each urban center, they can determine the optimal infrastructure and design that best suits their transportation requirements.

X. CONCLUSION

In conclusion, accelerating moving walkways offer a compelling solution to the challenges of urban transportation. With their variable speeds and efficient capacity, these walkways have the potential to transform pedestrian mobility in metro cities. By integrating with existing infrastructure and promoting sustainability, they can contribute to creating car-less, pedestrian-centric cities. While further research and development are needed, the concept of accelerating moving walkways presents an exciting opportunity for the future of urban mobility. The implementation of accelerating moving walkways requires careful planning and coordination with relevant stakeholders. Public acceptance, safety considerations, and continuous technological advancements will shape the successful integration of these walkways into urban centers.

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