

Use Cases: LiDAR 3D Point Cloud Visualisation with Clustering

1. Further Development of Room Planer Apps

Room Planer Applications are a way of virtually testing the arrangement of different furniture. In these apps (like the “IKEA Roomplaner”), the user makes several smartphone photos from which a 3D Model of the room is created. Inside the virtual room, models of different furniture (for example from the IKEA catalogue) can be placed, to test the look and practicability of the arrangement.

Using point clouds and image segmentation, it’s possible to further develop these applications to “cut out” the furniture that’s already set in the real-world version of the room. In this way, the user could start with an empty room to try out different pieces of furniture and decorations.

2. Gaming

A user could make a LiDAR Scan of an environment of their choice (e.g. the own living room) and then, using point cloud data format, transform this scan in a map for video games. In a first step, one could define “playable areas” in the scan, and use it for virtual motor races in an environment that looks like the own home. In a second step one could use image segmentation to define different things in the environment’s point cloud (like a plant, a couch or a table) as separate virtual objects. These objects could then be used as interactable things in maps for platform games (like Super Mario). In this way, the player could interact with a model of their own fridge to fill his ingame character’s life energy or interact with their own wardrobe to change the character’s outfit.

3. Security

Using LiDAR one can make scans of the rooms and corridors of big buildings, including their windows, doors and staircases. Using 3D models of the point clouds one can run different training simulations to find the best emergency route from each place inside the building. These trainings could also include sensor data from thermometers of humidity/light sensors to also involve environmental circumstances in the calculations. Furthermore, using point cloud segmentation, things on the corridors, like chairs, plants, printers, etc. could be marked as moveable items. In different simulations one could find the best place to put these items, so that they are still accessible to serve their purpose, but don’t interfere with people leaving the building in the case of an emergency.

4. Environmental Study:

Application: Ecologists and environmental scientists could leverage point cloud data to study and analyse natural landscapes. The ability to segment trees, rocks, and other geographical features offers a comprehensive view of the environment and its components.

Implementation: A research team might scan an area of special interest - perhaps a forest threatened by deforestation or a coastal region experiencing erosion. By uploading this data into the tool, they can quickly isolate specific elements (e.g., different types of trees or rock formations). This segmented data could be used to assess the health of an ecosystem, track the impacts of climate change, or study the habitat of specific animal species.

5. Robotics and Navigation:

Application: Robots operating in unfamiliar or complex environments require precise data about their surroundings to navigate safely.

Implementation: A rescue robot might be dispatched into a collapsed building. By scanning the environment and uploading the data into the tool, the robot can quickly differentiate large debris from smaller ones and plan a safe path to rescue victims. The segmentation ability helps distinguish vital from non-vital elements, allowing the robot to focus on its primary objectives.

6. Escape Room Design:

Application: Escape rooms often require intricate designs to offer participants a challenging yet solvable puzzle.

Implementation: A designer could scan a room or building where a new escape room is planned. With the scanned data, they could then use the tool to identify "zones" or clusters of interest. This might be a hidden room behind a wall, a series of clues arranged in a pattern, or specific features that could be utilized for puzzles or challenges.

7. Interactive Learning Environments:

Application: Educators are always looking for novel ways to make lessons more engaging and interactive for students.

Implementation: An educator might scan a historical location, like a castle or a battlefield. Using the tool, they could then identify clusters or areas of special interest - perhaps locations where key events took place. Students could then take a virtual tour of this scanned space, with each cluster representing an interactive learning module. For instance, a cluster in a castle kitchen might pop up a video about medieval cooking techniques, while another cluster on a battlefield displays an augmented reality depiction of a battle.

8. Navigation for blind people

Blind individuals can enhance their navigation by gaining awareness of their surroundings by using Lidar scanning. Instead of using traditional methods like canes that heavily rely on tactile feedback and can sometimes be imprecise, LiDAR scanner assists them in identifying and measuring the distance to objects including locating features like doors. Real-Time Mapping and combination with other sensor such as audio sensor also help them to navigate their surroundings more efficiently and safely. A danger alert can also be implemented so that they could prevent themselves from involve in any accident.

These detailed applications underscore the potential of point cloud data and how it can be utilized across various fields to offer **deeper insights, better planning and more engaging experiences.**