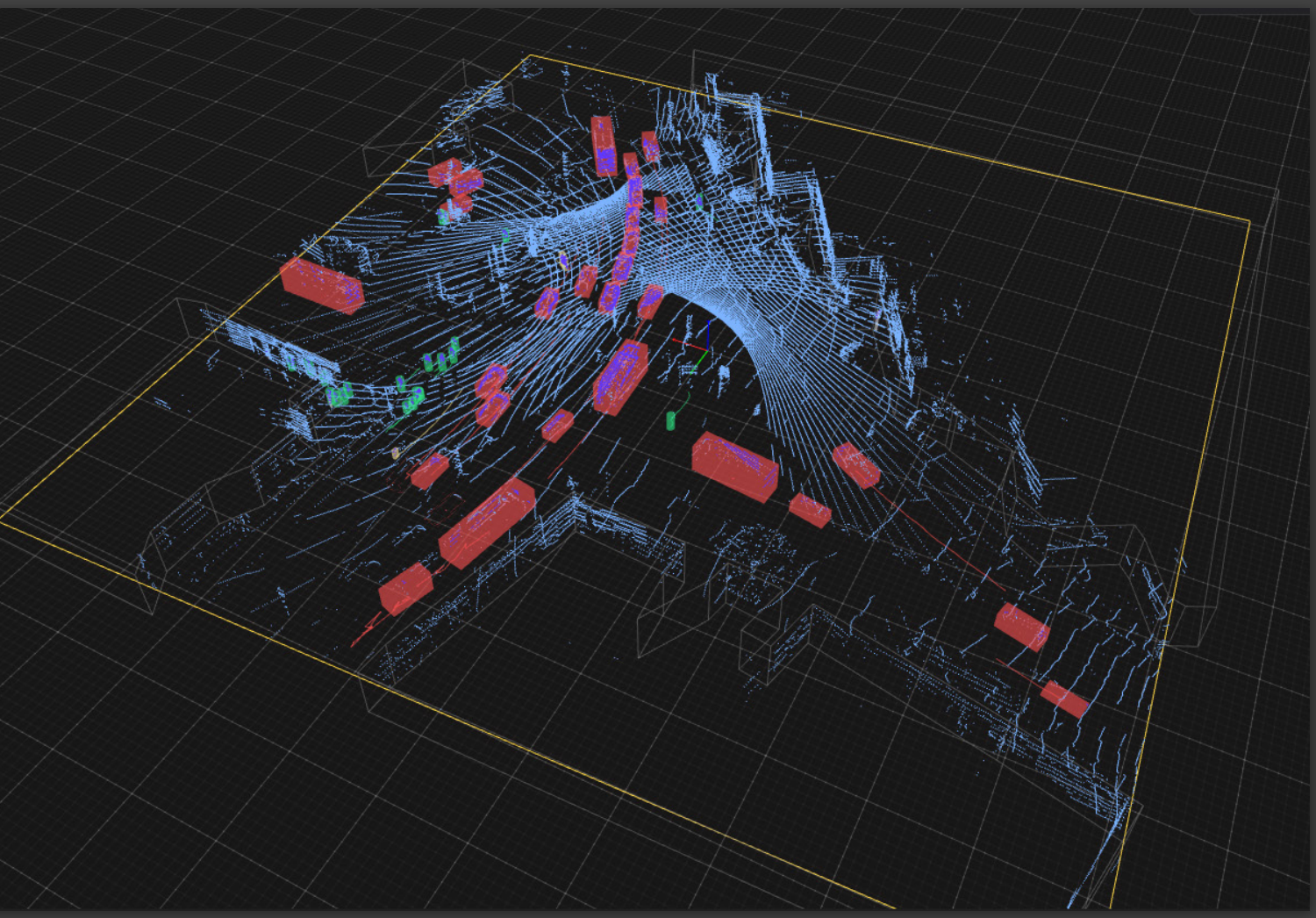
CASE STUDY

SEOUL ROBOTICS.

Intersection Insights: ALP.Lab and Seoul Robotics Develop LiDAR-Based Solution to Better Understand Road User Interactions in Salzburg Intersections



INTERSECTION INSIGHTS:

3D insight solution to unveil new level of insights into complex roadway interactions to make life-saving infrastructure improvements.

