



## **Box Lift Automation Using Digital Twin**

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### **ABSTRACT**

*This document describes the all features and procedures that we are going to follow to develop our system. The box lift is a fundamental part of almost all industries. This equipment can also be used to equip a larger number of packages and goods, requiring less persons to move material. In this project we have developed a box lift automation system using digital twin. Digital twin means digital representation of physical object or physical process This digital Twin technology consist a tool i.e Iphysics Software ; It is used to simulate the 3D model of our project. Then the automation is the main part of the project or system is designed in Automation Studio 4.7 software .using structure text language we have done programming and mapping on automation studio software. In this way we designed the box lift automation project using the digital twin concept.*

**Keywords** :— *Automation Studio 4.7 Software, Automation Runtime, Industrial physics (IPhysics) software.*

### **I. INTRODUCTION**

The box lift plays very important and efficient role in any industry. The box lift is simply the lift which transport the boxes from one end to another end. This is the basic work of the box lift . First the boxes are placed on the conveyor belt through which the boxes goes forward to the other side so we place the boxes on the conveyor belt so with the help of that belt we can take the boxes to it appropriate placed so then it goes for further process. The box lift model is design in iphysics software and the model is link to the automation studio software where programming and mapping is done. In this model we use digital twin technology, this technology is a digital representation of physical object or process.

This technology consist a tool that is Iphysics, this software is design and simulate the model in 3D way. We Have used mapping technology in our project. In mapping first function block is to collect data of your programming and the second one is use for UI connect which will give you the connection between your function block and your HMI.

## II. WORKING OF BOX LIFT AUTOMATION

There are Two conveyor belts (doConvTop) and (doConvBottom) are being used to transport boxes to a lift. If the photocell (diConvTop ordiConvBottom) is activated, the corresponding conveyor belt is stoppedand the lift is requested. If the lift is requested, it is sent to the appropriate position (doLiftTop, doLiftBottom). When the lift is in the requested position , the lift conveyor belt (doConvLift) is turned on until the box is completely 3 on the lift (diBoxLift). The lift then moves tothe unloading position (doLiftUnload). When it reaches the position (diLiftUnload), the box is moved onto theunloading belt. As soon as the box has leftthe lift (diUnloaded), the lift is free for thenext request.

### Flowchart

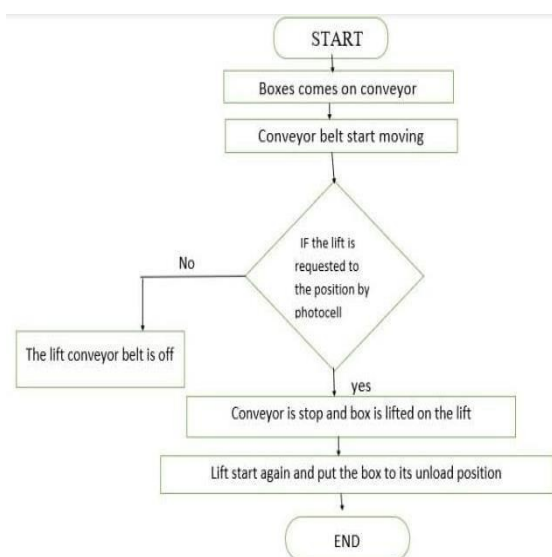


Figure 1: Flowchart Diagram

## III. MAPP TECHNOLOGY

In mapping first function block is to collect data of your programming and the second one is use for UI connect which will give you the connection between your function block and your HMI.

### Mapp Services :

#### 1. Mapp UserX Management



Figure 2: Mapuser [2]

In user management, the user is split into number of groups with different levels of permission.

In this we have created roles and users account, that they can manage the system.

#### 2. Mapp AlarmX : Alarm Management



Figure 3: Alarm [2]

In this management the alarm can assume the states and how these states function is related to another. It also defines the errors in system.

### 3. Mapp Recipe Management



Figure 4 Recipe [2]

Mapp recipe management provides all the functions necessary for the project. It includes reading writing and connection to the visual components.

### 4. Mapp Audit: Event Management



Figure 5: Audit [2]

In this management we can add different events, like Mapp- user or user defines event. That can definitely which events are store in a file.

### 5. Mapp Data: Data Logging

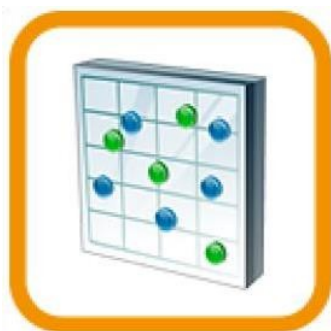


Figure 6: Data [2]

Mapp Data makes it possible for users to back up values of defined process variables (PVs). This data is stored in CSV files.

