Smart Product Labeling and Traceability System

SIMULATED USING PYTHON

Introduction

- Labeling is crucial for product tracking, compliance, and identification.
- Manual labeling is error-prone.
- This project simulates a smart, automated labeling system

Problem Statement

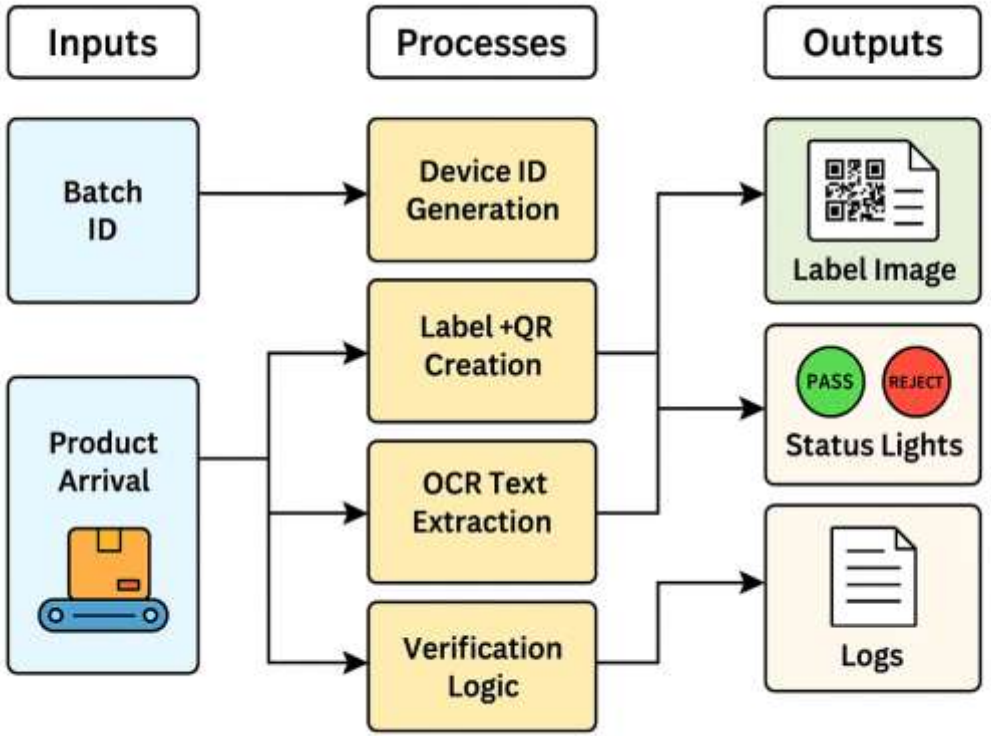
Design a system that:

- Assigns serial numbers
- Generates QR-coded labels
- Verifies using OCR
- Rejects incorrect labels
- Logs all transactions

System Architecture

- Inputs: Batch ID, GUI trigger
- Processes : ID generation, label + QR creation, OCR verification
- Outputs : Label image, pass/reject status, log file

System Architecture



Technologies Used

- Python 3.10+
- Tkinter (GUI)
- PIL (Image Creation)
- qrcode (QR generation)
- EasyOCR (Text detection)
- CSV & JSON (Data logging)

GUI Workflow

- 1. Click "Simulate Detection"
- 2. Generate label and QR
- 3. OCR validation
- 4. Visual result (PASS/REJECT)
- 5. Log to CSV

Results

- Handled multiple batches
- -OCR handled distortions well
- GUI feedback works as intended
- Logs maintained successfully

Applications

- Smart manufacturing
- -Warehouse tracking
- -Education/Training
- Compliance systems

Advantages

- Reduces human error
- Real-time label validation
- Easy to use GUI
- Traceable logs
- Cost-effective simulation

Conclusion

- Modular, low-cost simulation
- Demonstrates Industry 4.0 tools
- Scalable to real hardware
- Excellent for prototyping and learning