

Project pots filler

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Introduction

Design and Proof of concept of Automation system for filling pots for Raina Robotech the system have 5 functional require. Automation systems must load a single, fill the pot with soil, stamp a hole, release the pot to output process, and positioning the pot. The purpose of this project is to prepare the Automation system concept and use that concept to implement automation system consisting of 5 functional requirements in detail.

The system that loads a single pot is the system that can separate pot from the stack using a mechanism and the pot feed track in this Proof of concept must be only one size pot.

The systems that fill the pot with soil are conveyors used to transport the soil into the soil feed track. This system must be only cad design and calculation concept.

The system that stamps holes this system is a vertically linear transmission that stamp a hole in the middle of pots.

The system that releases the pot to output uses linear transmission to push the pot out of the positioning system.

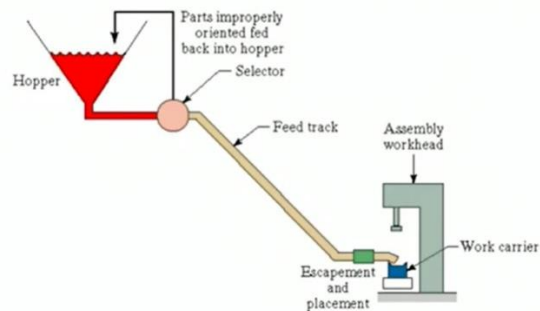
The system that positions the pot in this project is a Revolute joint with 4 pots standing this system rotates in loop 90° .

To develop a Proof of concept of an Automation system for filling pots using knowledge of robot structure design to design a mechanical Automation system and apply electronic knowledge to choose a suitable electronic device control concept is PLC.

Background Study

Part feeding system.

Parts Delivery at Workstations



Hopper container for soil or pots

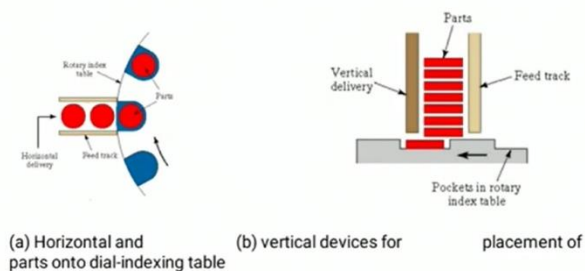
Parts feeder removes soil and pots from hopper.

Selector Acts as a filter to allow only the proper orientation part to pass through feed track.

Feed track move parts from hopper to filling soil into pot.

Escapement to remove filled pot to automatic pot filler.

Escapement and Placement Devices



Automation system

An automation system is an integration of sensors, controls, and actuators designed to perform a function with minimal or no human intervention.

Automatic Pot Filler

Automatic Pots Filler is an Automation system used to fill pots with soil in the planting process.

Sensor

A sensor is a device, module, machine, or subsystem that detects events or changes.

Actuator

An actuator is a component of a machine that is responsible for moving and controlling a mechanism or system.

PLC

A Programmable Logic Controller These controllers can automate a specific process, machine function, or even an entire production line.

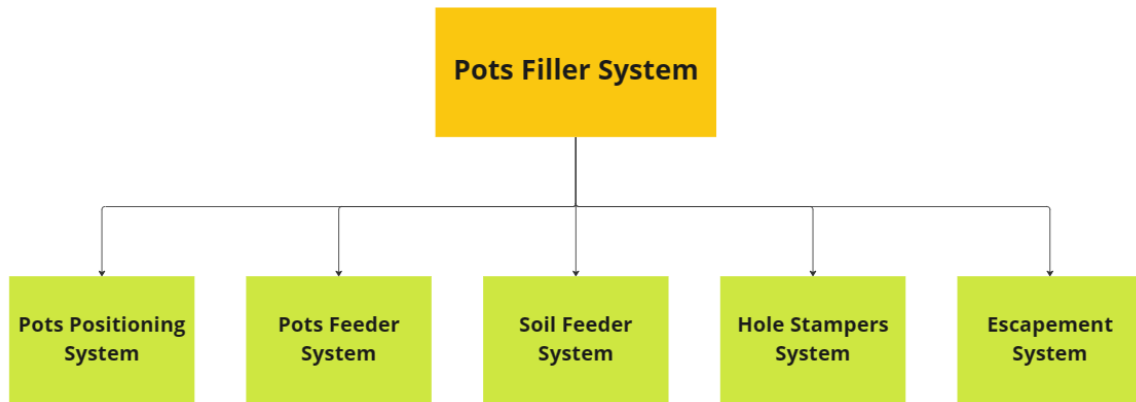
HMI

A Human-Machine Interface (HMI) is a user interface or dashboard that connects a person to a machine

