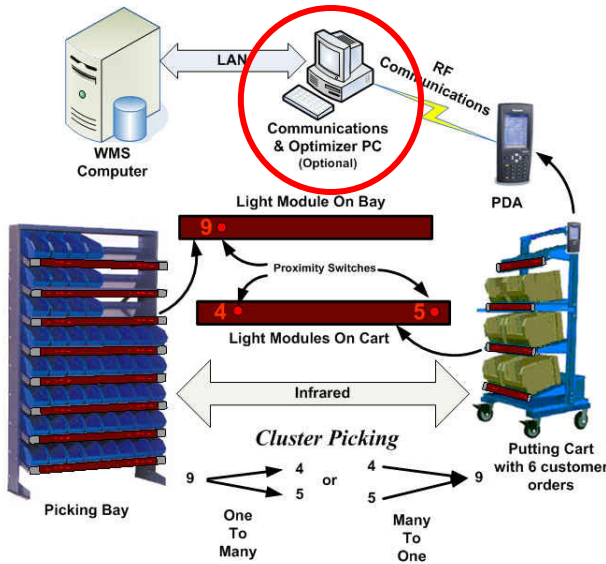


Batch Optimization System



ALEXA increases customer satisfaction and efficiency by innovatively combining voice, Bluetooth barcode scanning and light-directed picking to provide **FAST, ACCURATE, BATCH PICKING** in distribution and manufacturing environments.

Requiring *only a PDA* to control lighted displays on picking bays and putting carts, Alexa enables cluster picking, reverse logistics and sequenced picking using low-cost wireless infrared communications for **light-directed picking** from storage bays and **light-directed putting** to cart locations. **Voice direction** and wireless Bluetooth **bar code scanning** confirmation is used for locations without lighted displays.

The Problem

A wave of 200 orders must be picked this morning using carts with a capacity of 10 orders per cart. How should be orders be batched so that the 20 cartloads can be quickly picked with the least amount of work? For example, it would be wise to place orders requiring products from only one part of the picking area on the one cart and orders requiring products from only another area on a different cart.

The Goal

Ideally, the batches should be chosen so that several variables contributing to the total workload are optimized. For example these variables should be minimized:

- walking distance to pick all items (walking tends to dominate total pick time)
- stops on the traversal path (pick as much as possible at each stop)
- unused space on cart shelves (multiple size cartons may result in wasted space)

while these variables should simultaneously be maximized:

- priority compliance (important orders are picked first)
- number of common items (clustering common picks across multiple orders saves time)
- items meeting a carrier departure schedule (pick orders on the truck/container before it leaves)
- employee workload balance (keep all employees busy picking rather than idle waiting for work)

These variables can be weighted to represent relative importance of one variable against another.

The Alexa Solution

For all but trivial size waves, the problem of computing a true optimal solution is intractable, meaning it is so hard that computing the “best” solution is impossible within a practical timeframe. A few attempts have been made to use “greedy” algorithms that create a few batches in a wave with excellent picking performance, but other batches in the wave have poor performance. Consequently, total performance is often poor.

The Alexa Optimizer System uses a “genetic algorithm” that borrows from the principles of biology to quickly compute a “near optimal” solution. Unlike “greedy” algorithms, Alexa’s method creates batches so that picking performance is optimized across the total set of batches in the wave.

Alexa’s optimizer creates excellent batches so quickly that the system can also support “waveless” picking in which orders can continuously be added to the set of unpicked orders and batches created dynamically from all unpicked orders.