

## Executive Summary

FedEx has provided a challenge for the IEEE SoutheastCon 2006 Competition. The task is to design an autonomous package-loading robot that will barcode scan, collect, and deliver a total of 12 packages to three airplanes before departure. The first plane will depart in three minutes, the second in four minutes, and the third in five minutes. The challenge will be simulated using plywood for the airplane loading area, a FedEx triangular shipping tube for the package chute, cardboard boxes for airplanes, and wooden blocks for the packages. Universities from across the Southeast will be competing to determine who can create the best robot. The winner will be determined by three rounds of competition scored on speed and accuracy of package delivery.

Mississippi State University's SECon team has designed a robot that quickly and effectively completes the task. The robot adheres to SoutheastCon's starting size requirements of 8" x 8" x 12" and avoids added complexity by only extending one arm for package retrieval. Despite its lack of expansion, the robot is able to collect, sort, and store all 12 packages during a single visit to the chute. This approach requires only 1/12<sup>th</sup> of the delivery time needed for a single-block collection approach without adding a significant amount of loading and sorting time. By stacking the packages externally for storage, each plane's packages can be unloaded in a single action. This unloading approach requires 1/4<sup>th</sup> of the time needed for a single-block delivery system.

The robot has been tested on a plywood playing field built to SECon's specifications. Numerous package orderings were tested for the chute to ensure the robot's ability to handle any sequence of package collection. Figure 1 below shows the playing field and the robot.

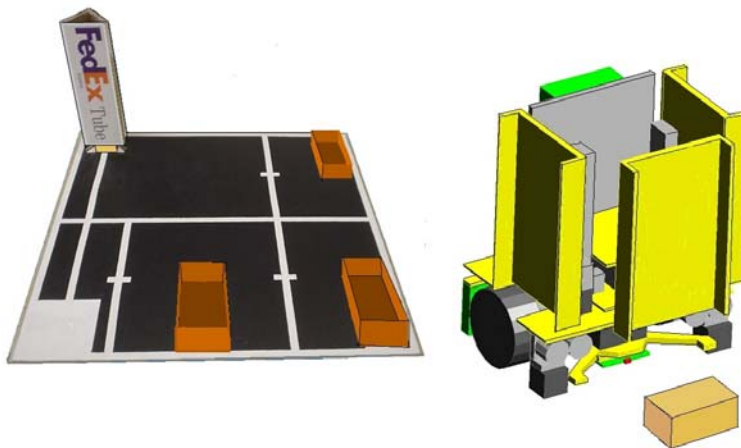


Figure 1: Playing Field and Robot

Thorough navigation simulations have been conducted to guarantee that the locomotion software can reliably deliver the robot to each loading and unloading station. Due to the nature of the SECon competition, reliability is the keystone to the robot's success. Victory hinges on the ability to complete the task successfully in three consecutive attempts. In order to achieve the

necessary reliability, power conservation is extremely important to ensure all motors and circuitry function properly throughout an entire round. To conserve power, the robot disables motors, servos, and the barcode scanner when they are not in use.

A first place victory at SoutheastCon 2006 in Memphis on March 30<sup>th</sup> would bring deserved recognition and praise to the dedicated faculty and students of the electrical and computer engineering department of Mississippi State University.