



Marker-Based Robotic Guidance System(MBRGS)

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PROJECT OVERVIEW

Managing warehouses has been very expensive and inefficient because of high labor cost and human errors. Therefore the purpose of this project was to design, build and test a robot that will accurately navigate a RFID scanning system through a warehouse in a predetermined path.

The objectives and constraints of the project included:

- Navigate the robot to a point via predetermined path at a maximum speed of 3 ft/s
- Provide location data of the robot at any given time with an accuracy of ± 1 inch.
- The guidance system must have an emergency stop and should allow manual overriding of the robot.
- Collision avoidance feature to guide the robot to stop with in a foot if there are obstacles on its path
- System should be modular and should be adaptable for different paths.

HOW IT WORKS

The MBRGS performs three distinct actions simultaneously. First it guides the robot to a specific point in the warehouse. Second, the robot performs its autonomous operations while safely avoiding obstacles. Third, the robot determines its absolute position within the warehouse at any given time.

The robot's drive wheels are controlled by DMC-2143 Galil motion controller. Two TR3 Tru-Trac rotary encoders are used to determine the distance the robot has traveled. As the robot moves along its path the encoder counts are reported to the motion controller. ColorMax-1000 color sensor is utilized to track a line of tape on the ground. The color sensor detects the line and tells the PhidgetSBC2 color values. PhidgetSBC2 communicates with Galil motion controller via network switch to make minor adjustments to the steering. Using four MaxBotix EZ-1 sonar sensors connected to PhidgetSBC2 the robot detects upcoming obstacles and stops before it hits them. To determine the robot's absolute position in the warehouse the system uses a combination of barcodes at the intersections of pathways and encoder wheel revolution counts. The bar codes serve as absolute position markers. They will designate the intersections of the warehouse pathways.