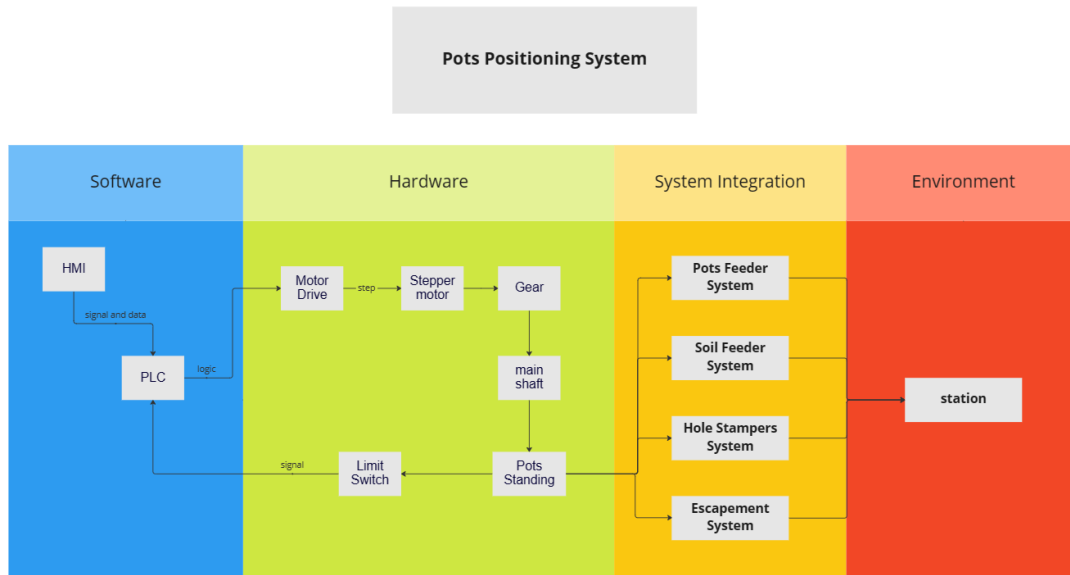
Conceptual Design

1. System Architecture

- Pots Filler System and Subsystem

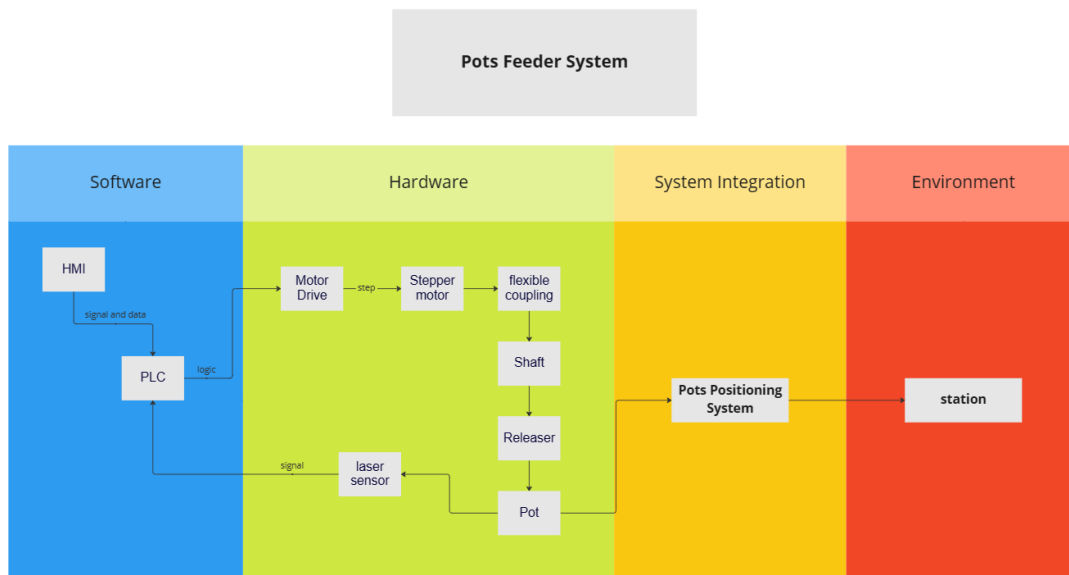


- System Architecture of Pots Positioning System



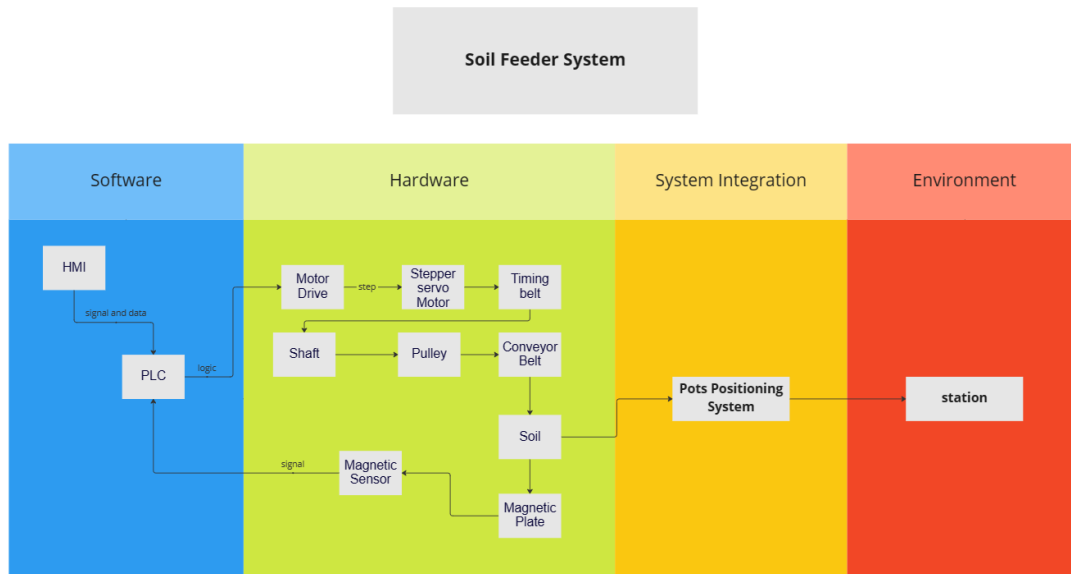
From the System Architecture of the Pots Positioning System, The Software is HMI that contains input from the user and then sends the signal to PLC, PLC uses Absolute Position Control Function to send the Pulse output device and Direction signal output to the Motor drive, Motor Drive output step to Stepper motor and rotate 90 degrees in a loop after every system is working completely then stop rotation process when trigger limit switch and waiting other system working completely again.

