RoboGuide

Intelligent Collision Avoidance Tracking and Hazardous Object Detection for Robot Temi

suivi intelligent permettant d'éviter des collisions et de détecter des objets dangereux pour les robots Temi

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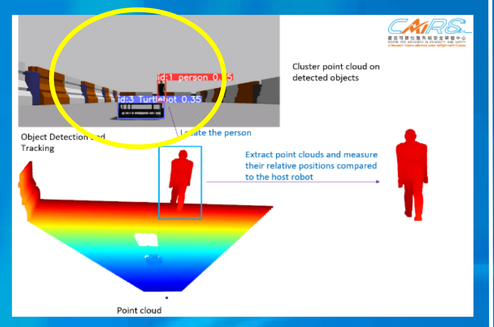
Problem:
- When a mobile robot moves, it is difficult to predict the velocity & collision area of moving obstacles that increases the collision risk

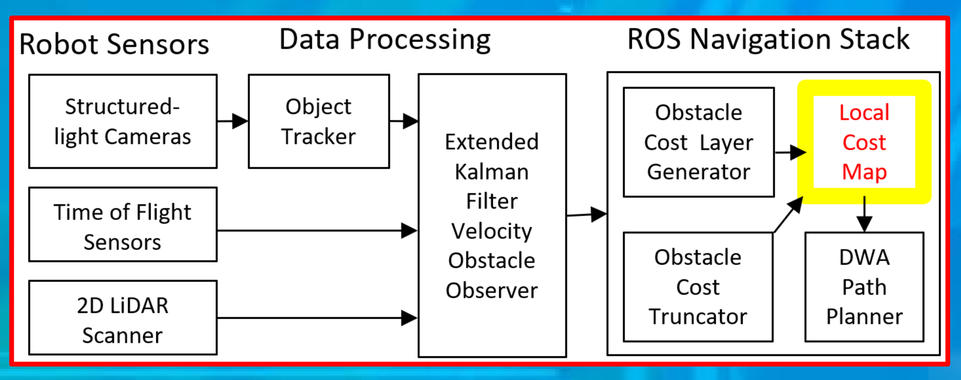
Objective:
- Apply object tracking methodology on sensors (LiDAR/RGB/depth) to create a local costmap for collision avoidance prediction of dynamic object(s)



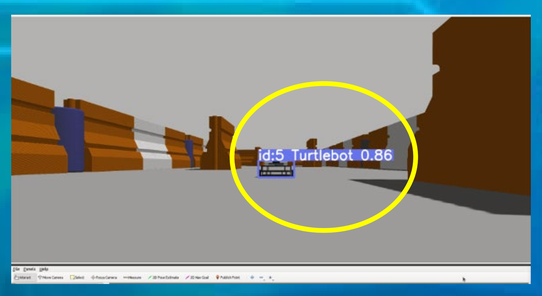
Tracking distance and velocity

Methods:
- Real-time detection & tracking of moving obstacles.
- Track/predict the position & velocity of moving obstacles, with short-term updates
- Build an improved local cost map that includes areas occupied by the moving obstacles

Results:
Accurately track moving object(s) and predict probability of collision with local cost map (>90%)



Robot Temi



Tracking Moving Object

Local Cost Map

Problems:
- Hazardous object in private venue (e.g. hospital) is difficult to be detected
- It is difficult/impossible to collect sufficient number of hazardous object images for AI model training

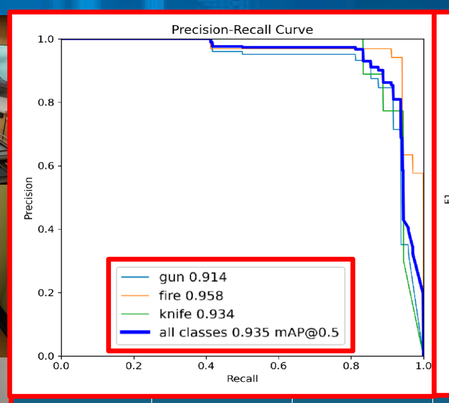
Objectives:
- Equip patrolling robot with hazardous object detection function using AI
- Create synthetic images by simulation to solve the insufficient/no image problem.

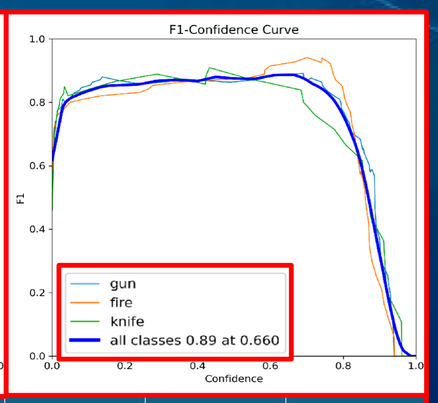
Patrolling Robot Temi

Methods:
- Apply hazardous object detection with transfer learning on YOLO AI model
- Simulate hazardous images (fire/knife/gun) by Nvidia Omniverse for YOLO model training

Results:
Accurately predict (Precision ~ 90%) hazardous objects in hospital environment on robot Temi

Synthetic Images in Hospital





	Instances	Precision	Recall	mAP50	mAP50-90
All	122	**0.893**	0.806	0.886	0.642
Gun	39	0.917	0.855	0.929	0.741
Fire	51	0.8	0.783	0.851	0.504
Knife	32	0.961	0.78	0.878	0.682

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