RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES

DEPARTMENT OF ELECTRONICS AND COMMUNICATIONS ENGINEERING

SRIKAKULAM

MAJOR PROJECT-1

Cam2Cart: Vision Based Product Search Using ESP32-CAM and Raspberry Pi

BatchNo: 25

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Abstract :

In today's fast-moving world, automation and smart vision systems are becoming an essential part of daily life. This project, titled **Cam2Cart**, is designed to help users instantly search for products online just by writing their names on paper. The system uses an ESP32-CAM module to capture an image containing handwritten or printed text. That image is then processed on a Raspberry Pi using the EasyOCR model to recognize the text content.

Once the text is recognized, it is automatically searched in an online browser such as Google or Amazon. This combination of computer vision and embedded systems provides a smooth interaction between the physical and digital worlds.

Introduction:

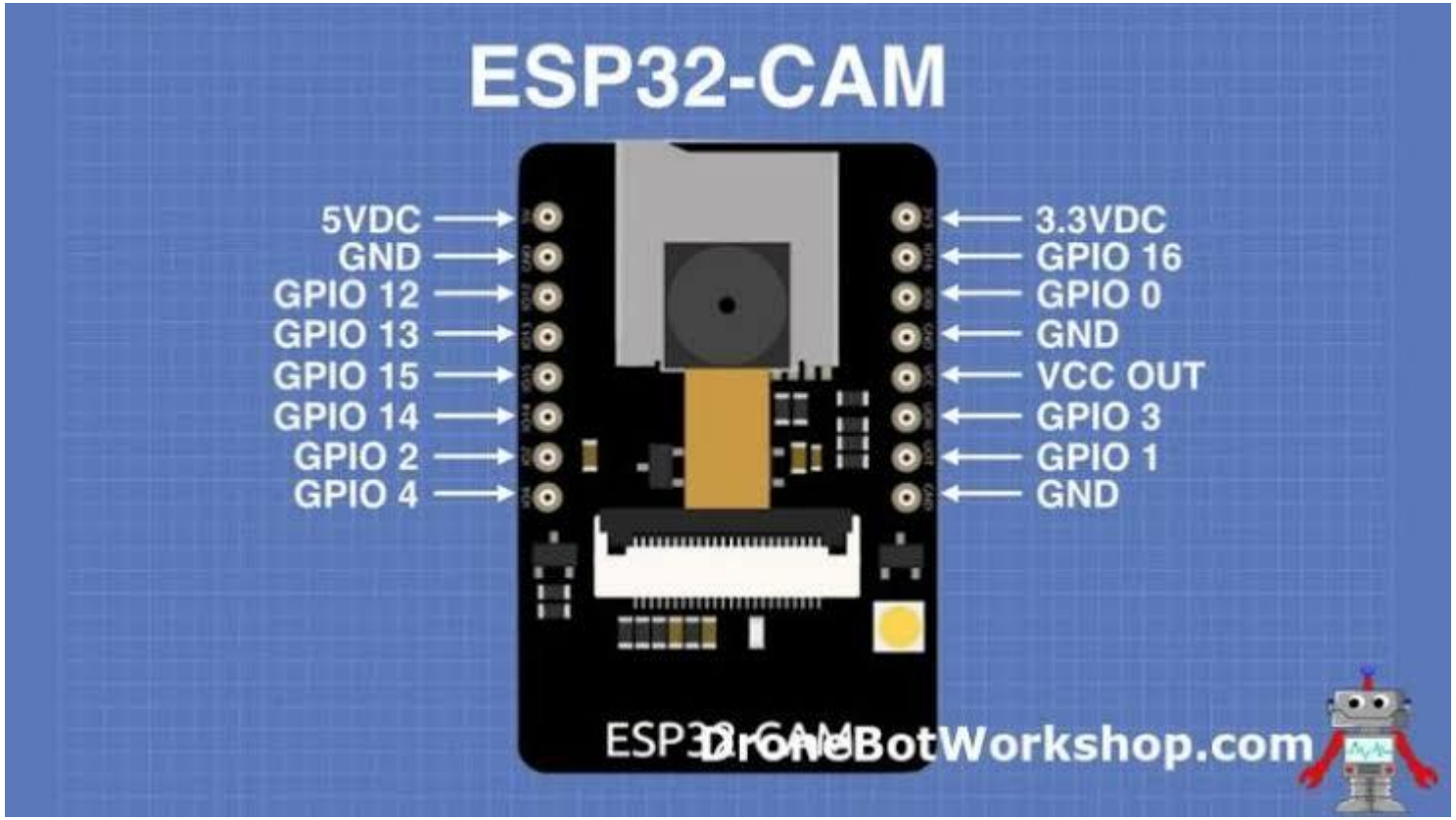
The Cam-to-Cart system is a low-cost, vision-based embedded solution designed to automate product identification and online search. It integrates an ESP32-CAM module for image capture and a Raspberry Pi for on-device image processing and Optical Character Recognition (OCR) using Tesseract.