- System Architecture of Pots Feeder System



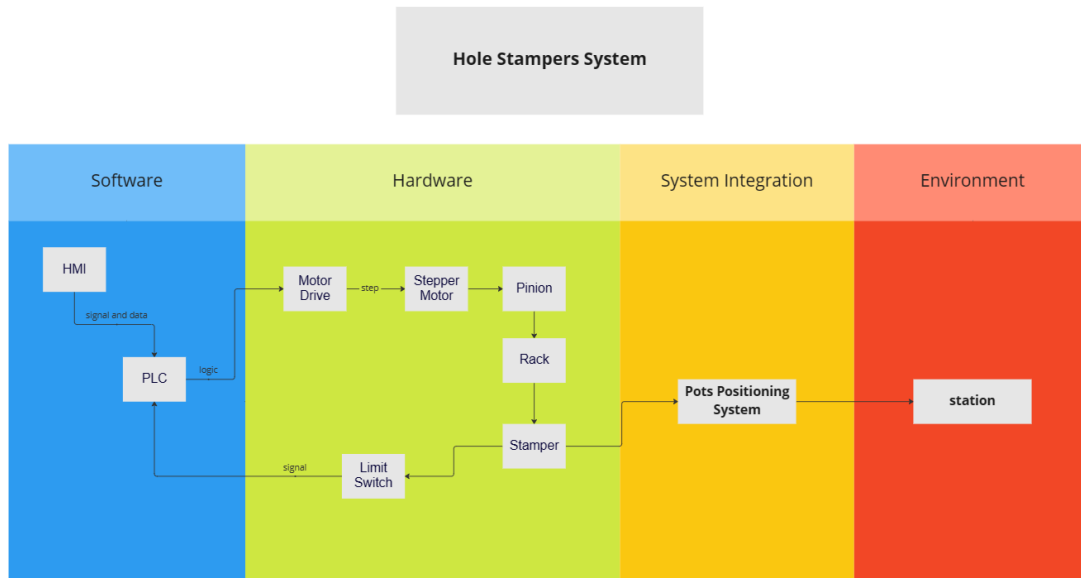
From the System Architecture of the Pots Feeder System, The Software is HMI that contains input from the user and then sends the signal to PLC, PLC uses Absolute Position Control Function to send the Pulse output device and Direction signal output to the Motor drive, Motor Drive output step to Stepper motor and rotate releaser then stop rotation process when pot drops into pot standing in Pots Positioning System by checking light sensor and waiting other system working complete and let Pots Positioning System run again.

