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Object Detection Using Deep Learning

Haque Mohammed Azim Anwarul[1], Barot Savan Hareshbhai[2], Mohammed Zaid Topiwala[3], Prof. Reema Raval[4]

Student, Department of Electronics and Communication, LJIET-Ahmedabad, India[1]

Student, Department of Electronics and Communication, LJIET-Ahmedabad, India[2]

Student, Department of Computer Engineering, SAL-ITER-Ahmedabad, India[3]

Assistant Professor, Department of Electronics and Communication, LJIET-Ahmedabad, India[4]

ABSTRACT: Over the recent years technology is enhancing by each passing day. It has enhanced up to such a greater extent that technology has become human like. One of the several features of human eye is that it detects & recognizes the object. Similar result can be obtained by using an ESP32 Camera. The AI-Thinker ESP32-CAM module is a low-cost development board with a very small size OV2640 camera and a micro SD card slot. It has an ESP32 S chip which has built-in Wi-Fi and Bluetooth connectivity, with 2 highperformance 32-bit, 7-stage pipeline architecture. We have previously explained ESP32-CAM in detail and used it to build object detection.

KEYWORDS: ESP 32 CAM, servo motor, Computer VisionDeep learning, neural network algorithm.

I. INTRODUCTION

It is needless to point out that in the field of security and surveillance object detection playsan important role. With object tracking it would be easier to track a person in a video. Object tracking could also be used in tracking the motion of a ball during a match. In the field of traffic monitoring too object tracking plays a crucial role.The main purpose of object detection is to identify the object and label it which is present in image or video. In object detection the main technology used is image processing, pattern recognition, AI and machine learning. Has many applications in military, accident prevention, etc.

II. SCOPE OF PROJECT

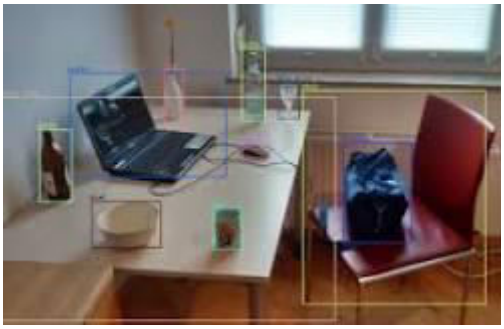

Figure 1 Camera detecting objects

It is widely used in computer vision tasks such as image annotation, vehicle counting, activity recognition, face detection, face recognition, video object co-segmentation.

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III. BLOCK DIAGRAM

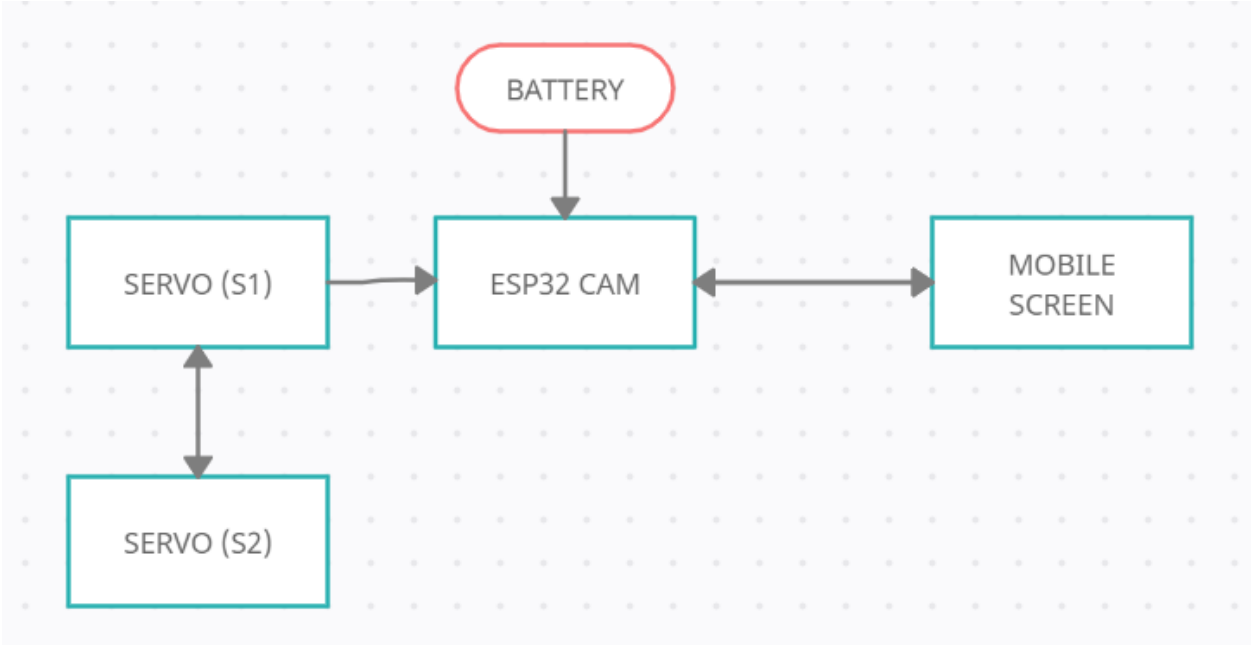

Figure 2: ESP32 CAM with servo

As you can see in this block diagram both the servo (S1 & S2) are connected to ESP 32 cam.Moving further, ESP32 CAM is connected to WiFi network through video streaming takes place & we can see the visual output over our mobile screen. When object is detecteda green box like structure is formed around the object. Furthermore, if we want to control the direction of ESP 32 CAM it can be done with the help of control keys present in our mobile app.

IV. COMPONENT DESCRIPTION

1. ESP32 CAM

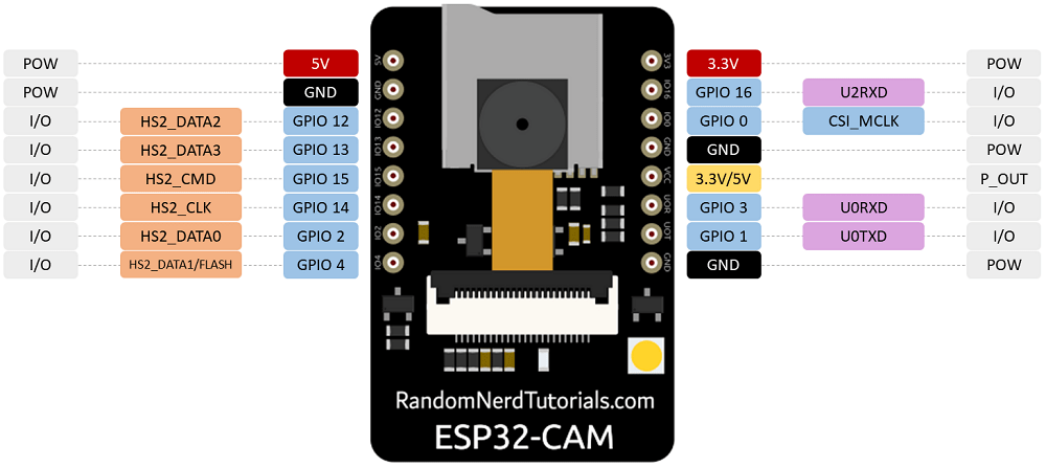

Figure 3: ESP32 CAM

The ESP32-CAM is an Ai-Thinker's Original ESP32 CAM WiFi+Bluetooth with OV2640 Camera Module based on the ESP32 chip with the additional facility of using a camera. It is ideal for various IoT applications. The ESP32-CAM has a very competitive small-sized camera module that can operate independently as a minimum system.

Ai-Thinker ESP32 CAM can be widely used in various IoT applications. It is suitable for home smart devices, industrial wireless control, wireless monitoring, QR wireless identification, wireless positioning system signals and other IoT applications. It is an ideal solution for IoT applications.

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Specification:- Ultra-small 802.11b/g/n Wi-Fi + BT/BLE SoC module

- Low-power dual-core 32-bit CPU for application processors
- Up to 240MHz, up to 600 DMIPS
- Built-in 520 KB SRAM, external 4M PSRAM
- Supports interfaces such as UART/SPI/I2C/PWM/ADC/DAC
- Support OV2640 and OV7670 cameras with built-in flash
- Support for images WiFI upload• Support TF card
- Support multiple sleep modes
- Embedded Lwip and FreeRTOS
- Support STA/AP/STA+AP working mode
- Support Smart Config/AirKiss One-click distribution network

