Case Study

Accessibility

Real-Time Guidance for the Visually Impaired

Advanced Perception, Awareness, and Navigation with RealSense Technology

Spotlight on Biped AI

Founded in 2021 in Lausanne, Switzerland, Biped.ai develops smart navigation aids for blind and visually impaired people. Its Navigation, Obstacle, and AI (NOA) mobility vest offers real-time guidance, obstacle detection, and environmental descriptions, empowering visually impaired people to navigate with greater autonomy and confidence.

"RealSense technology provides high-quality depth perception and visual information. This enables NOA to accurately detect objects, avoid obstacles, and create detailed 3D maps of the surrounding environment."

– Mael Fabien, co-founder and CEO, Biped Robotics

Challenge: Vision Language Models (VLMs) have the potential to revolutionize robotics, but their utility is hindered by challenges generating accurate and reliable visual descriptions. As a result, traditional assistive technologies often provide only limited mobility and spatial awareness.

Solution: Biped.ai incorporates depth information and images captured by RealSense™ Depth Module D430 for essential tasks such as scene understanding, object recognition, and generative AI descriptions.

Results: Equipped with 3D vision and advanced AI algorithms, Biped.ai is poised to revolutionize the way blind and visually impaired individuals move through their worlds.

Introduction

Imagine navigating the world without the ability to see. For millions of people worldwide, this is a daily reality, a profound challenge that significantly impacts their quality of life. According to the World Health Organization (WHO), an estimated 43 million people are blind and 253 million have low vision. These individuals struggle to navigate their surroundings, limiting their independence and participation in society.

Assistive technologies, such as canes, guide dogs, and screen readers, have played a crucial role in supporting blind and visually impaired individuals. However, these traditional aids often fall short, limiting real-time perception, spatial awareness, and detailed environmental descriptions.

To improve the independence of blind and visually impaired people, Biped.ai developed Navigation, Obstacle, and AI (NOA), an AI-driven mobility vest that provides real-time guidance, obstacle detection, and environmental descriptions, enabling visually impaired users to navigate with greater autonomy and confidence.

How NOA Works

NOA utilizes three RealSense depth modules D430 to replicate the human eye's field of view. The cameras perceive obstacles such as low-hanging branches, potholes, vehicles, and traffic signs, alerting users via auditory feedback through bone-conduction headphones. The guidance system is powered by self-driving vehicle software, jointly developed with Honda Research Institute.

Visual data is fused with turn-by-turn GPS navigation instructions. Users can press a button on the right of the vest to obtain more precise descriptions of their surroundings. NOA employs generative AI technology to describe common activities such as crossing a street, exiting a shop, or ascending a flight of stairs.

According to Paul Prevel, co-founder and CTO of Biped Robotics, RealSense Depth

The founding members of the Biped.ai team are passionate about their mission.

Module D430 offers accurate depth sensing, high resolution, and a wide field of view, making it an ideal choice for applications that require reliable, high-performance depth perception capabilities. "RealSense technology has been instrumental in our development of NOA," he says. "The sensors can capture both RGB/infrared and depth information. This has allowed us to create a robust system that can accurately detect objects, avoid obstacles, and provide detailed descriptions of the environment."

Selecting RealSense Technology

Mr. Prevel and his colleagues chose RealSense technology for two primary reasons. They valued the extensive developer community and mature software development kit (SDK) that provides. This ecosystem offered valuable resources and support, accelerating the development process. Second, the reliability and scalability of RealSense Depth Module D430 was essential for a product that would be used in diverse environments and by a growing number of users.

"We used the RealSense SDK 2.0 from day one, mostly to tackle image pre-processing, calibration, multi-camera sync, IMU data processing, and much more," explains Mael Fabien, co-founder and CEO of Biped Robotics. "The information is easy to find and works well, which sped up the prototyping phase. By leveraging RealSense technology and their pre-processed information, we saved hundreds of thousands of dollars in engineering hours."

Prevel concurs. "Being able to work with an existing technology ecosystem accelerated the R&D process by a huge factor," he adds. "For components as sensitive as cameras, it was important for us to rely on years of experience. The RealSense community has already tackled many of the issues we encountered, and we felt sure that we could scale our orders over time without any problem."

Looking Under the Covers

NOA operates as a fully integrated robotics platform, combining advanced computer vision algorithms with natural language processing. The cameras on the vest capture images, which are then processed to detect obstacles, track objects, and estimate 3D velocity. This information is used to generate real-time audio feedback, guiding users through their surroundings with directives such as "Turn left at 10 o'clock" and "There is a sliding door slightly to your right at about three meters."

"Having access to both RGB/infrared and depth information is a crucial element in object detection systems," Mr. Fabien explains. "Many visually impaired people also have photo-

The NOA mobility vest provides real time guidance, object detection, and physical descriptions.

NOA helps blind people move confidently through unfamiliar environments.

sensitivity and struggle with low-light situations. Getting reliable information in low-light settings was a big factor in our decision to use RealSense."

In addition to obstacle avoidance, NOA can also provide detailed descriptions of the environment. Using a vision language model (VLM), the device can analyze visual information and generate human-understandable descriptions of objects, landmarks, and other relevant features.

"RealSense has been a fantastic partner," Fabien says. "They have been instrumental in bringing NOA to market and ensuring its ongoing success. RealSense technology has enabled us to create a truly innovative product that is making a significant difference in the lives of visually impaired individuals."

"We probably wouldn't have built so many features in the last two and a half years if it weren't for the robust RealSense ecosystem."

– Paul Prevel, co-founder and CTO, Biped Robotics

Technical components of the solution

- RealSense Depth Module D430
- Navigation, Obstacle, and AI (NOA) mobility vest

Learn More

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- **RealSense Technology**

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