CONTACTLESS FAN AUTOMATION FOR SPECIALLY ABLED PEOPLE

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I. ABSTRACT

Microcontrollers are being developed with the intention of automating various aspects of human existence in order to better the lot of the poor and disadvantaged. Product applications of gesture and motion detection algorithms, such as the 'Gesture-based Fan. Using camera sensors for motion detection, we can determine whether or not there is a human presence in a space. The fan's speed and on/off switch can be controlled by gestures of the hand. There are some human emotions that are better conveyed through physical gestures than through words. The global community is searching for a cutting-edge, low-priced option.

Keywords - Computer Vision , Image Recognition , Arduino , Motion detection

II. INTRODUCTION

The rate of technical progress is increasing dramatically, and nearly every appliance or electronic gadget we use today has undergone some sort of improvement. But if you look at the crowd closely right now, you'll see that we haven't changed much. Since no serious research or study has been done on the subject of "fans" in the last few decades, the phenomenon is still in its infancy. The most recent development in fan technology is the remote control fan that can be operated by a switch; nevertheless, this solution is sometimes too costly to be practical. It is now clear, thanks to IoT-Techniques, that current air conditioners are technologically advanced; yet, their high cost prevents them from being accessible to the vast majority of users. However, a fan is the cheapest option for both cooling and air circulation. In today's world, a smart fan that is both affordable and technologically advanced is much-needed.

III. LITERATURE REVIEW

A. Design and Implementation of a Secure Smart Home with a Residential Gateway .

They propose the Smart Home Security Protocol, a unique cryptographic protocol, in addition to a safe smart home network (SHSP). A residential gateway .(RG) is required to conduct the essential authentication, key distribution, and encryption tasks to secure a smart house . Based on the characteristics

of networks and associated devices, we define smart homes into three distinct sub-network groups, and these networks are interconnected via the RG. Several secure scheme types are deployed based on the subnetwork to reduce workload and device wait times while retaining adequate security. Several embedded system configurations are used to create and validate the proposed smart house security paradigm.

B. Design of a Novel IoT Framework for Home Automation using Google Assistant

Automating the home with Node MCU and Google Assistant. Home automation is anything that simplifies and improves the lighting, heating, and appliance performance in a home. All of your home's major utilities, from heating to lighting, can be managed by a single remote or automated system. You can customise the options to suit your needs. Wireless technology is prioritised because it is easier to deploy than wired alternatives.

C. Modeling of Intelligent Sensor Duty Cycling for Smart Home Automation

The sensors in a smart home network are divided into several groups using the dynamic temporal warping (DTW) algorithms and recurrent neural network (RNN) in order to foresee events with high accuracy and minimal energy consumption. A RNN model with bidirectional long-short-term memory (BLSTM) is used to anticipate the future behaviour of smart home users in order to select the sensors that are most likely to predict those behaviours. Similarly, DTW is utilised to select a guard sensor from among sensors with a high degree of similarity in order to predict unanticipated home user activities. To maintain a balance between energy consumption and precision, the function of the sensor switches between multiple modes. To determine the effectiveness of the suggested strategy for integrating data from reliable sources, a considerable number of simulations are done.

D. IoT Based Home Automation Using App & AWS

They have implemented AWS DynamoDB, a fully-managed NoSQL database solution that enables substantially more rapid, consistent, and predictable performance. Integrating the Raspberry Pi, AWS, and MQTT App makes this possible. Because the user may choose with whom to share data, integrating IoT home automation with AWS is a fantastic idea for data management and privacy.

E. Automized Gesture Controlled Switch

The APDS-9960 motion sensor and Arduino are the brains of a proposed contactless appliance control system. Hand gestures and other motions are used as commands in gesture recognition. The reflected infrared signal from the user's hand is transformed into control signals by the Photodiodes present in the APDS9960 sensors.

