INTERMEDIATE REPORT – MITSUBISHI ELECTRIC CUP 2019

Team Name : MIRAI

Registration No : MEC1920048

Team details : Arun.P [Team Lead]

Aswini.J

Yogitha.P

Dinesh Kumar.A

Faculty incharge : Mr. Rajasekar T, M.Tech

Project Name : AWM (Autonomous Warehouse Management Bot)

PROGRESS OF PROJECT:

MITSUBISHI COMPONENTS STUDY :

1. PLC (Programmable Logic Controller) – FX5U-32-MT/ES :

A programmable logic controller (PLC) is a small, modular solid state computer with customized instructions for performing a particular task. It is flexible and easily programmable controller which has replaced hard-wired relays, timers and sequencers. PLC has high-reliability automation controllers suitable for real time environments. PLC instructions can test if the input state is on or off.

The PLC receives information from connected sensors or input devices, processes the data and it displays. Using the input terminals, PLC interprets the logical states from switches and sensors. The output from the output terminals is used as a signal for various devices, providing them on/off controls. Depending on the inputs and outputs, a PLC can monitor and record run-time data such as automatically start and stop processes, generate alarms if a machine malfunctions, and more.

2. HMI (Human-Machine Interface) - GS-2107-WTBD

Human-machine interface is also known as man-machine interface (MMI).It is a component of certain devices that are capable of handling human-machine interactions. The interface consists of hardware and software that allow user inputs to be translated as signals for machines that, in turn, provide the required result to the user.

3. SERVO SYSTEM - MR-JE20A AND HG-KN23

A servo drive receives a command signal from a control system, amplifies the signal, and transmits electric current to a servo motor in order to produce motion proportional to the command signal. Typically, the command signal represents a desired velocity, but can

also represent a desired torque or position. A sensor attached to the servo motor reports the motor's actual status back to the servo drive. The servo drive then compares the actual motor status with the commanded motor status. It then alters the voltage, frequency or pulse width to the motor so as to correct for any deviation from the commanded status.

WORKING METHODOLOGY:

PLC AND HMI:

The Mitsubishi PLC FX-5U-32 MT/ES is the main unit which controls the operations of the bot. It is programmed using GXWORKS3 by ladder logic. The various operations of the bot such as warehouse management, sorting, path detection, pick and place are controlled by the PLC. The Human Machine Interface [HMI] is connected to PLC via Ethernet. The design of HMI screens is done using GT DESIGNER for the respective operations of the bot. The screens are designed based on the PLC program to control the bot by establishing connection between PLC and HMI. The user can easily control operations of bot using single button touch in the HMI screen.

ROBOTIC ARM:

The robotic arm is used in our bot for carrying out pick and place operations, managing stock in the warehouse, soring the products, monitoring the factory floor and also to carry out additional operations such as spray painting. The arm is connected to camera to capture images and process them further for path identification, sorting the products and live video streaming. Image processing techniques such as edge detection, image enhancement and segmentation are used for is used for path identification and for sorting.

WAREHOUSE MANAGEMENT:

The bot when working in the production side would gather all the information of the products by scanning its bar code and stores this data in cloud. The customer side data is also stored in cloud and is accessible to both the user and manufacturer. Customer data relates to the demand for certain product and the dates of delivery. Depending on the customer data the production rate can be increased or decreased suitably to deliver the products on time.

“ specify how we are going to achieve this ”

PATH IDENTIFICATION:

The robotic arm has a camera which is used for capturing images and recording video. The captured image is processed by edge detection techniques for identifying the path and avoids obstacles. The bot can identify the path by storing a set of images of the factory floor and avoid obstacles once it is aware there is an object in its path.

FLOWCHART:

WAREHOUSE MANAGEMENT:

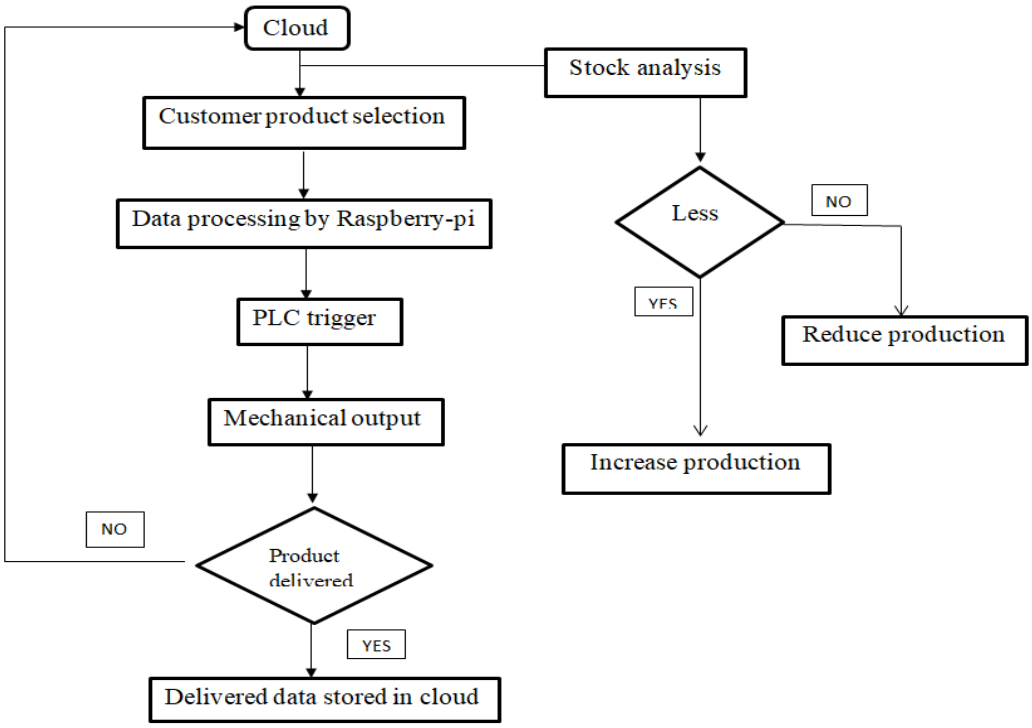


IMAGE PROCESSING:

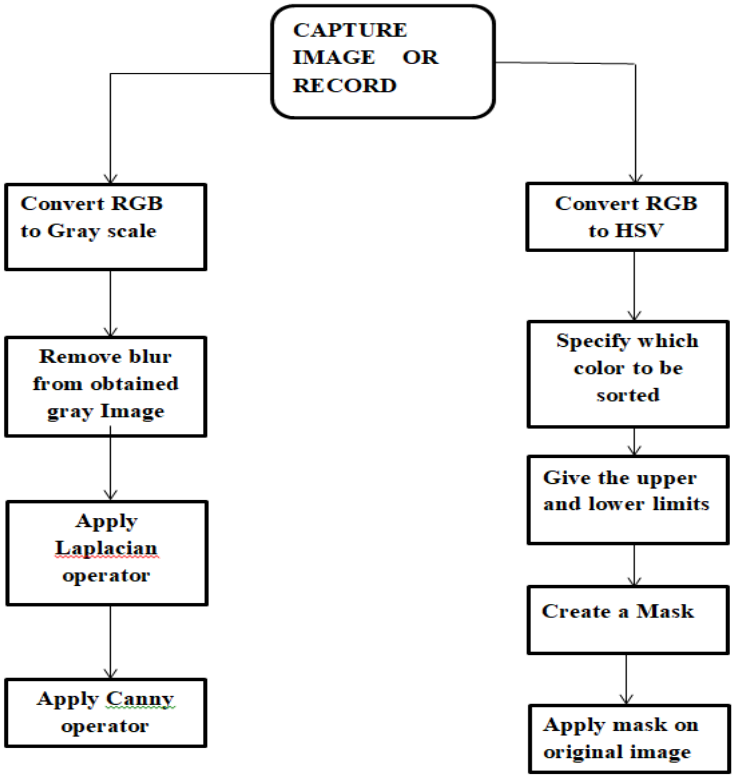
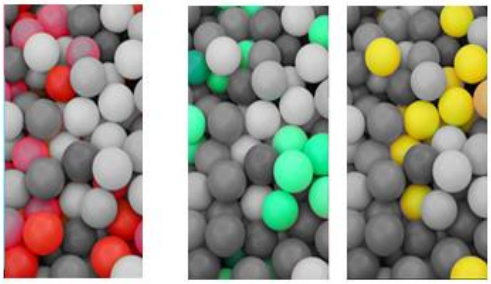


IMAGE PROCESSING:

Fig 1. Edge detection

ORIGINAL IMAGE



COLOUR BASED SORTED IMAGE

Fig 2. Sorting

ANDROID APPLICATION:

Fig 3. Home screen

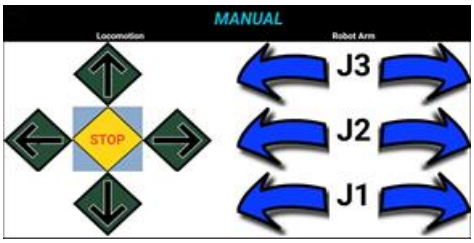


Fig 4. Manual control

Fig 5.Automatic control

BILL OF MATERIALS PURCHASED: