## Abstract

The Compact Autonomous Robo-Assistant (CARA) is a land-based robot that aims to localize within an indoor environment using a combination of perception and odometry. In order to achieve perception, a two-dimensional RP LiDAR captures a 360-degree laser scan of the environment and a camera which captures landmark frames for image processing. Odometry is achieved through quadrature encoders and fused BNO055 IMU data which helps localize with a continuously updated pose estimate within its environment. This robot follows a differential drive kinematic model and uses a motor controller with an Arduino MEGA 2560 to power and control two planetary gear DC motors via pulse-widthmodulation (PWM). A NVIDIA Jetson Nano was used as a Linux machine capable of running the Robot Operating System (ROS) – a middleware that facilitates robotics software development through hardware abstraction and published packages. A ROS software package was developed for the robot control and visualization. In the robot's current state, the package allows for tuning velocity output using PID control and publishing odometry messages given requested motor speeds.

### **Problem Definition**

Design and build a robot that can autonomously deliver a payload from one office to another within MECC.

	Key System Components	
	Component	Purpose
	NVIDIA Jetson Nano	Top-level processors; Master Node
	Arduino MEGA 2560	Low-level processor; Serial Node
	RP LIDAR A1	2D Laser Scan
	BNO055 IMU	Accelerometer, gyro, magnetometer
	MDD10A Motor Driver	Dual channel control of motors (PWM/direction)
	Planetary Gear Motor with encoders (2)	Diff-drive; determine robot velocity; odo information
	Raspberry Pi V2-8 Megapixel	Read office number
Total Cost of Key Components		

# Autonomous Robo-Assistant

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