F. Smart Home Automation for Differently Abled Person using Controller and IoT

It is an Internet of Things (IoT) gadget for automating the house, and its controller is a "atmega328p." This controller facilitates communication between various sensors, including those used to detect gas, fire, and infrared heat. Infrared sensors pick up on light, gas sensors pick up on alarms, and fire sensors pick up on fires .Lights, fans, and other home electronics can all be controlled just by speaking a command.

G. .Intelligent Home Automation System for Disabled People

In this study, numerous home appliances are controlled using an Android smartphone in conjunction with a Raspberry Pi 3 Model B running the Blynk software. When PIR sensors detect motion, an alert is immediately activated. The Blynk app manages everything. The alarm will continue to ring until you push the "OFF" button. When adequate light is detected, the camera immediately turns on and begins photographing the user.

H. Hand Gesture Based Home Automation System for Physically Challenged Humans

Home appliances can be controlled by moving the hand left, right, and up and down. The APDS 9960 sensor and the Arduino Uno board are the main components. Each one has its own microcontroller connected to the motion detector. The APDS-9960 sensor's gesture recognition capabilities trigger the switch, which in turn activates the devices.

I. Smart Home Automation System for Elderly and Handicapped People Using Mobile Phone

It's an internet-based smartphone app. In order for the model to function, the user must make a choice within

the mobile app. The Raspberry Pi's controller can communicate with the database via the GPS connection. In order to turn on or off the appliances in a home, it first reads the value from a database and then sends the corresponding voltage signal to a relay.

J. Home Automation System for People with Visual and Motor Disabilities in Colombia

A smartphone's touch-to-speech functionality serves as the foundation for this. The technology design is based on a web server that was built with the help of an Arduino Uno and a Wi-Fi Shield. In addition, a wireless router supports its dual LANs. The network to which the mobile device is attached helps us pinpoint the disabled person's exact location inside the house. A mobile application relays this data to the user and also allows them to remotely power off or restart devices.

