

## Automated Shipping Container Transfer in Chicago

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### The Problem

As the United States has no transcontinental railroad, shipping containers must be transferred between railroad companies in order to cross from one side of the country to the other. As a major point of interchange between many of the nation's railroads, Chicago is the third largest intermodal port in the world, and the location where many of these transfers take place – mostly by truck. **2 million containers pass through Chicago a year, and containers are getting stuck for up to two days! Railroads are looking to bypass the city and truck transfers are crowding the streets. Chicago has exhausted its capacity.**

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### Objectives

Our primary purpose in IPRO 307 is to minimize the time delays and cut down on the number of trucks transporting containers between rail heads in Chicago. To do this, *a fully automated system of container lifting and transport* was conceived over the spring 2004 semester, incorporating an overhead mobile crane network (called GRAIL) and an interyard transit network. This semester, we have continued development of the system with a number of objectives aimed at making its implementation a feasible reality:

- Produce interyard network maps for Chicago showing the shortest possible route and region-sensitive route. Additionally, produce preliminary engineering designs for the structure of this interyard network.
  - Develop the design of the overhead mobile GRAIL cranes (called shuttles).
  - Determine the design of the automated computer control systems responsible for managing operations.
  - Perform a full financial analysis of the expected costs of construction/operation of the system to determine/prove its feasibility for possible investors.
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### Critical Barriers

- Non-existent information regarding transfer volumes between Chicago rail yards necessary for making critical network design decisions.
  - Missing knowledge regarding linear induction technology to be utilized in shuttles.
  - Lack of access to models of existing automated control systems of comparably complex nature.
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### Accomplishments

- GIS Maps of two possible interyard networks and CAD drawings depicting preliminary design of the network structure.
  - CAD drawings depicting the basic design of the shuttle and its components.
  - Descriptions of the container identification and shuttle location systems as well as a detailed flow chart of the automated computer procedures that would control rail yard operations.
  - IRR, volume numbers, and estimated total costs of construction for both proposed network designs as well as IRR and estimated total cost of construction for a network/GRAIL implementation solely in Chicago's busiest intermodal transfer corridor (between the Corwith and 47<sup>th</sup> Street rail yards), determined using an Excel model.
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### What Next?

With the extensive challenges of the proposed automated network/GRAIL system, much still remains to be done to prove/disprove the feasibility of the solution and to bring it to a point where it could be implemented:

- Feasibility analysis and design of the steel GRAIL structure and technical design of shuttle pathway.
  - Feasibility analysis and design of the shuttles' LIM technology or a next-best alternative if necessary.
  - Finalization of the Chicago-based interyard network based on analysis of right-of-ways, neighborhoods, land availability, and existing obstacles.
  - Development of the automated computer programs to control rail yard operations.
  - Updated financial/feasibility analysis as the project further progresses towards a complete network design.
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