- System Architecture of Soil Feeder System



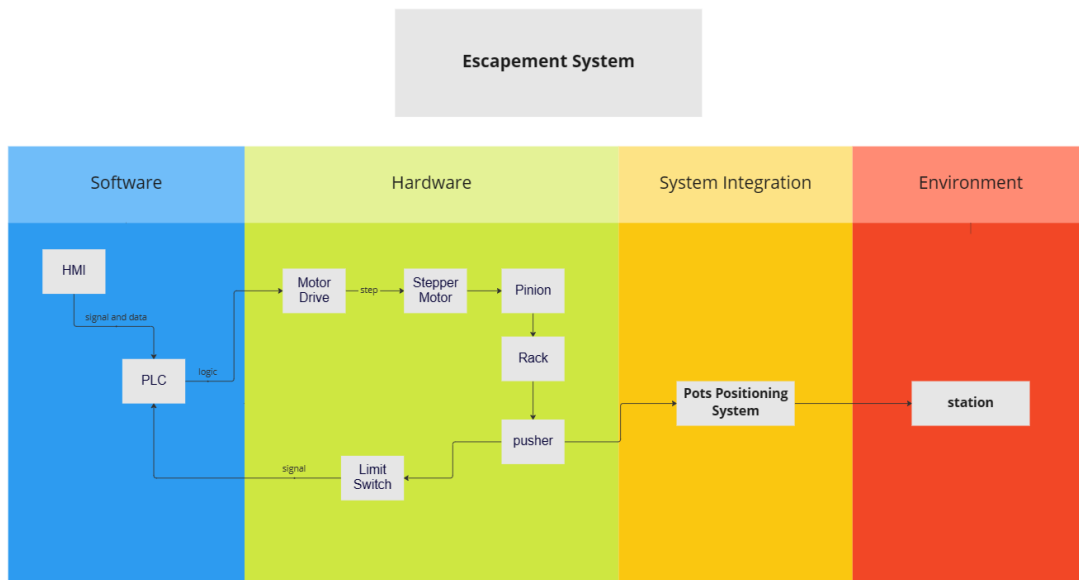
From the System Architecture of the Pots Feeder System, The Software is HMI that contains input from user and then sends the signal to PLC, PLC uses Control Function to send the Pulse output device and Direction signal output to the Motor drive, Motor Drive output step to the Stepper motor and start conveyor process to transport soil into a pot in Pots Positioning System by timer and check magnetic sensor and waiting other system working complete and let Pots Positioning System run again

