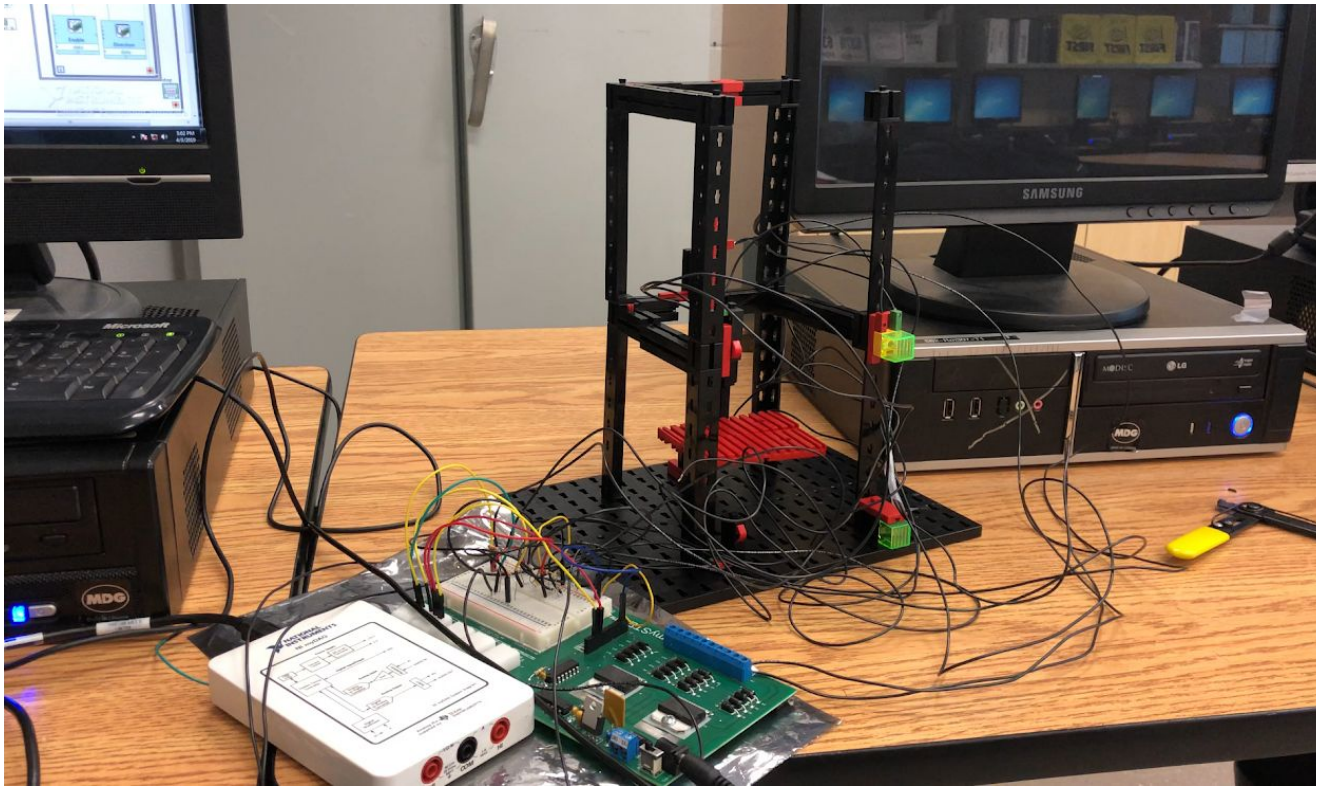
Creating a Labview Elevator



INTRODUCTION

The goal of this project was to create a functional elevator using technology provided by National Instruments. The project was constructed through the use of the myDAQ system and the program was compiled using LabVIEW. The frame of the elevator consisted of plastic building blocks provided by FischerTechnik.