When a product name or label is shown to the camera, the Raspberry Pi extracts the text, converts it into an online search URL, and generates a QR code that directly opens the product's page on e-commerce sites such as Amazon.

COMPONETS USED:

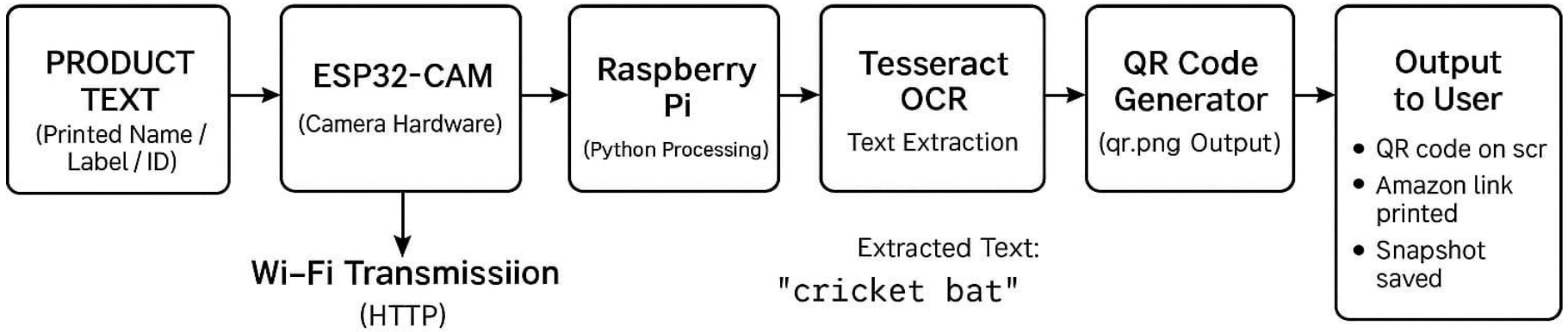
- **ESP32-CAM** – Captures product images and sends them for processing.
- **TTL Converter** – Connects the ESP32-CAM to a computer for programming.
- **Raspberry Pi** – Acts as the main controller to process images and manage data.
- **MicroSD Card** – Stores images, programs, and system data.

ESP-32CAM


ESP32-CAM
5VDC
GND
GPIO 12
GPIO 13
GPIO 15
GPIO 14
GPIO 2
GPIO 4
3.3VDC
GPIO 16
GPIO 0
GND
VCC OUT
GPIO 3
GPIO 1
GND
DroneBotWorkshop.com

RASPBERRY PI MODEL 3 B+

BLOCK DIAGRAM:



WORKFLOW:

1. Prepare Hardware and Network
2. Flash ESP32-CAM firmware
3. Set up Raspberry pi environment
4. Place and configure Python script
5. Run end-to-end demo