- System Architecture of Hole Stampers System



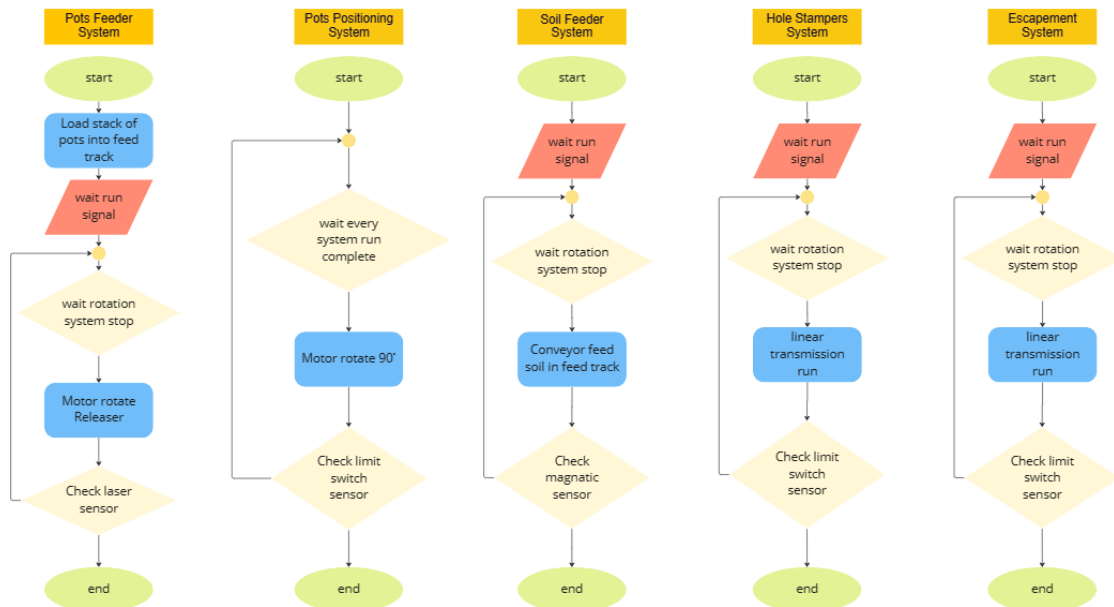
From the System Architecture of the Pots Feeder System, The Software is HMI that contains input from the user and then sends the signal to PLC, PLC uses Control Function to send the Pulse output device and Direction signal output to the Motor drive, Motor Drive output step to Stepper motor drive linear transmission using Rack and pinion to move stamper into a pot in Pots Positioning System by checking limit switch sensor and waiting other system working complete and let Pots Positioning System run again.

- System Architecture of Escapement System



From the System Architecture of the Pots Feeder System, The Software is HMI that contains input from the user and then sends the signal to PLC, PLC uses Control Function to send the Pulse output device and Direction signal output to the Motor drive, Motor Drive output step to Stepper motor drive linear transmission using Rack and pinion to move stamper into a pot in Pots Positioning System by checking limit switch sensor and waiting other system working complete and let Pots Positioning System run again.

2. System Flow Chart



3. Mechanical Design:

- System requirement
- CAD mockups of each design concept
 1. Description of the features being illustrated in the CAD model.
 2. Calculation concept

4. Electronic Design concept:

- electronic design concept
 1. Power system and sub power system
 2. Emergency

5. PLC control concept:

- Control step motor
- Working Logic

Team, Task, Process

Design process

Ideate by drawing overall system consists of 5 subsystem pots feeder system, soil feeder system, hole stampers systems, escapement system, pots positioning system.

Detailing into every subsystem and make it stand alone system then system integration all system to pots feeder system.

Tasks

Tasks	date
Project Meeting 1	10/02/2023
- Plan Process of system Input Output overall system specify every system.	
- Planning system Flow diagram	
design of pots feeder system concept	15/03/2023
- requirement of this system	
- Calculate Mechanical system and choosing material.	
- choosing suitable Sensor and Actuator.	
- Create CAD, DRAWING, BOM of Mechanical system.	
- Mock-up concept	
design of soil feeder system	-/3/2023
- requirement of this system	
- Calculate Mechanical system and choosing material.	
- Choosing suitable Sensor and Actuator.	
- Create CAD, DRAWING, BOM of Mechanical system.	
design of pots positioning system	-/4/2023
- requirement of this system	
- Calculate Mechanical system and choosing material.	
- Choosing suitable Sensor and Actuator	
- Create CAD, DRAWING, BOM of Mechanical system.	

design of hole stampers systems	-/4/2023
- requirement of this system	
- Calculate Mechanical system and choosing material. - Choosing suitable Sensor and Actuator	
- Create CAD, DRAWING, BOM of Mechanical system.	
- Mockup Linear transmission concept	
design of escapement system	-/4/2023
- requirement of this system	
- Calculate Mechanical system and choosing material.	
- Create CAD, DRAWING, BOM of Mechanical system. - Choosing suitable Sensor and Actuator	
- Mockup Linear transmission concept	

Learning Plan

Loader or Feeder Design (CAD) (phase I).

System design key concept and structure of system

Create a Design mock-up or proof-of-concept (proof of concept) (phase I).

Calculation concept and mockup system complete design

Learning how to control stepper motor with PLC.

How to choose the design specification (Void) (phase II).

Learning from the internet how to calculate ROI of Automation system.

Electrical Drawing and BOM (Electrical Drawing, Electric Device BOM) (phase II).

Learning from the internet how to design power and safety of electronic system.