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Mission

In 2011, the European Union set a goal of reducing overall road deaths to zero by 2050. Road design is a pivotal factor in enhancing user safety and quality data is essential for analyzing opportunities for improvement. ALP.Lab and Seoul Robotics have partnered to develop a solution that is able to capture the intricate movements of high-risk intersections in order to better understand, plan, and improve roads for vulnerable users.

Problem

Cyclists have had the greatest increase in serious crash-related injuries on European roads in the last decade at 24%, with a high proportion of fatalities occurring at intersections. While most modes of transportation have seen significant reductions in fatalities since the Vision Zero initiative was announced, the number of bicycle crashes is the only category to remain consistently high, signaling the need for highly detailed, targeted, and actionable insights.

Until recently, most intersection monitoring technologies have lacked the sophistication to accurately identify, track, and analyze the movements of pedestrians and cyclists, instead prioritizing vehicle analytics. It's becoming increasingly important for municipalities to invest in new technologies designed to capture the insights needed to inform essential improvements needed to better protect cyclists and other vulnerable road users.

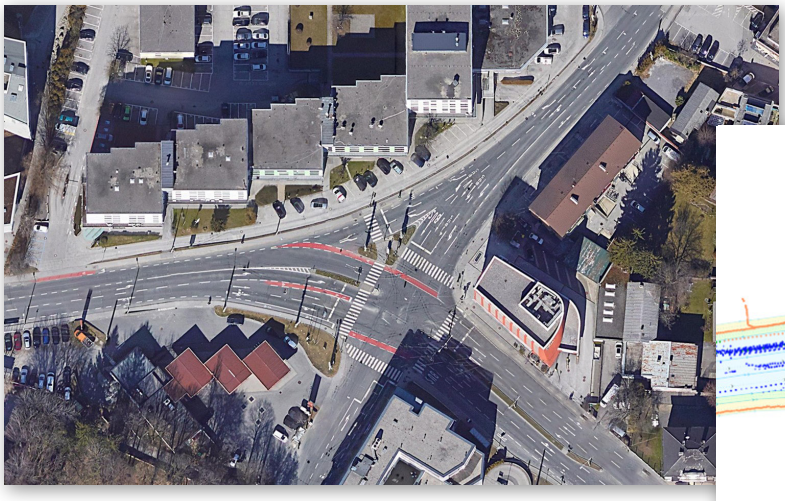
Solution

In order to improve cyclist safety and save lives, Seoul Robotics and ALP.Lab developed a LiDAR-based system, powered by Seoul Robotics' 3D perception software, SENSR™, to collect higher accuracy data that would help better understand interactions between vulnerable road users and vehicles.

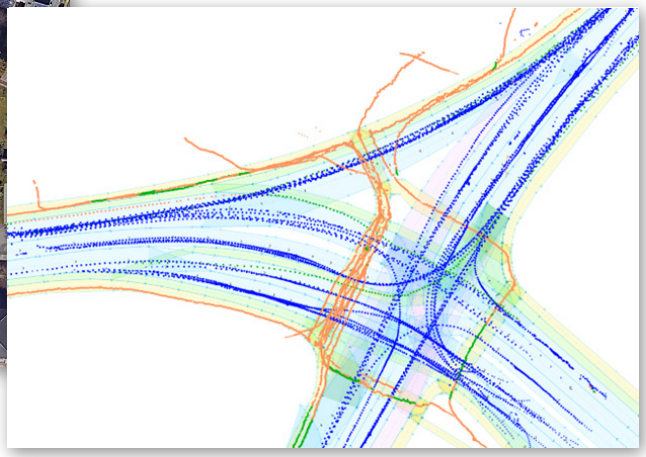
Two specific intersections in the city of Salzburg that have multiple bicycle lanes and therefore many interactions between motorized vehicles and cyclists have been equiped with the LiDAR-based system. A software-based solution is currently being developed by Salzburg Research, on behalf of the Mobility Laboratory zukunftswege.at in order to properly understand the various interactions between road users and and to make strategic adjustments to better protect users.