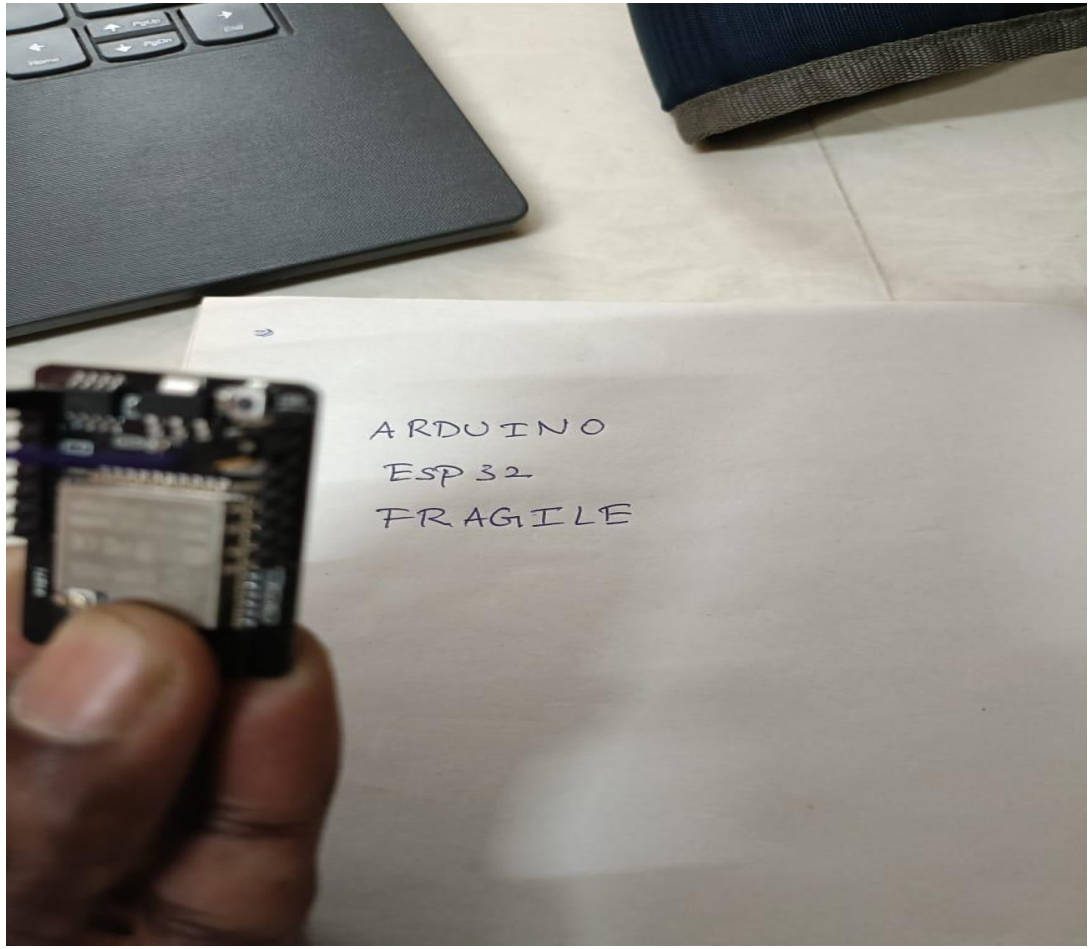
APPLICATIONS:

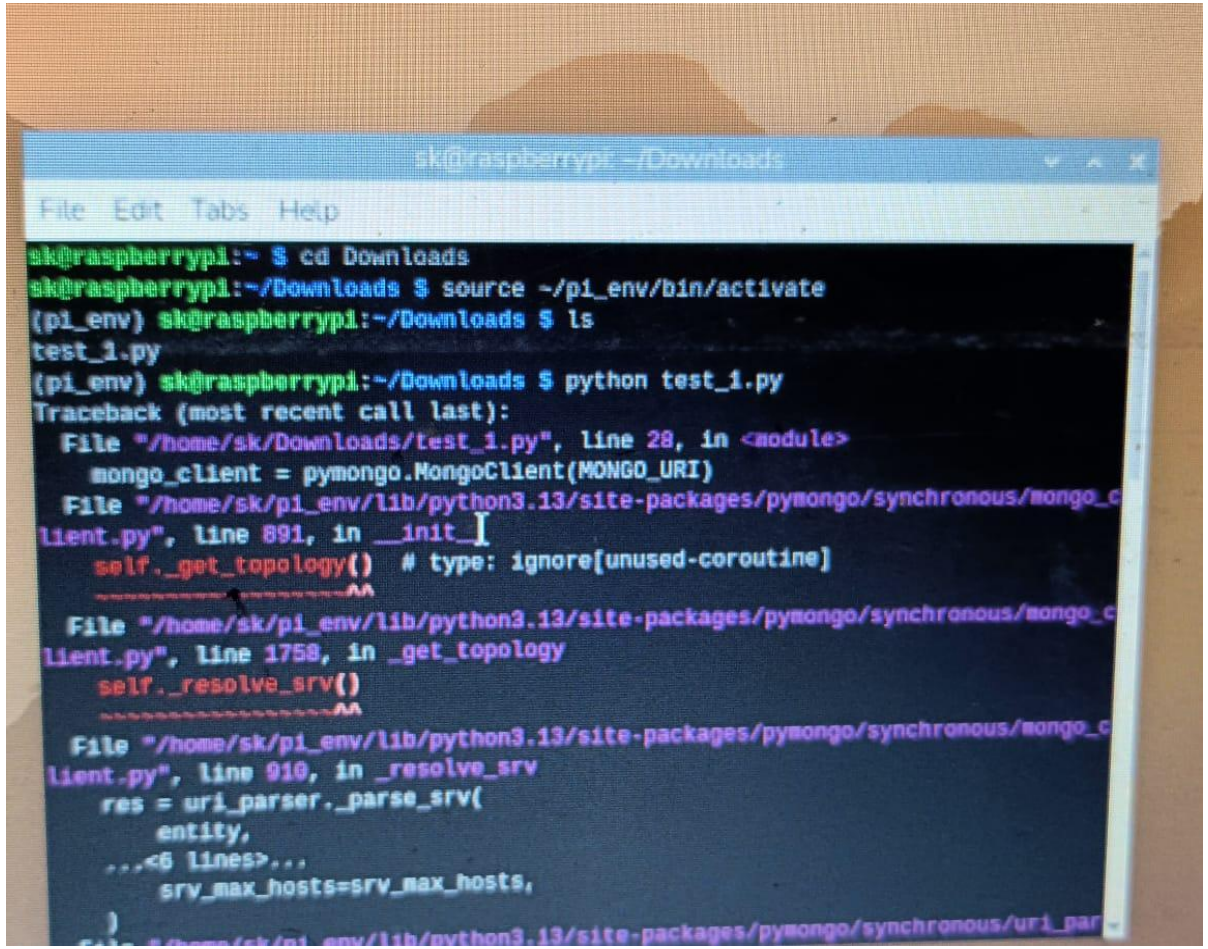
- Smart Shopping Carts
- Retail Store Automation
- Automated Billing Systems
- Warehouse Management
- E-commerce Product Search
- Smart Vending Machines
- Library or Asset Tracking.

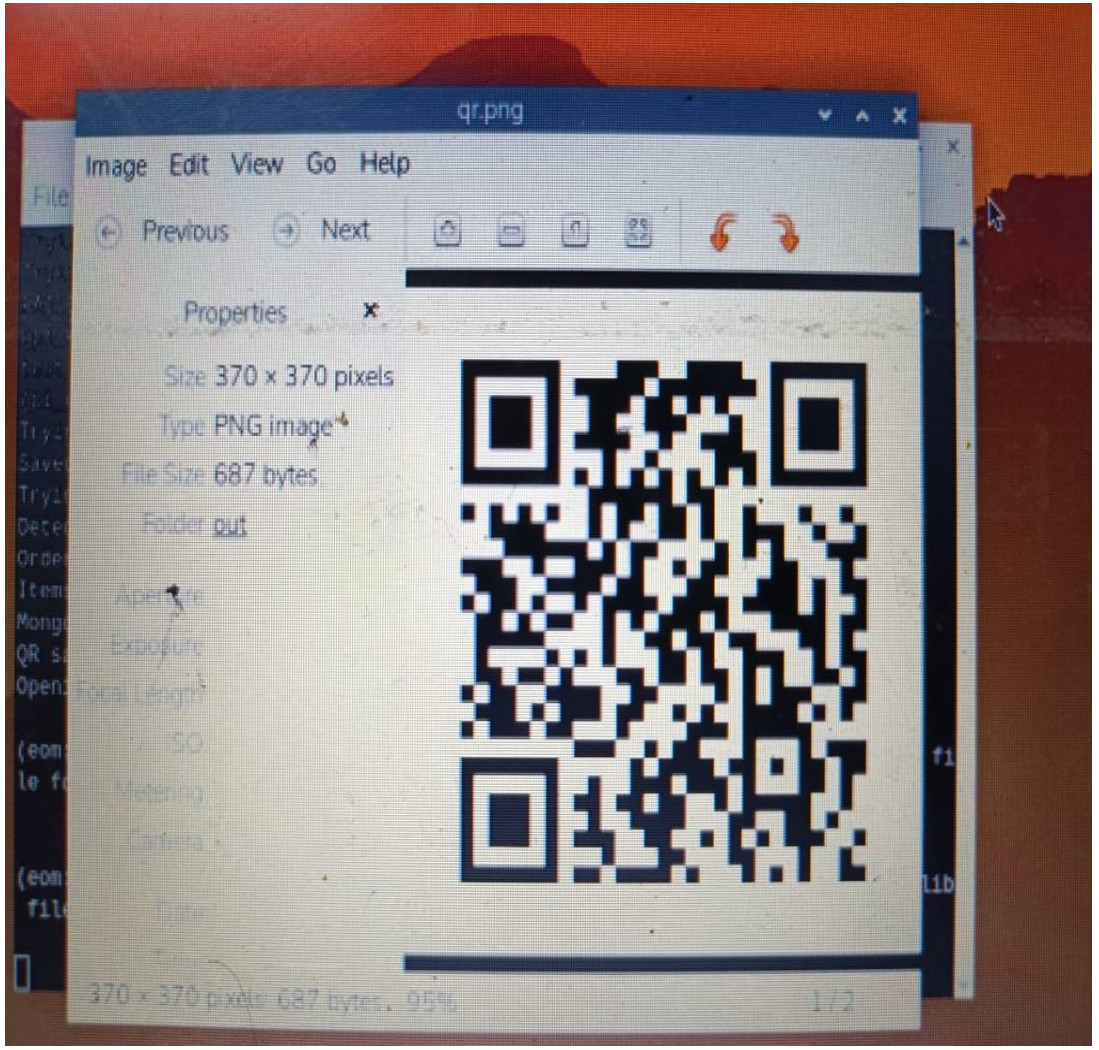
ADVANTAGES:

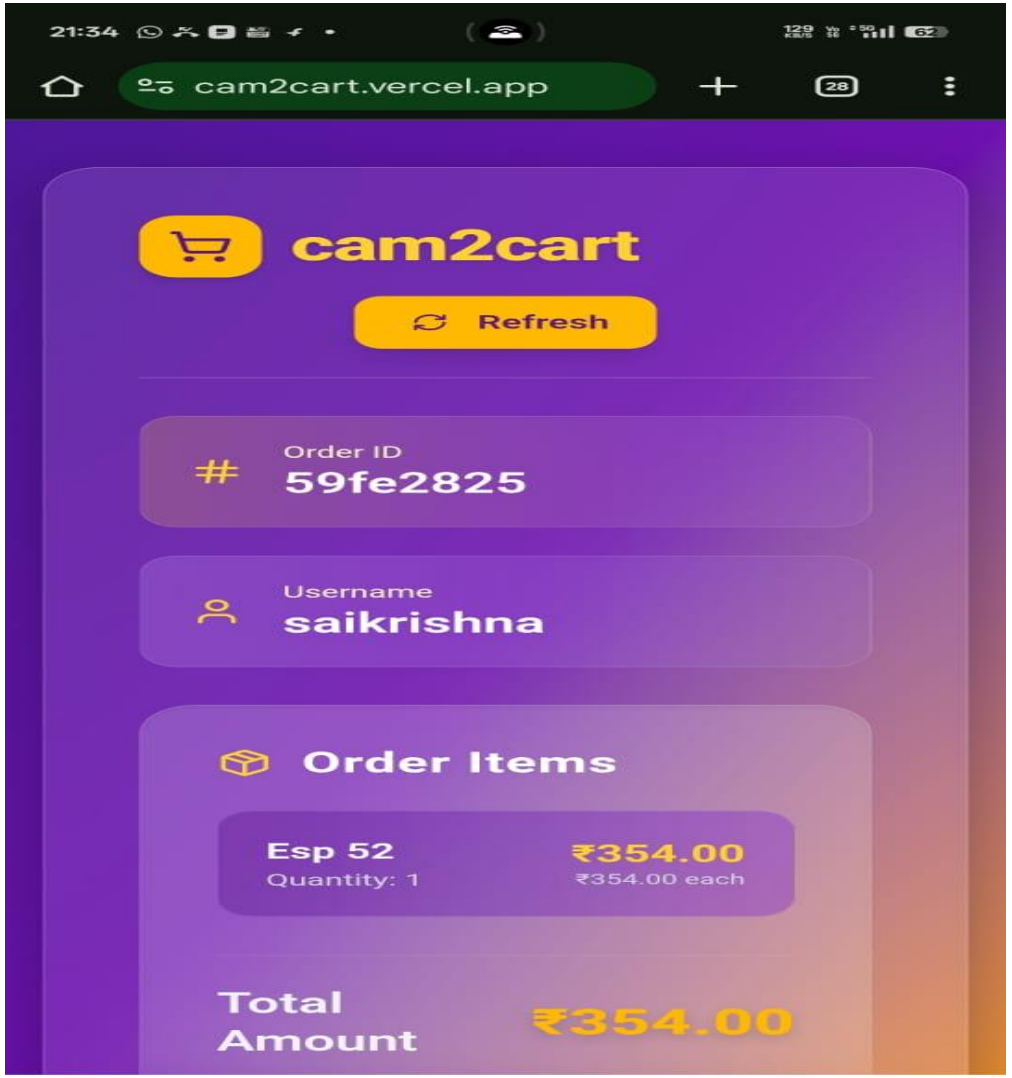
- Low Cost
- AutomationHigh Efficiency
- User-Friendly
- Wireless Operation
- Compact and Portable
- Real-Time Processing