### 6. Mapp File Management



Figure 7: File [2]

Mapp files provides the file management system and connection to the HMI applications to display the files available into the system.

### 7. Software

#### 1. Automation Studio 4.7



Figure 8: Automation Studio[2]

Automation Studio is a software used for circuit design and project documentation. CAD, maintenance, and training purposes are the basic uses of it. Automation studio is a software which is used for programming the project in various PLC language, For design, training and troubleshooting of hydraulics, pneumatics, HMI and electrical control systems automation studio is applied.

## 2. VNC Viewer



Figure 9: VNC Viewer [2]

For showing the contents of a remote screen on the computer VNC viewer is used. It is also used for sending the keyboard and mouse signals.

## 3. Automation Runtime Simulation

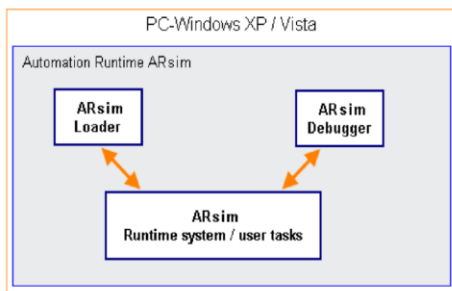


Figure 10: ARsim [2]

ARsim contains 3 components: The loader, Debugger and the runtime system. To run the project we have to link the automation studio with ARsim. If we don't link both the software the project is not able to run.

## 4. Industrial Physics - B&R Edition 2.4.0

1TGSIMIP.SNG.00-01



Figure 11: Industrial Physics [2]

For a complex 3D physics simulation the IPhysics software package is used. The IPhysics is used for 3D modelling of the project. By using this software we can see the real time process on the screen so if there any error occurs one can easily recognize.

### Advantages

- It minimizes the human intervention hence accuracy is more.
- It reduce accidents.
- Improve efficiency, System will be faster.

### Applications

- Boxlift automation systems can be used in warehouses.
- Boxlift automation system can be used in huge factories.

## IV. RESULT

For this project we used automation studio version 4.7, VNC viewer and industrial physics (Iphysics). Automation studio for programming, VNC viewer for HMI or mapping and industrial physics (Iphysics) for simulation of box lift. With the help of this software we can program and design the mapping pages and simulate the box lift in Industrial physics (iphysics).

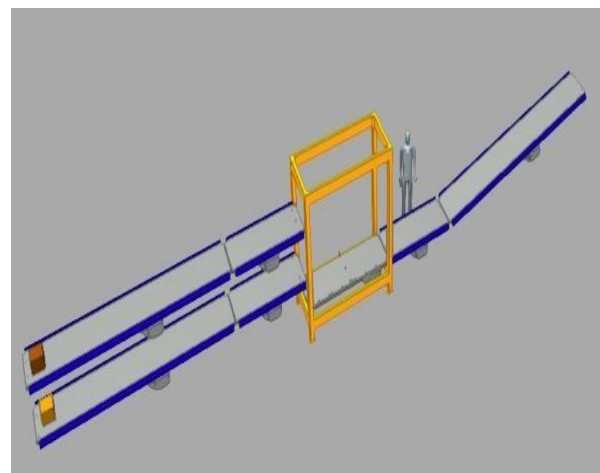


Figure 12: Starting Process (a) [2]

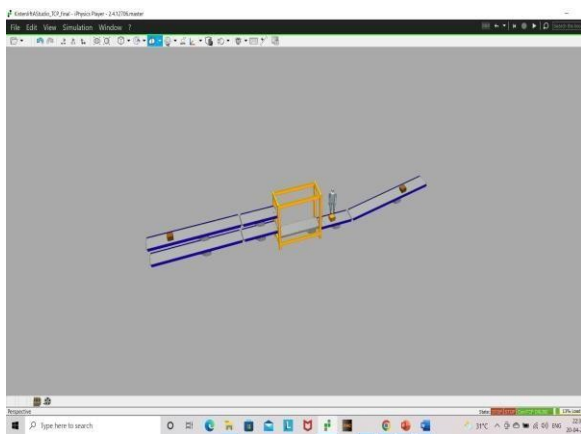


Figure 12: Starting Process (b) [2]

## V. CONCLUSION

A digital twin is, in essence, a computer program that uses real world data to create simulations that can predict how a product or process will perform. The box lift plays the important role in many industries. The box lift is simply the lift which transport the boxes from one end to another end. Now we have done the box lifting automation using digital twin technology. To reduce accidents and to improve efficiency of system, the box lifting automation system is useful in many industries.

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