2. ARDUINO UNO

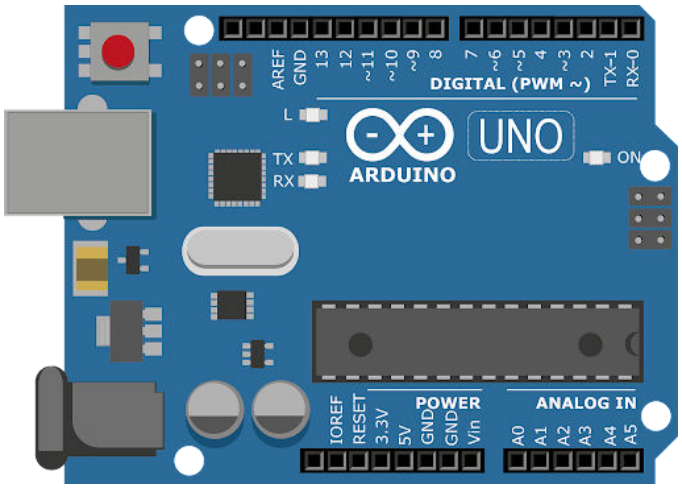

Figure 4: Arduino UNO

The Arduino Uno R3 is an open source microcontroller board based on the ATmega328 chip. This Board has 14 digital input/output pins, 6 analog input pins, Onboard 16 MHz ceramic resonator, Port for USB connection, Onboard DC power jack, An ICSP header and a microcontroller reset button. It contains everything needed to support the microcontroller. Using the board is also very easy, simply connect it to a computer with a USB cable or power it with DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2Atmega8U2 up to version R2) programmed as a USB-to-serial converter. While the Arduino UNO can be powered via the USB connection or with an external power supply, the power source is selected automatically.

SPECIFICATION

- Microcontroller: ATmega328P.
- Operating Voltage: 5V.
- Input Voltage: 7-12V.
- Digital I/O Pins: 14 (of which 6 provide PWM output).
- Analog Input Pins: 6.
- DC Current: 40mA.
- Flash Memory: 32 KB.
- SRAM: 2 KB.
- EEPROM: 1 KB.
- Clock Speed: 16 MHz.

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3. FT232RL USB - TTL CONVERTER

Figure 5: FT232RL

This is USB to TTL 3.3V 5.5V Serial Adapter Module based on FT232RL IC, It is mainly used for arduino applications.

SPECIFICATION

- Material: PCB + Electronic Component
- Support 3.3V, 5V
- Main Color: Red
- Chipset: FT232RL
- USB power has over current protection, using 500MA self-restore fuse
- RXD/TXD transceiver communication indicator
- Pin definition: DTR,RXD,TX,VCC,CTS,GND
- Pitch:2.54mm
- Module Size: About 36mm(length)*17.5mm(width

4.Servo Motor SG90

Figure 6: Servo Motor SG90

Micro Servo Motor SG90 is a tiny and lightweight server motor with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos. Good for beginners who want to make stuff move without building a motor controller with feedback & gear box, especially since it will fit in small places. It comes with a 3 horns (arms) and hardware.

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Features

- Weight: 9 g
- Dimension: 22.2 x 11.8 x 31 mm approx.
- Stall torque: 1.8 kgf·cm
- Operating speed: 0.1 s/60 degree
- Operating voltage: 4.8 V (~5V)
- Dead band width: 10 µs
- Temperature range: 0 ºC – 55 ºC

V. LIMITATIONS

The limitation of this project is that phone and ESP module must be connected to the same Wi-Fi network. Furthermore the picture quality of the camera can be improved.

VI. CIRCUIT CONNECTION

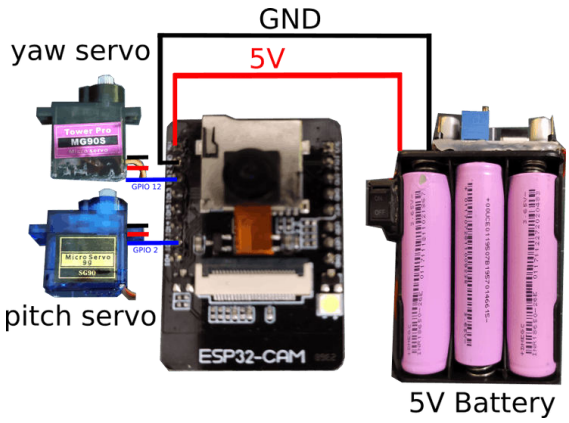

Figure 7 Circuit Connection

VII. CONCLUSION

The object detection is based on the technology of deep learning. This concept is useful in several fields with the help of this project we can do many projects.

VIII. FUTURE ENHANCEMENT

We can use a camera with better In future we can place this object detection circuit in a car or if we place this circuit into robot for open doors for customer and help to serve food.

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