

## DISASTER SCENE ANALYSIS AND SIMULATION USING LASER RANGE IMAGES

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### SUMMARY

Laser range images are used for varieties of tasks such as surveillance, robot vision or outdoor scene modeling. Our project aims to develop an algorithm to recognize outdoor disaster scenes by using range sensor images for robot's navigations, creating disaster maps and evaluation plans. We use a mobile robot which has a line scan laser range sensor and a rotation stage. The sensor is able to scan a range data in a vertical direction and surrounding range image can be taken by rotating the sensor by rotation stage. The obtained range images are segmented into semantic regions such as people, cars or buildings. This segmentation result is used for following application tasks.

#### 1) Creation of 3D digital maps onto Google Map images

By aligning captured range images, we can automatically create 3D maps of the large environment. Here, we used Google Map data for the 'ground-truth' map. The captured and segmented range images are matched to the Google Map image according to the semantic segmentation results and we can create 3D maps of the large environment.

#### 2) Simulation of evacuations

According to the large environmental map and semantic segmentation results, we can perform the evacuation simulations by using multi-agent based evacuation simulation techniques. By combining the recognition algorithm and digital mapping technique, users can easily grasp the disaster situation and find the optimal way of evacuation.

#### 3) Recognition of the disaster buildings

We applied machine learning techniques to the range images to find disaster building. Namely, we prepared miniature buildings of normal condition and collapsed condition and the image features from them are learned. The learning results are used to find the collapsed structured of the actual range images.

