세미나

2019305050 이제희

새로운 주제

Computer vision

컴퓨터로 시각 데이터를 처리하는 분야

- SLAM
- 3D Object Detection

SLAM

Simultaneous Localization and mapping
동시적 위치 추적 및 지도 작성

1. Localization : 자신의 위치를 찾는 것

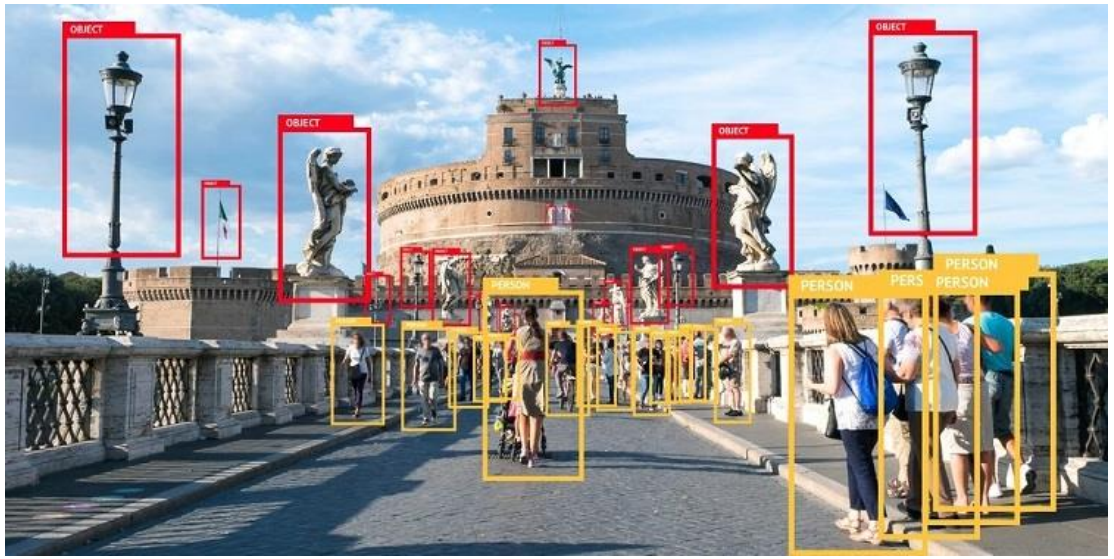
2. Mapping : 주변의 환경을 지도에 그려냄

센서를 사용해 위의 두가지 문제를 해결
➔ 카메라, LiDar

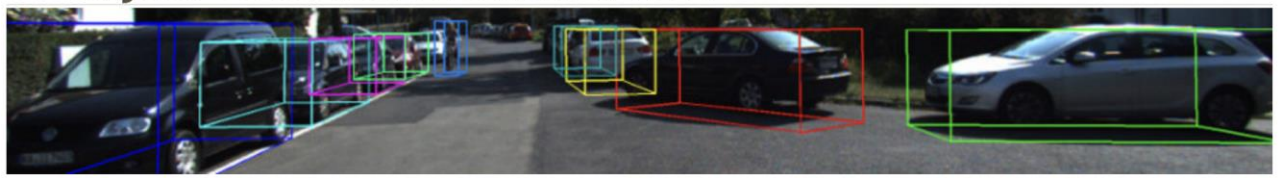
Lidar : 빛 감지 및 범위를 의미
레이저 펄스를 쏘고 반사되어 돌아오는 시간을 측정해
반사체의 위치좌표를 측정

