Optimum Path Creation & Guiding System for AGV

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Introduction

This is a system which will find the shortest path between two points avoiding the obstacles. This will create new best paths at every new situation. This could be used in anywhere such as ware house, shopping malls, etc.
There are so many Automated Guided Vehicles (AGV), simply install this system and the vehicles can move freely.



Real World Problems

There are so many systems existing, but all of them use either guided method or obstacles avoidance method. The main problem is that they don't have dynamic capabilities.

<u>In guided method</u>

- If a new obstacles is placed on the path, system freeze
- Installation cost is high for every new path
- If a new path is available system will not use unless it's guided

<u>In obstacles avoidance</u>

- Does not choose the shortest path

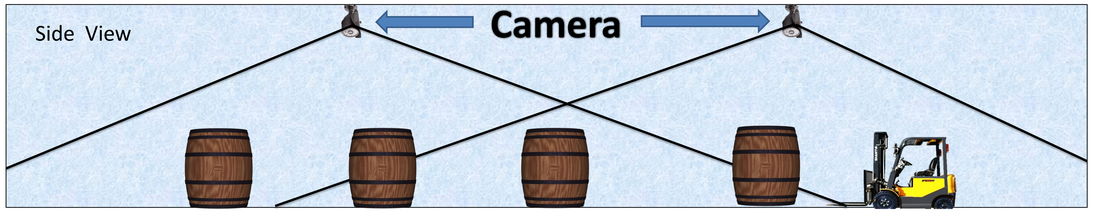
Our system (Solution)

- While AGV is travelling our module will continuously scan for obstacles. If a new obstacle is placed on the path, our module will stop the AGV and wait for a certain period of time (10 sec), if the obstacle is still there, our module will request centralized system for a new path.
- One time installation cost. Each time centralized system will dynamically create optimum path for every situation.
- If a new path is available, centralized system will choose the shortest path.

System overview

In this a typical scenario where our system could be used. Items required are

- Barrels (obstacles),
- Fork lifter
- Multiple cameras.



- <u>Number of cameras needed may vary</u>
  - Depending on the size of the ware house (area of floor) the number of cameras will change
- <u>We will fix a module to the fork lifter</u>
  - This module will communicate with our centralized system and guide the AGV.

<u>Arial view</u>

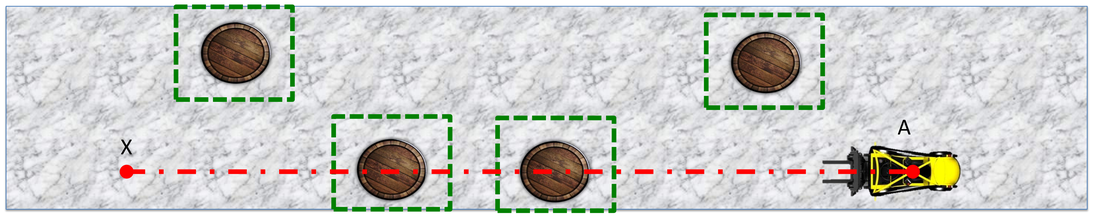
- System will overlap pictures
  - Pictures taken from each camera are joined in to one big picture
- Identify the obstacles
  - Using image processing technique (thresholding) system will identify obstacles

Module will

- <u>gets its location coordinates</u>
  - current location of AGV will be found using indoor location identifying system using Wi-Fi
- <u>Send to our centralized system</u>
  - location will be sent to the system using Wi-Fi

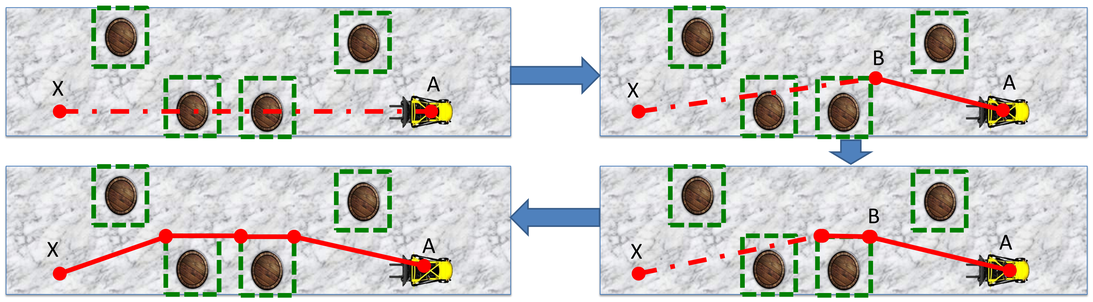
Using obstacles detection and localizing

- find the obstacles
- draw boxes
- when we box we add a constant value (= 0.5 * width(fork lift))



- <u>Fork lifter's current location is starting point</u>
- <u>User will set the destination</u>
  - for example, if the user wants to fork lifter near inventory I, then the destination is location of inventory I.

- draw a line from starting point (A) to destination(X)
- find the first obstacle in between



- find the nearest edge (using pythagoras theorem, nearest edge will give nearest distance).
- Now we have found the next point B.
- Now from B we draw a straight line to X and find the nearest edge.
- These steps will continue until we reach X. At last we create the full path A, B …. X.

- path will be sent to the module.
- Module will guide the fork lifter through that path.
- While going the module will scan for obstacles.

Advanced Features

- Highly Scalable
  - When the room size is increased, increasing the number of cameras will solve the problem
- Highly Dynamic
  - Optimum path is created at each time
- Low cost
  - One time cost and expansion cost are less
- More Reliable
  - Guide every step of AGV through optimum path

Conclusion & Future Works

As you can see our system will create path made up of straight lines. We are working on to make the path more dynamic, ie, curve path.