IV. METHODOLOGY

A. STATE TRANSITION NETWORK

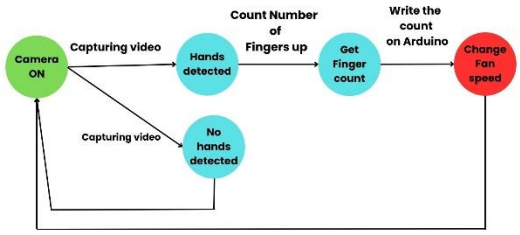

Fig. 1 :- State transition network

B. FLOW CHART

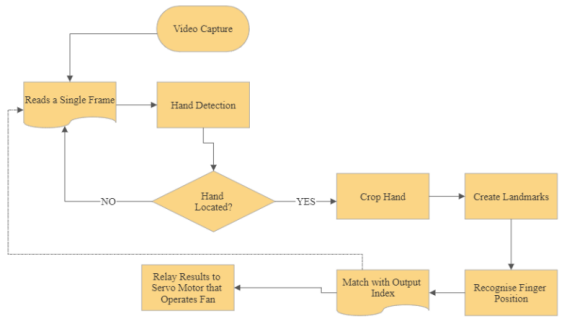

Fig. 2 :- Flowchart for proposed model

C. HIERARCHIAL TASK ANALYSIS

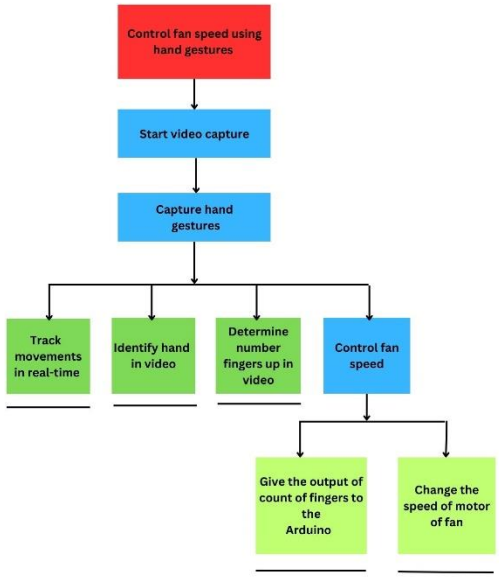

Fig. 3 :- hierarchical task analysis

D. WORKING

Our approach prioritizes both products and equity. The preceding figure 1 depicts the process flow of our project. Those with limited mobility or who are elderly will have difficulty operating the equipment. However, our suggested paradigm shift will eliminate the need to deal with this issue in the future. Normally, turning on a fan requires either locating the remote or getting out of bed to flip the switch. This method of switching cannot be taken anywhere. But remotes can be carried about easily. The overuse of remote controls is a problem that has to be addressed. As a result, we propose a novel method of operating the fans via hand gestures, in which the user indicates his intention to do so by pointing his hands towards the camera and making various finger patterns that may be recognized by computer vision. The model's recognition capabilities are constrained to reduce the possibility of misinterpretation and guarantee that the fan's speed will not be adjusted in response to an inaccurately captured finger pattern. The model automatically creates a response whenever a pattern is recognized. The Arduino runs the code that controls the fan motor.

IV. COMAPRISON

Aspect	Gesture-Based Switch Control	Contactless Fan Automation
Component	APDS-9960 Sensor	Integrated/External Webcam
Protocol/Library used	I 2C Protocol	Python Libraries: cv2, media pipe, time and serial
Gesture Range	7(UP, DOWN, LEFT, RIGHT, FAR, NEAR, NULL)	24
Function	Switching Appliances ON and OFF	Switching Appliances ON and OFF while changing speed/rate
Cost (non-common components)	₹250	₹500

As presented by the comparative analysis in Table , the contactless fan is superior due to wider range of gestures recognized. Due to the same and added functionality of 'rate-control' it has a wider range of application in fan-operation and ultimately, home-automation

V. RESULTS AND DISCUSSIONS

A. MAKE A MOVE BEYOND FIELD OF VIEW

1) MODEL HUMAN PROCESSOR

Total Time = Tp + Tc +Tm=100+(5+1)70+70=590 ms

2) KEYBOARD LEVEL MODEL:

S.NO	DESCRIPTION	OPERATOR	TIME (ms)
1	Preparing to make the motion in one's head	M	1.35
2	Making hand gesture	P	1.10
3	Making a gesture toward the eye area	H	0.4
4	Authenticating the Acknowledgement	M	1.35
			TOTAL = 4.2

3) GOMS ANALYSIS -

Method for goal: Preparing to make the motion in one's head

Step 1. You pick the move..

Step 2. Come back when you're done.

Method for goal: Making hand gesture

Step 1. Direct the gesture at the eyes.

Step 2. Come back when you're done.

Method for goal: Making a gesture toward the eyes

Step 1. Put your gestured hand camera see it.

Step 2. Come back when you're done.

Method for goal: Authenticating the Acknowledgement

Step 1. Verify the Recognition.

Step 2. Come back when you're done.

B. MAKE A MOVE IN SIGHTLINE

1) MODEL HUMAN PROCESSOR

Total Time = Tp + Tc + Tm=100+(5)70+70=520ms

2) KEYBOARD LEVEL MODEL:

S. NO	DESCRIPTION	OPERATOR	TIME (ms)
1	Preparing to make the motion in one's head	M	1.35
2	Making a hand gesture	P	1.10
3	Authenticating the Acknowledgement	M	1.35
			Total= 3.8

3) GOMS ANALYSIS-

i. Method for goal: Making a gesture toward the eyes

Step 1 Direct the gesture toward the eyes.

Step 2. Come back when you're done.

ii. Method for goal: Preparing to make the motion in one's head

Step 1. Pick the hand signal.

Step 2. Come back when you're done.

iii. Method for goal:

Making a hand gesture

Step 1. Aim the gesture right at their camera.

Step 2. Come back when you're done.

iv. Method for goal: Authenticating the Acknowledgement

Step 1. Authenticating the Acknowledgement

Step 2. Come back when you're done..

