DLIP Final Project

Camera-Based System for Automatic Pin Mapping on Breadboards

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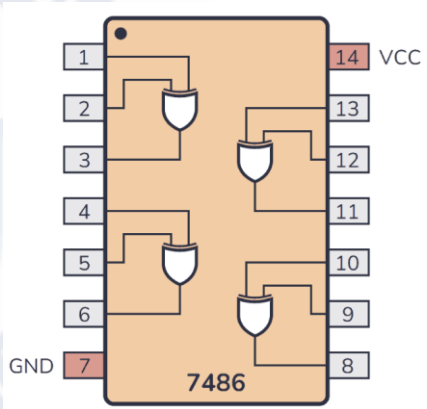
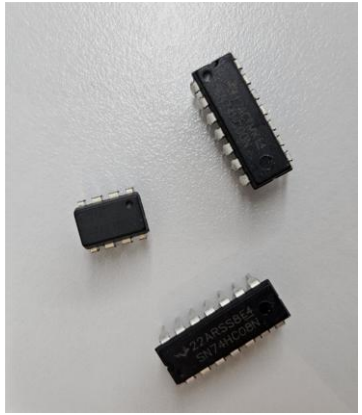
Introduction

Background

Various forms of integrated circuit (IC) chips are essential components and commonly used at school experiment and an industrial site.





Problem Description

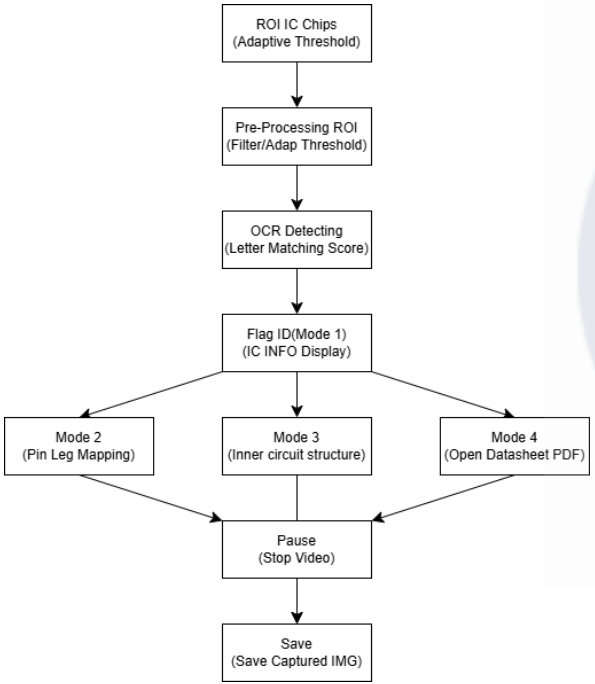
- Hard to identify a IC chip
- Not convenient to look for datasheet

Project Objective

- IC chips and its node are identified by corresponding mode.
  User may pause or resume the program and save the image.

Introduction

Flow Chart



Key Advantages

- **No webcam** required

  Runs with your phone camera — no extra hardware required.

- Easily **Customizable**

  Add new chips by updating an `IC_INFO` dictionary.

- **Multi-Function** Support

  Includes various modes to cover all user needs.

Mode Description

Mode 1

- Default Mode
- Detect IC Name
- Match to Function Type

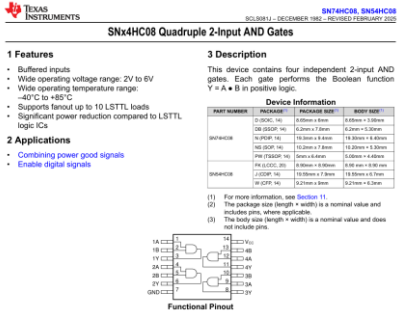
Mode 2

- Toggle Display Mode
- Pin Identification
- Oriented Text Rendering on IC

Mode 3

- Toggle Display Mode
- Overlay Internal Circuit Diagram

Mode 4


TEXAS INSTRUMENTS
SN74HC08, SN54HC08
SCLS081J – DECEMBER 1982 – REVISED FEBRUARY 2020

SNx4HC08 Quadruple 2-Input AND Gates

1 Features

- Buffered inputs
- Wide operating voltage range: 2V to 6V
- Wide operating temperature range: –40°C to +85°C
- Supports fanout up to 10 LSTTL loads
- Significant power reduction compared to LSTTL logic ICs

2 Applications

- Combining power good signals
- Enable digital signals

3 Description

This device contains four independent 2-input AND gates. Each gate performs the Boolean function $Y = A \bullet B$ in positive logic.

Device Information

PART NUMBER	PACKAGE(1)	PACKAGE SIZE(2)	BODY SIZE(3)
SN74HC08	D (SOIC, 14)	8.65mm × 3.91mm	8.65mm × 3.90mm
	DB (SSOP, 14)	6.2mm × 7.8mm	6.2mm × 5.30mm
	N (PDIP, 14)	19.3mm × 9.4mm	19.30mm × 6.40mm
	NS (SOP, 14)	10.2mm × 7.8mm	10.20mm × 5.30mm
	PW (TSSOP, 14)	5mm × 6.4mm	5.00mm × 4.40mm
SN54HC08	FK (LCCC, 20)	8.90mm × 8.90mm	8.90 mm × 8.90 mm
	J (CDIP, 14)	19.55mm × 7.8mm	19.55mm × 6.7mm
	W (CFP, 14)	9.21mm × 9mm	9.21mm × 6.2mm

(1) For more information, see Section 11.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.
(3) The body size (length × width) is a nominal value and does not include pins.

Functional Pinout

- Retrieve Matching Datasheet
- Open PDF for Detailed Specifications

Function Description

Pause / Resume

- Toggle behavior: pressing ‘p’ pauses the program, and pressing ‘r’ resumes it.
- Only one is active at a time.
- Used to freeze processing for inspection or saving.

Save

- Triggered by pressing ‘s’ while paused.
- Prompts user to enter a filename.
- Saves the current frame as a .png image.

Exit

- Press ‘ESC’ (Escape key).
- Immediately terminates the program, regardless of current mode or state.

Demo Video

https://youtu.be/vTJCyv63dBk?feature=shared

Conclusion

Objectives Summary

- Successfully developed a machine-vision system which detects IC chips
- Provides multiple mode and functions to increase user's convenience

Challenges

- Heavy pre-processing before Tesseract OCR
- Multiple filtered images used to ensure OCR accuracy
- Difficulty in rotated text placement (coordinate transform, DCM)

Improvement

- Need to improve operation speed
- Need to improve exact node position
- Need to improve IC indicating accuracy

Thank You!!