Autonomous mobility with ropeways – the next generation of modern transportation

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AURO ropeways operate without station attendants. Equipped with state-of-the-art and networked technology, they bring passengers safely and reliably to their destination in tourist areas or in cities.

1. AURO system, general overview:

AURO, short for Autonomous Ropeway Operation, revolutionizes ropeway transportation by enabling unmanned operation of ropeways. This system utilizes advanced technology, including artificial intelligence, cameras and sensors, to substitute station attendants in unmanned stations.

These unmanned stations are monitored and controlled from a centralized hub known as the Ropeway Operation Center (ROC), which can be located at a distance from the ropeway itself. Continuous supervision of the unmanned station is not necessary!

This innovative approach not only enhances operational efficiency but also offers flexibility in station personnel deployment, making it a cutting-edge solution for modern ropeway management.

2. AURO-MGD, the system for monocable gondola lifts:

The implementation of various technologies has revolutionized the activities traditionally carried out by operating personnel in ropeway stations. These technologies encompass a range of measures, starting from the station entry and extending throughout the loading and unloading areas, ensuring passenger safety and comfort. Notable technical measures include cabin stabilization, which minimizes longitudinal swaying and vertical movements during loading and unloading, guaranteeing a safe journey. Presence recognition systems, such as "pit monitoring", enhance safety by detecting individuals or objects in the pit and automatically shutting down the installation to prevent potential hazards. Specific design features, such as a larger clearance between cabin and station floor, optimized cabin step board outlines, and twist-in ski racks, further streamline the loading and unloading process while ensuring passenger safety. Additionally, provisions for special transportation needs, including separate emergency buttons and communication systems to contact the ROC, ensure accessibility and efficiency.

The 10MGD Valisera ropeway at Silvretta Montafon ski resort represents the first AURO ropeway installation in Austria. This highly frequented ropeway starts from the main terminal of the ski resort and consists of two sections. The installation of the new Valisera ropeway was completed in December 2021, integrating the innovative AURO MGD system. Both the bottom and top stations of the Valisera ropeway operate unmanned and are remotely managed through the ROC located in the mid-station. Staffing requirements have been significantly reduced from 9 to 3 employees, resulting in substantial operational cost savings. Operational experience over the first three winter seasons demonstrate the system's high accuracy, achieving approximately 97% correct stops. With an exceptional 100% availability rate, the AURO system demonstrates outstanding performance and reliability. The introduction of the AURO MGD system in 2021 marks the beginning of a new era in ropeway operations at the ski resort Silvretta Montafon.

3. AURO-CLD, the system for detachable chair-lifts:

The following examples show an overview of the specific components of the AURO-CLD system and highlight what distinguishes an AURO station from a standard chairlift station:

A key requirement is the video management system, enabling the ROC personnel to monitor unmanned stations and promptly respond to system-related shutdowns without continuous top station supervision. Notably, the AI-based Computer Vision (CV) system, Mantis, plays a pivotal role. Mantis autonomously detects various features such as chairs and passengers, determining whether situations are within the scope of normal operation or require intervention. Triggered by, for example, a falling passenger, the

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system promptly stops lift operations to prevent accidents, showcasing the first AI-assisted incident detection system in the ropeway industry. Validation based on data collected from over 3 million passengers in 10 stations underscores its efficacy. Remarkably, the system makes decisions 15 times per second using comprehensive camera coverage, surpassing human capabilities. Additionally, a range of sensors detects persons leaving designated ramp areas unauthorized, triggering system shutdowns when individuals enter restricted zones. Another crucial requirement for AURO-CLD is the detection of skiers unloading before the exit point, which is facilitated by a sliding ramp directing skiers to safety onto pressure-sensitive mats that initiate installation shutdowns if necessary.

The Alptobel chairlift – also called Silvretta chairlift – is an 8-seater in the Silvretta Montafon ski resort. It operates since 2016 and has a transport capacity of 3200 passengers per hour. The pilot operation of AURO CLD has started in 2021. After two years of further development and AI learning, the system obtained the operational licence in december 2023. The top station of the Alptobel chairlift is equipped with the AURO system and is remotely managed through the ROC situated in the bottom station. Employing the AURO system reduces staffing requirements by 50%. Notably, the AURO system intervention rate averages 10.2 times per day during the 2023/24 winter season, addressing slowdowns and full stops with 92% accuracy in critical situation detection. The AURO CLD system is certainly more complex than the AURO MGD system. It operates in outdoor environments, handles a greater number of incidents and incorporates artificial intelligence. Nevertheless, the system is already reliable and can make operations safer and more efficient. AURO upgrades for several existing chairlifts in the Silvretta Montafon ski resort are planned for the next years.

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