Pick and Place based on Template Matching

Sponsor: Anora Labs LLC

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Introduction: Device testing is a major part of the Semiconductor engineering industry; it is crucial that these machines are accurate and reliable. There are many techniques employed to accurately translate the position of parts to digital means. This project aims to employ fiducials, distinct signifying symbols, as a means of tracking. This system will relay the position of fiducials to various systems. Furthermore, this system will automate the human process of visually identifying a PCB assembly, picking up the assembly and loading it for testing. Once testing is complete this system should unload the assembly from the tester and return the assembly for further processing.

Problem Description: Accurate position systems require feedback in real world environments. A truly accurate and precise systems are expensive to implement and require many feedback mechanisms. Stalling of stepper motors prevents the system from knowing where in space the system is and using standard feedback systems require expensive encoders that must be accurately mounted in the axis of motion and are sensitive to dust ingress.

Objective: Use existing pick and place set-up and implement a template-based algorithm to pick-up a PCB, do X, Y and theta correction, place it at a target location. Target will be a PCB tray with locating pins.

Required Equipment:

- Bessel camera/Buy a Raspberry Pi Global Shutter Camera – Raspberry Pi
- Software implemented using REST API and web framework.
- Python FastAPI for REST API
- React for web front end
- Use open-source platform (Open CV) for camera interaction
- Implement the algorithms on mini-PC such as those from Minisforum.