FEATURES

The elevator constructed had the ability to move in two directions: up and down. The direction the elevator could move was dependant on the floor that it was currently on. Since no other sensors were available, floor detection was done through the use of two buttons. When the elevator was at a certain floor, the button corresponding to the elevator floor number was pressed by the back of the motor moving the elevator. An example of how the buttons are laid out is shown in Figure 1. The program controlling the buttons would be notified of a button press occurring on the myDAQ system, and depending on which button was pressed it could make an assumption of the physical location of the elevator. Pressing one of the buttons would stop the elevator, as it would assume that it has reached its target destination. Beyond the buttons used for floor detection, there were 4 other buttons used to control the movement of the elevator. Two of these buttons were physical entities, while the other two were virtual buttons found in the LabVIEW code. The virtual buttons and the physical buttons had the same function. Two of the four buttons were used for moving the elevator up to floor two, and the other two buttons were used for moving the elevator down to floor one. As an implemented safety feature, if the floor detection button was held at the floor that the user wanted to go to, the elevator would not move. For example, if the elevator was at floor two, the floor

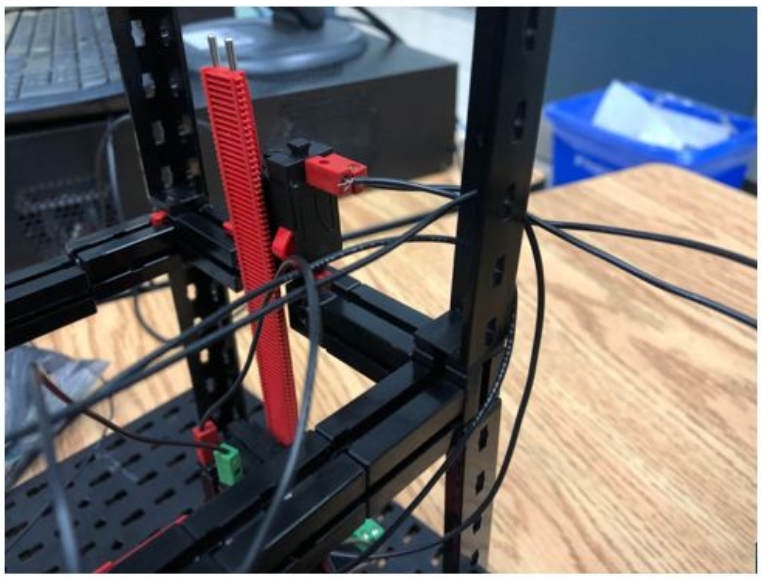


Figure 1 - Elevator setup

detection button corresponding to floor two would be held. If the user pressed the button to move the elevator up to floor two, the elevator would not move as it would already be at the desired floor. The code blocks that implements these functionalities is shown in Figure 2. Note that the truthy and falsy code blocks are relatively the same for Floor 2 and 1.

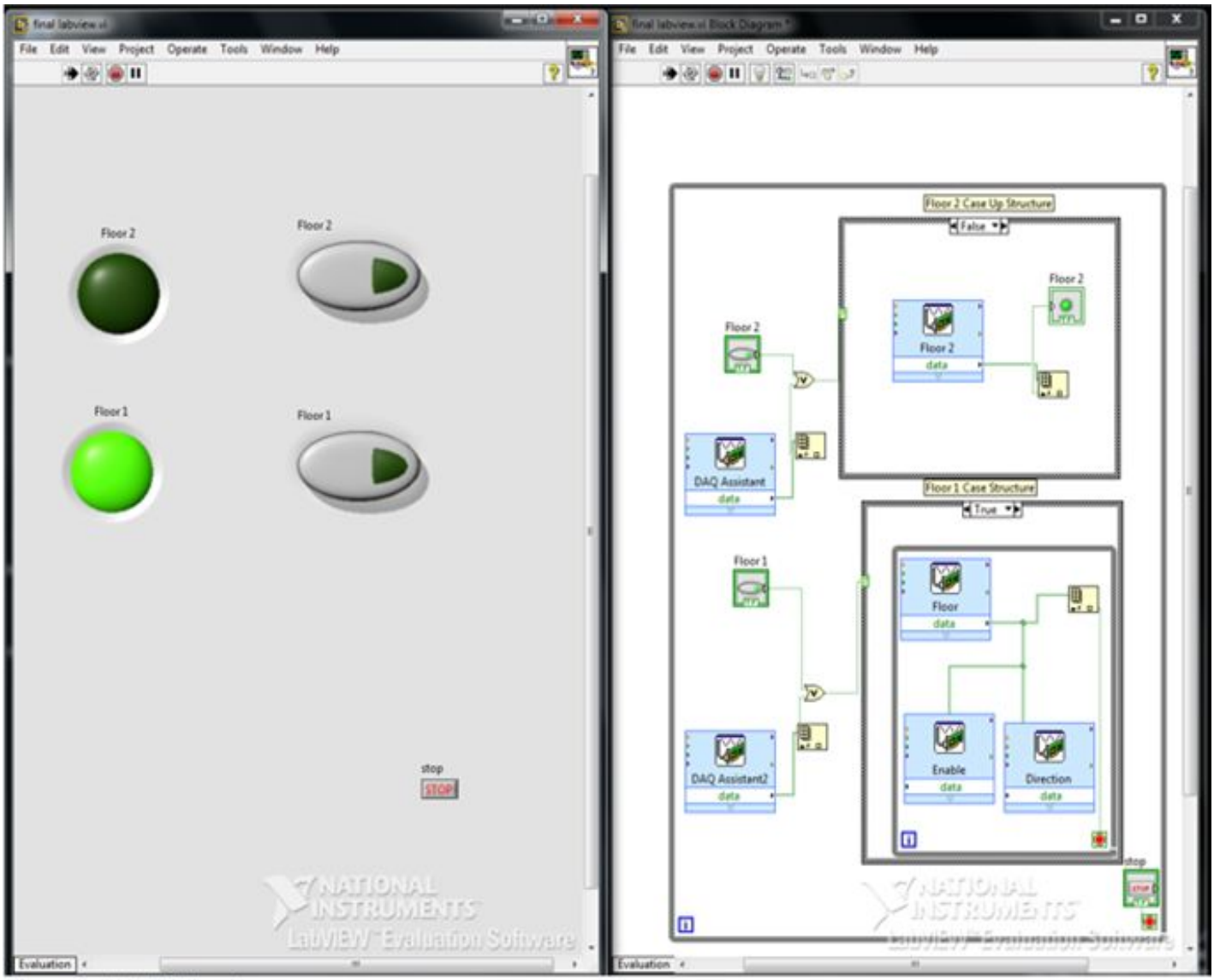


Figure 2 - LabVIEW code

CHALLENGES

When constructing the elevator, there were many obstacles that needed to be quelled. One of the problem faced when designing this elevator was finding an adequate way to stop the elevator when it had reached its desired floor. Originally, LabVIEW's time-loop feature was planned to be used to move the elevator for a set number of seconds until it had reached the correct floor. Ultimately, this mechanism for movement was not pursued due to it presenting many inconsistencies when the elevator was in use. The elevator would more often than not, need to be updated with new time intervals to improve accuracy. The degradation of the gears used to move the elevator would cause the time intervals to be altered even further. For this reason, a floor detection system was used consisting of two push buttons that would inform the program of the elevator's current location. Aside from the issue of stopping the elevator, problems regarding the opening movement of the elevator were faced. The goal was to move the elevator through the use of physical buttons and the virtual buttons found in the LabVIEW program. This initially proved to be a challenge as the program would constantly output error codes relating to occupied pins and the state of button presses. However, this problem was solved by analyzing the breadboard for improper wire placements, researching online, and analyzing our program. The reason that there were problem getting this feature to work, was because the same buttons being used to start the elevator were being used to stop the elevator. This meant that the same buttons were being constantly checked in the form of an infinite loop that LabVIEW could not comprehend. To resolve this issue, two more buttons were added which were assigned to different pins to rescind the error codes.

NEXT STEPS

While designing and building the elevator, there were many different ideas about how to improve the elevator's functionality. However, due to time and resource constraints, these ideas were not able to be brought to life. Nonetheless, given more time and resources, there would be an implementation of many features that would help the user experience and give more applications for the elevator. For instance, given more parts (i.e. tracks and blocks) and time, more floors would be constructed. However, given more floors, a better way than to use a motor and track would be to use things such as air pressure and magnets to help the elevator move more quickly and efficiently

while increasing the safety of the elevator. The safety would be increased as the magnets would hold the elevator in place in the event that the air pressure drops. Also, given more time, exterior lighting would be added so people waiting for the elevator would be able to know when the elevator was arriving.

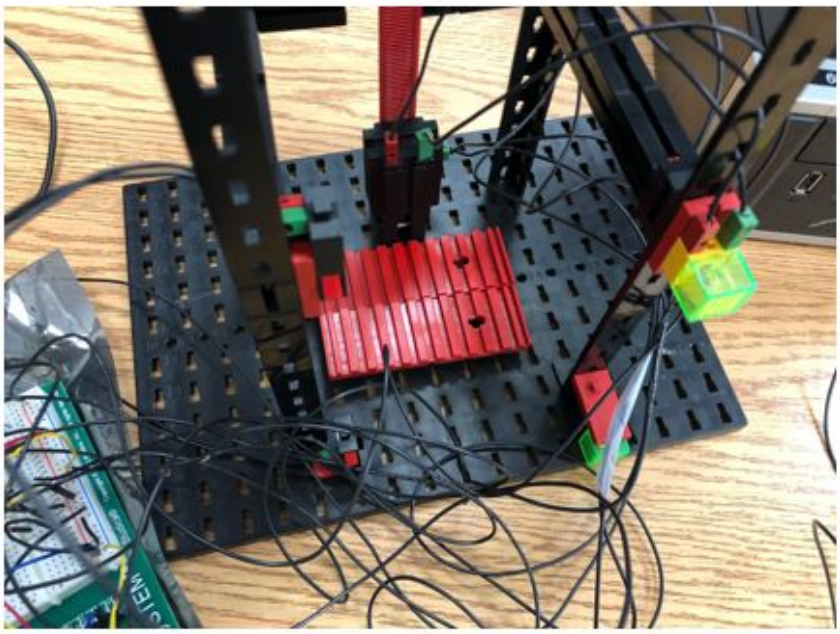


Figure 3 - Floor Indicator

This feature is shown in Figure 3. However, given more resources a better way to implement this feature would be to use a display that shows the current floor that the elevator is on to help give people a better estimate of when the elevator would arrive. Additionally, given more time and resources, doors would be added with implemented safety features ensuring that nothing gets caught in-between. This would be done using infrared light and a receiver. The infrared light would be blocked if anything was between the doors and hence the doors would not close. If there was nothing between the doors, the infrared light would be captured by the receiver, telling the program to close the elevator doors and to move to the desired floor. Given more time to research and more resources, the elevator can become more eco-friendly by introducing solar panels that move according to where light is being received or using hydro-generated power. A top priority for this elevator if given more time and resources would be to add a suite of features to improve accessibility for those that are disabled. This would include: Braille buttons, voice-activated controls, speakers for floor and emergency callouts.

Conclusion

Overall, this project was a fun way to explore the different applications of technology using the myDAQ system and LabVIEW. I learned how to work with LabVIEW's block programming architecture. In conclusion, this was a great way to be introduced to myDAQ and LabVIEW and will help me in future projects as well.