Progress Report 3 – Patent Lookup

Patent Summary - US009731896 - Autonomous Order fulfillment and inventory control robots

A cleverly designed robot that allows for the use of 3-dimesnions to aptly manage a warehouse or storefront style setting. This patent is the conglomeration of a few unique processes that allow it to operate as an independent entity in the supply chain. To provide this automation, complex systems have been designed to handle the variable heavy nature of reality. The main issues tackled are:

1. Navigation
   1. Warehouse Mapping
   2. Item/inventory location
   3. Mode of Travel
   4. Collison Avoidance
2. Product Retrieval
   1. Ordering
   2. Physical Retrieval Mechanism

Navigation in an open terrain requires this design to have specific knowledge of the area in which it operates. The “Autonomous Order fulfillment and inventory control robots”, or AOFICR’s, uses a means of mapping the designated area to allow for basic maneuvering to correct locations. Using local or GPS positioning the unit maps all of the pathways with shelf locations for safe travel.

While the unit maps the terrain, it makes a stop at each shelf to scan a unique shelf identifier, to map the location of a shelving unit with items to be retrieved. These local coordinates are uploaded along with the mapping. When a shelf is found the unit then undergoes an item finding function to map the z-axis location of all the products on that shelf. Scanning a second set of unique item identifiers, these are then linked to the shelf identifier to make for speedy recovery.

With the open space architecture there are some extreme circumstances placed upon the robot in terms of maneuverability. This design solves this issue with a four-wheeled design, with two drivetrain (motorized) wheels and two stabilizers. This design offers for precision turning and compact design, opposite motor turn offers for two wheels to spin in a circle along a central z-axis reference. To spot obstacles as well as help in mapping the area, a LIDAR system is used. This helps to map out objects in relative real-time. Allowing for the safe travel of people amongst the robots.

The next main function is for the unit to retrieve the items being requested. Ordering being the first responsibility. This starts from a server, or “control center”, at the front section of the operation. This control center can be tasked to do a variety of things, but basic ordering being the most pronounced across all models. Using this unique ordering code, the robot can then traverse to the shelf identifier that the item is located.

This robot uses a scissor lift device to conquer the z-axis dilemma. Using the shelf identifier as the initial marker, the unit extends the lift to the saved item location and scans the item identifier to ensure proper accuracy. If the correct identifier is scanned then a basic corkscrew device, found in many a vending machine, extracts a bin from the shelving. This corkscrew then extracts the desired number of items into its own storage container. Then returning them to a designated drop-off zone.