OUTCOMES


ARDUINO
ESP32
FRAGILE


sk@raspberrypi: ~/Downloads
File Edit Tabs Help
sk@raspberrypi:~ $ cd Downloads
sk@raspberrypi:~/Downloads $ source ~/pi_env/bin/activate
(pi_env) sk@raspberrypi:~/Downloads $ ls
test_1.py
(pi_env) sk@raspberrypi:~/Downloads $ python test_1.py
Traceback (most recent call last):
File "/home/sk/Downloads/test_1.py", line 28, in <module>
mongo_client = pymongo.MongoClient(MONGO_URI)
File "/home/sk/pi_env/lib/python3.13/site-packages/pymongo/synchronous/mongo_client.py", line 891, in __init__
self._get_topology() # type: ignore[unused-coroutine]
File "/home/sk/pi_env/lib/python3.13/site-packages/pymongo/synchronous/mongo_client.py", line 1758, in _get_topology
self._resolve_srv()
File "/home/sk/pi_env/lib/python3.13/site-packages/pymongo/synchronous/mongo_client.py", line 910, in _resolve_srv
res = uri_parser._parse_srv(
entity,
...<6 lines>...
srv_max_hosts=srv_max_hosts,
)


qr.png
Image Edit View Go Help
Previous
Next
Properties
Size 370 x 370 pixels
Type PNG image
File Size 687 bytes
Folder out
370 x 370 pixels 687 bytes 95%
1/2


21:34
cam2cart.vercel.app
28
cam2cart
Refresh
Order ID
59fe2825
Username
saikrishna
Order Items
Esp 52
Quantity: 1
₹354.00
₹354.00 each
Total Amount
₹354.00

CONCLUSION:

The Vision-Based **CAM2CART** project using the ESP32 microcontroller successfully demonstrates the integration of embedded systems with computer vision capabilities. By leveraging the ESP32's built-in Wi-Fi, efficient processing power, and the ESP32 camera module, the system provides a compact and cost-effective solution for real-time image capture and analysis.

The project highlights how vision-based applications such as object detection, surveillance, and automation can be implemented on low-cost hardware without the need for high-end computing resources.

REFERENCES:

1. Text Detection and Recognition in Imagery: A SurveyX. Yin, X.-C. Yin, K. Huang, H. Hao — IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2016.

DOI: 10.1109/TPAMI.2014.2366765

https://ieeeexploredl.iee.org/doi/10.1109/TPAMI.2014.2366765?utm_source.com

2. Shape Robust Text Detection with Progressive Scale Expansion Network (PSENet)

W. Wang et al. — Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2019.

DOI: 10.1109/CVPR.2019.00956

https://IEEE.www.researchgate.net/publication/338513389_Shape_Robust_Text_Detection_With_Progressive_Scale_Expansion_Network?utm_source=com

THANKYOU