MECH 455 Course Project

2022 Fall

Basic Elevator Scene

Group Member

Hao Xue (20127037)

Ethan Hsiao (20103333)

Yan Zhou (20095060)

Submitted to Prof. Zak

Dec 6, 2022

# Scene Design

The scene selected was the basic elevator using code ELB. The objective is to categorize and transport different sizes of boxes such small, medium, and large items through different levels using two elevators. The working principle is that the largest boxes were assigned to the third floor as sensor read the dimensions and transported to the exit on the first floor using the elevator. When the object is ascending or descending via elevator, the lights on both elevators will be on. The elevator can only be activated for the next pallet after receiving one pallet on the exit for safety. Minor changes were adopted to the original scene expect the longer conveyor on the bottom and an exit slide to receive boxes. In order to achieve smoother and safety transportation of items, those two elements were added in the elevator scene. A detailed illustration of the elevator scene is provided in Figure 1.

A picture containing indoor, metal

Description automatically generated

Figure : The elevator scene shown in Factory IO.

# Control Design

## 2.1 Entrance Conveyor Control

This section of code was created to trigger the entrance conveyor when the start button is pressed. It also integrates the stop button and emergency stop, both of which will shut down the conveyor movement. It can only be restarted once the emergency stop has been reset.

A screenshot of a computer

Description automatically generated with medium confidence

Figure : Logic for initiating and ending conveyor.

## 2.2 Box Size Identification

Light array emitters are used to read the height of boxes entering the system from the entrance conveyor. It is used to differentiate between large, medium, and palletizing boxes which are separated by one beam in height. The control code then assigns a memory to the respective box size, used to identify the box type throughout the movement process. A screenshot of a computer

Description automatically generated with medium confidence

Figure : Logic for identifying the box sizes.

## 2.3 Elevator Ascent Control & Left Right Transfer Initiation

Based on the identification assignments from the light array sensor, elevators are actualed upon the arrival of boxes to the edge of the left loading platform. Once height has been reached this control code also stops the elevators and triggers the transfer of boxes from the left elevator to the right. Exceptions made for palletizing boxes to be transferred on ground level.

Diagram

Description automatically generated

Figure : Logic for controlling elevator ascent and initiation of left to right transfer

## 2.4 Middle Conveyor and Exit Conveyor Control

This section of the control code is triggered when the central conveyors are needed to transfer a box from the left elevator to the right or when a box needs to be transferred out of the system.

A screenshot of a computer

Description automatically generated with low confidence

Figure : Logic of initiating middle and exit conveyor.

## 2.5 Elevator Descent Control

Once boxes have been transferred from the left to the right elevator, the descent control code stops the boxes when they are loaded onto the right elevator and brings them down to ground level for removal from the system.

Graphical user interface, application, Teams

Description automatically generated

Figure : Logic for elevator descent control.

## 2.6 Box Size Reset

As the boxes leave the system and go down the chute, they trigger a box size reset that allows the control code to correctly assign a box size to the next box.

A screenshot of a computer

Description automatically generated with medium confidence

Figure : Logic for resetting the box size.