Machine Learning based Smart security Locker for Real time Application using Python

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ABSTRACT: Security of lives and properties is highly important for enhanced quality living. Smart home automation and its application have received much progress towards convenience, comfort, safety, and home security. With the advances in technology and the Internet of Things (IoT), the home environment has witnessed an improved remote control of appliances, monitoring, and home security over the internet. Several home automation systems have been developed to monitor movements in the home and report to the user. Existing home automation systems detect motion and have surveillance for home security. However, the logical aspect of averting unnecessary or fake notifications is still a major area of challenge. Intelligent response and monitoring make smart home automation efficient. This work presents an intelligent home automation system for controlling home appliances, monitoring environmental factors, and detecting movement in the home and its surroundings. A deep learning model is proposed for motion recognition and classification based on the detected movement patterns.
A human detected by the surveillance camera is classified as an intruder or home occupant based on his walking pattern. The proposed method's prototype was implemented using an ESP32 camera for surveillance, a PIR motion sensor, an ESP8266 development board, a 5 V four-channel relay module, and a DHT11 temperature and humidity sensor. The environmental conditions measured were evaluated using a mathematical model for the response time to effectively show the accuracy of the DHT sensor for weather monitoring and future prediction. An experimental analysis of human motion patterns was performed using the CNN model to evaluate the classification for the detection of humans.

Keyboard—ESP32, IOT, DHT Sensor, ML,Arduino UNO R3,Python.

I.INTRODUCTION

In recent years, IoT-based smart home technologies have become a research hub. Yuan et al developed smart home systems with the STC89C52 CPU and the GSM module of the TC35 modem as the system's operational core, temperature and humidity sensors, and a natural environment information gathering source. To boost business intelligence, Wang et al. suggested a style-based 3-D scenarios virtual home intelligent suggestion system. Hand movement recognition employing camera-enabled gadgets, in specific, would allow for more natural involvement than typical interfaces provide. The use of embedded and ubiquitous computing in the home should make the relationship between humans and computers more natural, simple, and efficient. Hand gesture-based interfaces have the potential to simplify human-computer interaction. As a result, the purpose of this research is to develop a real-time collaborative control system for domestic appliances using image detection and processing technologies combined with pattern recognition.

A variety of SH projects are now being created for the goal of proof-of-concept demonstration as well as the construction of genuine living habitats. Sensor networks, data connections, and gadgets are examples of enabling technologies that offer portions of the capabilities required for the SH. On the one hand, this has resulted in increased capacities for producing large volumes of sensor data relating to SH habitats, occupants, and events, etc.

These issues may be resolved if a detection method that can distinguish between people and creatures other than humans is implemented. Furthermore, to minimize power waste in areas in which there is no individual control over the status of appliances in one segment of the room, the appliances must be controlled segment by segment, with each segment being a component of the space where this system is implemented. This results in significantly higher savings when compared to other systems that regulate the entire space as a single unit. To address this challenge, an object detection method YOLO with base net like Mobile net is employed rather than an object identification algorithm to obtain the dimensions of the observed human in the room. Once the co-ordinates have been anticipated, appliances in that section will change states based on the existence (or absence) of people.

These technologies strive to make it easier for consumers to use and maintain household appliances so that they run automatically and properly. Furthermore, they are an important step towards achieving energy efficiency. To create these kinds of management systems, it is required to identify and regulate the energy consumption of main household appliances that are responsible for greater electrical demand. The major goal of this work is to give a method for decreasing the use of numerous sensors by replacing them with a single camera and an algorithm that uses machine learning to identify the presence of humans in a specific segment rather than viewing the entire space as a single unit.

II.AIM & OBJECTIVE

The objective of this work is to develop an Intelligent Home Automation System. To reduce Electricity Wastage and ensure Privacy-Preserving Identification and Authentication. To Implement effective object detection methods and utilize Machine Learning for human detection.

III.EXISTING SYSTEM

The Internet of Things (IoT) is ushering in a new era of digitalization, connecting various sectors of daily life and offering consumers unprecedented levels of comfort and control. However, a significant portion of the population, particularly in the developing world and among the elderly, struggles to use standard electronic devices such as PCs, smart phones, or tablets.

This digital divide underscores the importance of finding inclusive solutions for technology adoption. Speech recognition-based systems represent a promising approach to making IoT technology accessible to a broader segment of society.

In recent years, IoT-based smart home technologies have emerged as a prominent research focus. Researchers like Yuan et al. have developed smart home systems with advanced hardware components, such as the STC89C52 CPU and the TC35 modem's GSM module, temperature and humidity sensors, and environmental data sources. These systems aim to enhance not only the convenience but also the efficiency of daily life.

IV.PROPOSED SYSTEM

we propose a privacy-preserving and secure identification and verification method for Home Automation Systems. This method harnesses cutting-edge technologies, including IoT, Machine Learning (ML), and Image Processing. Object detection techniques are used to manage appliances within a specific geographic area, offering greater efficiency compared to traditional IR sensor-based systems.

ML algorithms play a pivotal role in identifying individuals in each camera frame. This approach represents a significant stride towards a sustainable and convenient future, reducing energy wastage while aligning with the trend of interconnected, user-centric smart devices.

As IoT and machine learning continue to advance, the potential for enhancing home automation systems is limitless, promising a more intelligent and efficient way of living for all. Our proposed work leverages the YOLO v8 algorithm to realize this vision.

V.BLOCK DIAGRAM

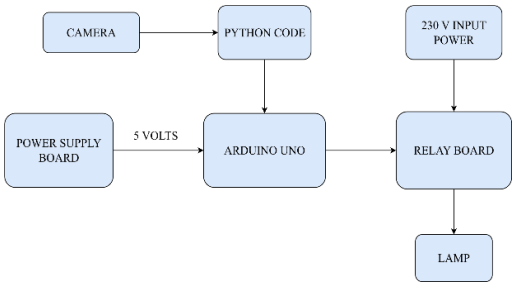

Fig 1 Block Diagram

VI.PROJECT WORKFLOW

The image processing workflow consists of two distinct phases: pre-image detection and post-object detection image processing. When a new frame is captured by the camera, it undergoes pre-image detection processing. In this phase, the image is automatically oriented by +/- 180 degrees in the X and/or Y axis to account for variations in camera orientations. This ensures that the image aligns correctly for subsequent processing. While the object detection module can handle images with different rotations and orientations, this pre-processing step standardizes the image orientation to facilitate post-object detection image processing. Once orientation adjustments are made, the image is resized to the input dimensions required by the object detection model. In our implementation, we employ the YOLOv8 algorithm.

VII.IMPLEMENTATION AND RESULTS

We propose a system for detecting humans in each region of a room and controlling gadgets based on whether or not people are there. Furthermore, the object recognition technology assures that only people and no other object or animal may cause the appliance's status to change. If no existing camera-based surveillance is in place, this technique requires the setting up of cameras in the areas where the system will be used. The video that are captured by camera are then processed to, where python code is used to detect the presence of humans using Deep Learning algorithm named YOLO (V8). And then the output of Raspberry Pi is passed to the Arduino where the entire control for the automation is processed.

Fig 2 Result of Human Detection

Fig 3 Result of Arduino

VIII.CONCLUSION

In the era of technological advancements, the fusion of artificial intelligence and computer vision has ushered in a wave of groundbreaking applications across diverse domains. This cutting-edge technology not only delivers enhanced automation and convenience but also assures that only humans can trigger changes in the operational status of connected appliances, effectively eliminating unintended interferences from inanimate objects or animals.

These regions can be dynamically configured to cater to specific needs, whether it involves lighting control, temperature adjustments. A cornerstone of this system is the integration of advanced object recognition technology, which ensures that only humans possess the capability to influence the operational status of connected appliances. To effectively deploy this system, a network of cameras plays a pivotal role. These cameras continuously monitor the designated areas, providing real-time data for human detection and object recognition. The system can be adapted to function seamlessly with existing cameras, thereby significantly reducing the hardware costs associated with its implementation. This cost-effective approach is particularly appealing to homeowners and businesses seeking to enhance automation and security without incurring substantial upfront investments in surveillance infrastructure.

