Boost my packet

1. Introduction

Where and how on Earth do they manage to waste all that time on your eBay and Amazon deliveries?

Even the biggest express courier services such as DHL, FedEX and UPS are still on a relatively low level on utilization of automation. Most eCom related logistics distribution hubs, such as Amazon and Alibaba, also depend heavily on “the human contribution” to their handling processes. Very much due to under-developed and -utilized automation tech, a typical logistics hub is just a huge, flat one-story box covering easily 100,000+ m^2, where incoming and outgoing parcels are manually consolidated to shipments.

Also, what may look like a sophisticated global real-time tracking & tracing system to a frustrated layman is, infamously, just as good as its worst link. And, oh boy how low can you actually go - the logistics API is often still just a piece of paper!

Last-mile delivery robotics and drones are an oxymoron. There is no space left in the metropolis or at hub airports to develop traditional distribution centers able to sustain delivery operators with any practically-relevant flocks/fleets of autonomous delivery units.

Ever-growing logistics operations cannot retain nor recruit enough staff for their physically-straining manual tasks. This global phenomenon since mid-2010s is here to stay.

It is high time to sweep the arena clean and start developing the Logistics Facility of the Future, solving the above problems with the same solution: a (fully) automated multi-story handling operation with minimal footprint and interfaces fit for serving dense populations.

2. Project Goals

The two-stage project will design, develop and demonstrate a simulation of a *next generation multi-story (air) cargo facility*. The project will include:

1. A system architecture and topology model
    a. Logical and numerical concept simulation with for example truck/aircraft shipment generators, process flows, both human and robotic handling agents, storages, and conveyor systems etc.
    b. A method for optimizing the model; AI suits such a complex task!
2. A reality check!
    a. Populate the model with real world data – load manifests, shipment schedules, specifications of existing automation subsystems and structural elements of a facility
    b. Visualize the results for final human validation, external communication and feedback

Don't be fooled. This is *far beyond state-of-the-art*. Nothing like a multi-story automated cargo handling operation exists by date. You can let your "AI-ideas" fly free: identify bottlenecks, reveal conflicts and resourcing problems, analyze and present numerical process data, and optimize your system for example for given shipment profiles etc.

A successful outcome has good chances of contributing to the concept design of a real reference implementation at its early stages.

3. Technologies

The Project is expected to utilize open-source tools and environments to most of its development tasks. It is suggested to use a common programming language such as Python or C++, along with all the available libraries. These could be combined, for example by programming the main logic with Python but relying on C/C++ to run computationally intensive subsystems. Blender and/or Unity could suit for modeling and visual simulations. You may use any AI system you consider suitable for optimization – or develop your own!

4. Requirements for the students

The students will need

- The ability to program in a common programming language such as Python or C/C++
- Familiarity with a visualization framework such as Blender or Unity
- Be able to parse real world cargo manifests for realistic input data
- Be able to split a complex system into smaller, manageable parts
- Be able to document in English

5. Legal Issues

The results will be published under a permissive free software license such as BSD or MIT. The client will share some confidential information with the students.

6. Client

The project will be executed under the Department of Computer Science, Aalto University. The project is guided by the Product Owner, Visiting Researcher Antti Nurminen. The project will receive real world data from ePiece Ltd.

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