C. COMPARISON

	KLM	MHP
MOVE YOUR HANDS OUTSIDE THE LINE OF SIGHT	4.2	590 ms
Gesture within the field of vision	3.8	520 ms

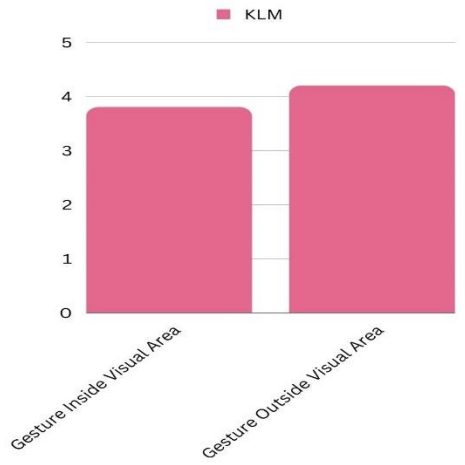

Fig. 4 :- KLM graph

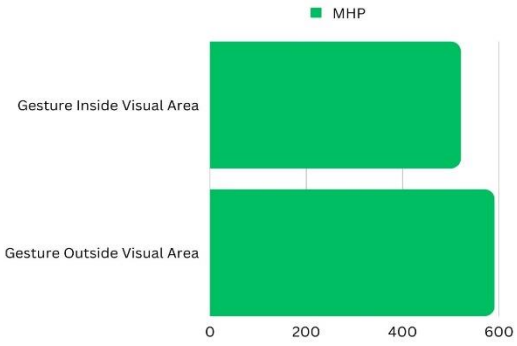

Fig. 5 :- MHP graph

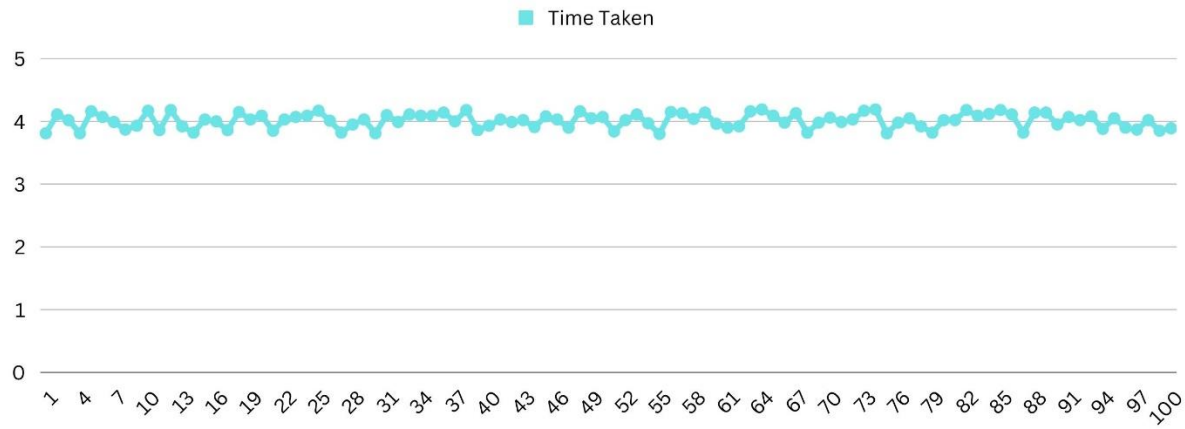

Fig. 6 :- Execution time for 100 instructions

VI. CONCLUSION

The 'Gesture-Based Fan' recognizes hand gestures to function without a remote and adapt to its user's preferences. The camera detects the user's hand movements and uses image recognition to translate that into commands for the fan. This idea project designed a automated fan based on the Arduino platform, which can be operated by human motion and would thus be usable by people of varying ages and abilities.

VII. FUTURE SCOPE

Without having to appear on camera, we can control the fan with a custom-made app on our mobile devices. This kind of technology might be used to improve a wide variety of household products, including lights, fans, and even smart-gas hob regulators.

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