

March 18<sup>th</sup>, 2022

Kudan Inc.

## Kudan 3D-Lidar SLAM (KdLidar) in action: In a shopping mall for autonomous cleaning or service robots

We have been relentlessly working on multiple exciting autonomous mobile robot projects with both Visual SLAM and 3D-Lidar SLAM, and wanted to share a bit of a sneak peek at how our SLAM works on actual projects and environments.

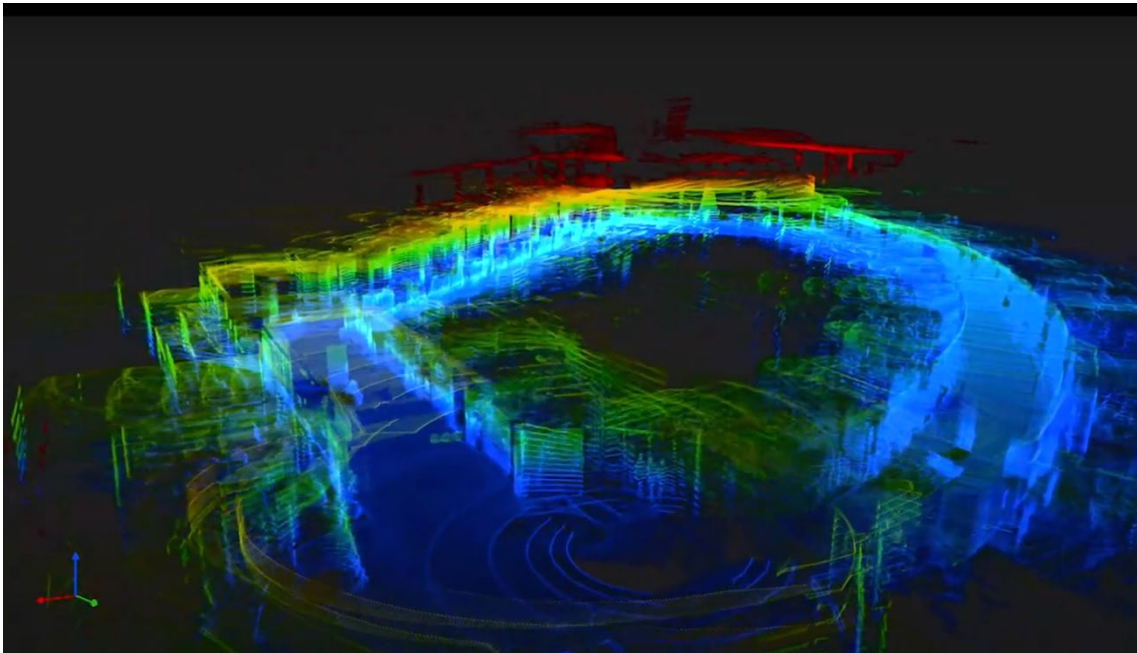
This post features one example of KdLidar being used for autonomous mobile robots in an indoor commercial facility (Data courtesy of Squad Robotics).

These are some of the typical challenges in commercial environments we frequently face:

1. **Ramp:** Slopes and ramps are part of the design in many commercial facilities such as shopping malls, and office buildings. Ramps can be a challenge for 2D-Lidar based SLAM, as it tends to get lost because the plane where the laser is directed changes and the laser doesn't see the same plane as it goes on and off the ramp.
2. **Moving objects and scenery changes:** As you can imagine, people and sometimes crowds are usually part of the make of an environment in commercial buildings, especially during the day. In addition to these dynamic environments where the scenery changes, lighting conditions change over a day, and throughout the year. However, our 3D-Lidar SLAM algorithm is robust against these challenging conditions, and combined with 3D-Lidar's wider FoV and precise depth-sensing capabilities, enables us to overcome these challenges.
3. **Nighttime:** Cleaning robots or security robots are expected to operate during the nighttime also. Obviously, vision-based approaches struggle in dark or dim environments. 3D-Lidar SLAM doesn't.
4. **Initial start-up:** Some 2D/3D-Lidar SLAM requires an initial indication of where the robot is, in order to actually enable the system to understand where it is when the robot is activated. At times when a robot loses tracking, an operator is required to manually move the robot to known locations to reset the position. Kudan's 3D-Lidar SLAM is able to localize its position automatically, and precisely without any external intervention.

With all that being said, here is a demo of KdLidar operating in a shopping mall.

[KdLidar in Action: SLAM in a shopping mall for autonomous cleaning or service robots](#)



As you can see, when the robot completes the first loop (at ~0'17), it triggers a loop closure, and the map was adjusted and optimized to enhance its accuracy. The result is a sharp, crisp, and connected point cloud.

To provide more context, here are some of the details of the environment, and demo parameters.

- Size of the area: 180m x 130m (or 590 ft x 430 ft)
- Sensor: Ouster OS0-16 3D lidar: Only lidar, without further sensor fusion (however, we can utilize other sensors if needed)
- Map generation time: 6 minutes on an Intel core i7 (data collection was 44 minutes)

While the area is relatively small and straightforward, KdLidar can easily scale to handle most commercial environments. We hope you think of us when you need an easy, robust SLAM solution for your commercial facility!

We are quite excited to see many projects going well and contributing to autonomous mobile robot expansion in the world!

## **About Kudan Inc.**

Kudan (Tokyo Stock Exchange securities code: 4425) is a deep tech research and development company specializing in algorithms for artificial perception (AP). As a complement to

artificial intelligence (AI), AP functions allow machines to develop autonomy. Currently, Kudan is using its high-level technical innovation to explore business areas based on its own milestone models established for deep tech which provide wide-ranging impact on several major industrial fields.

For more information, please refer to Kudan's website at <https://www.kudan.io/>.

## ■ Company Details

Name: Kudan Inc.

Securities Code: 4425

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■ For more details, please contact us from [here](#).