3D Object Detection

Object Detection : 영상에서 관심 객체를 탐지하고 찾는 것



3D Object Detection Evaluation 2017

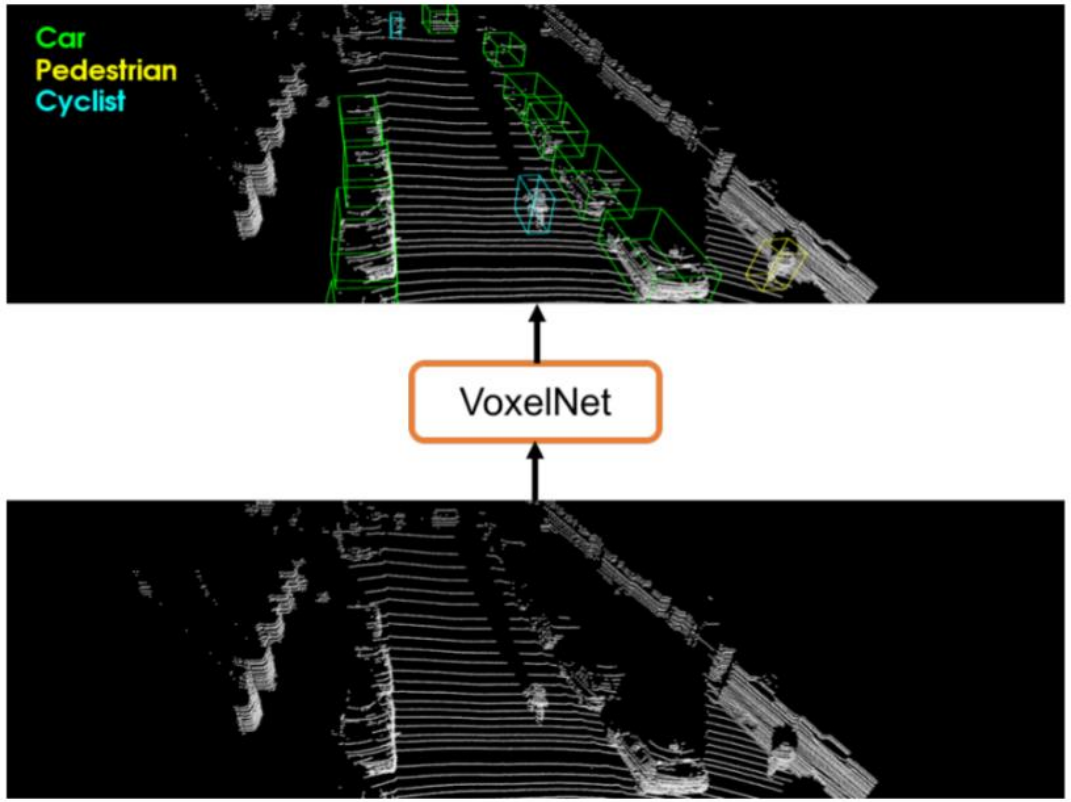


VoxelNet: End-to-End Learning for Point Cloud Based 3D Object Detection(2018)

