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Navigation of a Mobile Robot in the Indoor Environment Based on Visual Odometry Particle Filter and SLAM-Gampping Algorithm

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Introduction

◆ Localization is one of the important method for autonomous indoor robots to recognize it's position.

◆ In general, navigation of mobile robots is conducted using GPS. But in indoor environment, GPS is unavailable.

◆ Several algorithms have been applied to localize robots, but still needs to be improved.

◆ In this study, we proposed a method to navigate mobile robots in the indoor environment by combining visual odometry particle filter and SLAM-Gampping algorithm.

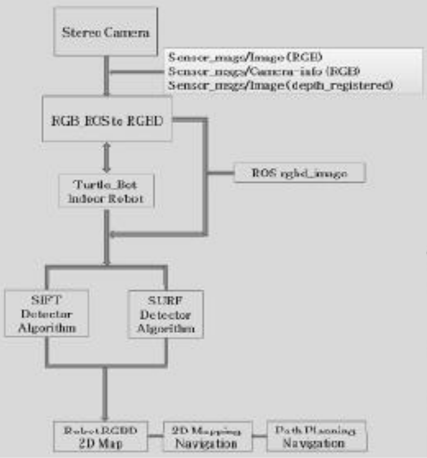
Materials & Methods

◆Autonomous Navigation Systems

◆Hardware Specifications

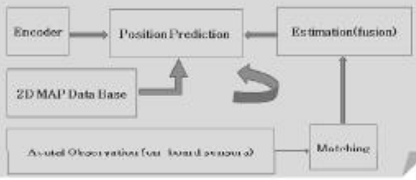
RPLIDAR A2 Laser Scanner		ZED Stereo Camera	
Model: RPLIDAR	A2	Depth Resolution	0.5 ~ 20m 6M
Distance Range:	0.15 ~ 12 m	Lens Field of View: 90° (H) x 60° (V) x 110° (D) max.	f/2.0 aperture
Angular Range:	0~360 degree	Sensor Resolution	4 M pixels
Distance Resolution:	0.5 ~ 1.5 mm	Connectivity	USB 3.0 port with 1.5m
Angular Resolution:	0.45 ~ 1.35 degree	Size and Weight	175 x 30 x 33 mm (6.89 x 1.18 x 1.3")
Sample Duration:	0.25 millisecond	Depth Format	32-bits
Sample Frequency	2000 ~ 8000Hz	Stereo Baseline	120 mm (4.7")

◆ Procedure of Mapping Navigation



◆SLAM-Gampping Algorithm

◆ Visual Odometry Particle Filter



Results

◆ Visual odometry particle filter algorithm showed that robot could know the position and follow the target location.

◆ The position error was relatively small in the office building.

◆ In future work, we will test the robot in more complicated indoor environment such as, glass

Simultaneous of Visual Odometry Particle Filter Localization

Real Time Simultaneous Localization and Mapping

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