REFERENCES

[1] Sakthikumar B., Ramalingam S, Deepthisre G., & Nandhini, T. (2022, November). In 2022 International Conference on Augmented Intelligence and Sustainable Systems (ICAISS) (pp. 1077-1081). IEEE.

[2] Sarojini R, Venkataramanan C, Sudha R, & Ramalingam S. (2022, October). Design of Intelligent Socket Module for Smart Home Application using Internet of Things..

[3] Ramalingam, S., Baskaran, K., & Kalaiarasan, D. (2019, July). IoT enabled smart industrial pollution monitoring and control system using raspberry pi with blynk server..

[4] IVÁN FROIZ-MÍGUEZ, PAULA FRAGA-LAMA AND TIAGO M FERNÁNDEZ-CARAMÉ "Design, Implementation, and Practical Evaluation of a Voice Recognition Based IoT Home Automation System for Low-Resource Languages and Resource Constrained Edge IoT Devices A System for Galician and Mobile Opportunistic Scenarios" The research is documented with DOI 10.1109/ACCESS.2023.3286391.

[5] Aimin Yang, Chunying Zhang, Yongjie Chen, Yunxi Zhuansun, and Huixiang Liu IEEE INTERNET OF THINGS JOURNAL, VOL. 7, NO. 4, APRIL 2020.

[6] MU-CHUN SU, JIEH-HAUR CHEN, ACHMAD MUHYIDIN ARIFAI, SUNG-YANG TSAI, AND HSIHSIEN WEI "Smart Living".

[7] Nagaraj Shet, C. Shreesha, P.V. Rao and Abdullah Gubbi "Low-Cost Appliance Control System for Home Automation and Energy Management Using Image Processing".

[8] PATRICIA FRANCO, JOSÉ MANUEL MARTÍNEZ, YOUNG-CHON KIM AND MOHAMED A. AHMED "A Framework for IoT Based Appliance Recognition in Smart Homes".

[9] Lawal Babangida, Thinagaran Perumal, Norwati Mustapha, and Razali Yaakob IEEE SENSORS JOURNAL, VOL.22, NO.9, MAY1, 2022.

[10] Alexander X. Oesterling, Mohammadreza F. Imani, Oren S. Mizrahi, Jonah N.Gollub, and David R. Smith "Detecting Motion in a Room Using a Dynamic Metasurface Antenna.

[11] C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of ELECTRICAL ENGINEERING, Vol.63 (6), pp.365-372, Dec.2012.

[12] C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011.
[13] C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor & Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011.
[14] C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
[15] Nagarajan C., Neelakrishnan G., Akila P., Fathima U., Sneha S. "Performance Analysis and Implementation of 89C51 Controller Based Solar Tracking System with Boost Converter" Journal of VLSI Design Tools & Technology. 2022; 12(2): 34–41p.
[16] C. Nagarajan, G.Neelakrishnan, R. Janani, S.Maithili, G. Ramya "Investigation on Fault Analysis for Power Transformers Using Adaptive Differential Relay" Asian Journal of Electrical Science, Vol.11 No.1, pp: 1-8, 2022.
[17] G.Neelakrishnan, K.Anandhakumar, A.Prathap, S.Prakash "Performance Estimation of cascaded h-bridge MLI for HEV using SVPWM" Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp:750-756
[18] G.Neelakrishnan, S.N.Pruthika, P.T.Shalini, S.Soniya, "Perfromance Investigation of T-Source Inverter fed with Solar Cell" Suraj Punj Journal for Multidisciplinary Research, 2021, Volume 11, Issue 4, pp:744-749
[19] C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007
[20] M Suganthi, N Ramesh, "Treatment of water using natural zeolite as membrane filter", Journal of Environmental Protection and Ecology, Volume 23, Issue 2, pp: 520-530,2022
[21] M Suganthi, N Ramesh, CT Sivakumar, K Vidhya, "Physiochemical Analysis of Ground Water used for Domestic needs in the Area of Perundurai in Erode District", International Research Journal of Multidisciplinary Technovation, pp: 630-635, 2019