특징

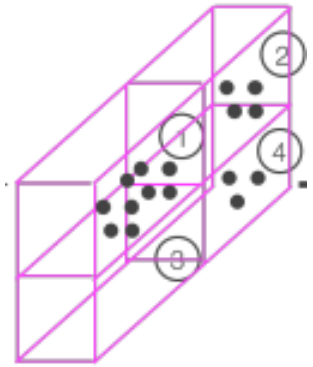
Voxel : volume + pixel. 부피를 가진 픽셀

End to End
Feature extraction (특징 추출)
+ Bounding box prediction

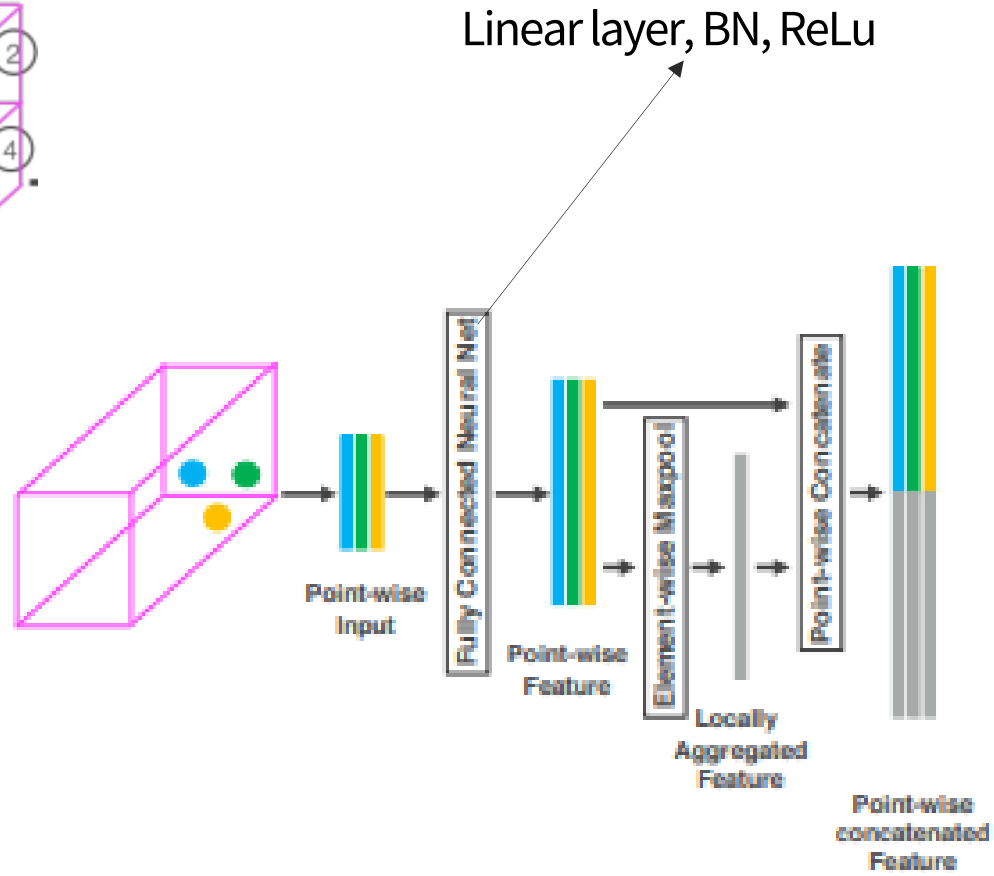


VoxelNet: End-to-End Learning for Point Cloud Based 3D Object Detection(2018)

1. 3D Point Cloud를 3D Voxel로 나눔



2. Voxel Feature Encoding layer를 이용해 통합된 특징 표현으로 변환



3. 특징 표현을 사용해 3D 객체 탐지

Voxel 내부 point들의 shape information을 학습 가능

VoxelNet: End-to-End Learning for Point Cloud Based 3D Object Detection(2018)

Method	Modality	Car			Pedestrian			Cyclist		
		Easy	Moderate	Hard	Easy	Moderate	Hard	Easy	Moderate	Hard
Mono3D [3]	Mono	5.22	5.19	4.13	N/A	N/A	N/A	N/A	N/A	N/A
3DOP [4]	Stereo	12.63	9.49	7.59	N/A	N/A	N/A	N/A	N/A	N/A
VeloFCN [22]	LiDAR	40.14	32.08	30.47	N/A	N/A	N/A	N/A	N/A	N/A
MV (BV+FV) [5]	LiDAR	86.18	77.32	76.33	N/A	N/A	N/A	N/A	N/A	N/A
MV (BV+FV+RGB) [5]	LiDAR+Mono	86.55	78.10	76.67	N/A	N/A	N/A	N/A	N/A	N/A
HC-baseline	LiDAR	88.26	78.42	77.66	58.96	53.79	51.47	63.63	42.75	41.06
VoxelNet	LiDAR	**89.60**	**84.81**	**78.57**	**65.95**	**61.05**	**56.98**	**74.41**	**52.18**	**50.49**

Table 1. Performance comparison in bird's eye view detection: average precision (in %) on KITTI validation set.

Method	Modality	Car			Pedestrian			Cyclist		
		Easy	Moderate	Hard	Easy	Moderate	Hard	Easy	Moderate	Hard
Mono3D [3]	Mono	2.53	2.31	2.31	N/A	N/A	N/A	N/A	N/A	N/A
3DOP [4]	Stereo	6.55	5.07	4.10	N/A	N/A	N/A	N/A	N/A	N/A
VeloFCN [22]	LiDAR	15.20	13.66	15.98	N/A	N/A	N/A	N/A	N/A	N/A
MV (BV+FV) [5]	LiDAR	71.19	56.60	55.30	N/A	N/A	N/A	N/A	N/A	N/A
MV (BV+FV+RGB) [5]	LiDAR+Mono	71.29	62.68	56.56	N/A	N/A	N/A	N/A	N/A	N/A
HC-baseline	LiDAR	71.73	59.75	55.69	43.95	40.18	37.48	55.35	36.07	34.15
VoxelNet	LiDAR	**81.97**	**65.46**	**62.85**	**57.86**	**53.42**	**48.87**	**67.17**	**47.65**	**45.11**

Table 2. Performance comparison in 3D detection: average precision (in %) on KITTI validation set.