The solution is designed to analyze the precise and high-frequency data collected at intersections in order to derive granular insights into the bicycle and car lanes, pedestrian crossings, bus stops, vehicle counts, and origin destination metrics on all road users movements, as well as insights into the interactions between road users.

LiDAR was chosen for its high level of data accuracy as well as the versatility to target very specific complex interactions that required analysis. SENSR is able to discriminate between different object types (bicycle, vehicle, pedestrian, etc.) and combine multiple sensors for a holistic single picture of the intersection and the connecting roads. Additionally, LiDAR collects non-biometric data, providing privacy protection for citizens, and open access to the data enables further custom processing.



(c) Illustration based on basemap.at



(c) Salzburg Research

How it Works

Sterneckstraße has been equipped with 6 sensors and a LiDAR-Processing Unit running Seoul Robotics' SENSR perception software. A mix of cabled and wireless connections was used, with wireless sensors powered by batteries and solar charging to ensure continuous operation.

ALP.Lab implemented a five-step processing stack on top of SENSR in order to:

- Record object paths and trajectories
- Add context such as signal phases
- Format data for traffic analytics and simulation software

SENSR's industry-leading deep learning AI is able to accurately detect, track, and classify hundreds of street-level objects, and is uniquely able to differentiate between cyclists, pedestrians, and vehicles to anonymously analyze their movements. SENSR collects data from the strategically positioned sensors for insights into the position and speed of objects within the intersection, even in harsh weather conditions.

The 3D perception software seamlessly fuses multiple LiDAR units to get a full picture of the intersection and the connecting roads in one field of view in order to record high-quality data that will be utilized for unprecedented analytics.

> Prioritizing insights for cyclists and pedestrians has enabled us to gain unprecedented insight into some of the most complex and dangerous roadway interactions. With this granular data, the city of Salzburg is empowered to make strategic changes that will ultimately better protect vulnerable road users and reduce the number of fatal accidents on our roads.
>
> — ALP.Lab

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Result

Salzburg Research is able to record precise and high-frequency data of all road user movements and then develops and evaluates algorithms for analysing road user behavior and conflict situations between them. Valuable insights can be derived, which can contribute to an increase in road safety for all road users and lay the foundation for improvement measures at the analysed intersection.

These valuable insights can specifically enable improvements in efficiency and safety measures at the analyzed intersections. It will also lead to learnings that can be applied in city planning initiatives, as well as, directly to other similar intersections in the city of Salzburg, contributing to an increase in road safety for citizens.

Broadening Access to Powerful Insights

Building on the success of the deployment, ALP.Lab plans to deploy the technology within other intersections in Graz and Salzburg, Austria, as well as in Zurich, Switzerland, contributing to enhanced road safety on a broader scale.

About ALP.Lab

ALP.Lab is the Innovation Hub for automated climate-neutral mobility and provides comprehensive services for safe and secure testing of automated driving technologies. ALP.Lab was founded in 2017 with the support of the Federal Ministry for Climate Protection and the Austrian Research Promotion Agency FFG. ALP.Lab provides an integrated test chain for automated driving functions and technologies, offering testing activities on test tracks and public roads. ALP.Lab offers a holistic traffic monitoring solution to create testing scenarios out of real-life driving behavior in primary, secondary, and urban road networks. Further, ALP.Lab is an accredited Euro-NCAP laboratory for active safety testing and is highly experienced with different testing equipment and proving grounds. A strong network of industrial and scientific partners support the capabilities of ALP.Lab for safe and secure testing of any autonomous mobility solutions. For more information, visit **www.alp-lab.at** and follow ALP.Lab on **LinkedIn** or **YouTube**.

About Seoul Robotics

Founded in 2017, Seoul Robotics is on a mission to make level-5 autonomy a reality. The company's core technology, LV5 CTRL Tower, is a commercial autonomous driving solution that uses vehicle-to-everything (V2X) technology in combination with 3D sensors to move vehicles without requiring human intervention or sensors on each vehicle. The company has partnered with OEMs, such as BMW, to deploy their technology within factory settings, Powered by deep learning AI with weather-filtering capabilities, Seoul Robotics' LV5 CTRL Tower provides the most advanced and accurate environmental data for safe and efficient autonomous driving.
For more information, visit **www.seoulrobotics.org**.