

# Augmented-Reality Computer-Vision and IoT Control platform

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**Abstract:-** The point of this exploration is to build up an inventive minimal effort and reasonable stage for savvy home control and vitality observing interfaced with enlarged reality. This technique will instruct individuals about vitality use when fuel costs are rising and make novel strategies for cooperation for those with inabilities. So as to build the attention to vitality utilization, we have built up an intelligent framework utilizing Augmented Reality to indicate live vitality use of electrical segments. This framework enables the client to see his constant vitality utilization and in the meantime offers the likelihood to connect with the gadget in Augmented Reality. The vitality use was caught and put away in a database which can be gotten to for vitality checking. We trust that the mixes of both, complex savvy home applications and straightforward intelligent UI will expand the consciousness of vitality utilization.

## I. INTRODUCTION

Future savvy home stages will be based upon different forthcoming outlook changes in innovation - in particular Augmented-Reality, Computer Vision helped location, Energy Monitoring-Disaggregation and IoT Control (ACADEMIC). The ACADEMIC stage we propose will be founded on the improvement of combination of these innovations in a minimal effort and reasonable bundle. Scholastic is the first of its sort - though fundamentally the same as suggestions or subsets of ACADEMIC have been proposed previously. We will probably draw upon the most recent research and make a brilliant home stage that is anything but difficult to utilize, and connecting with for all ages. Shrewd Homes have been around for a long while, however have neglected to catch the enthusiasm of individuals.

The Internet of Things has anyway as of late acquainted savvy home ideas with individuals through cloud middleware stages (for example IFTTT [1]), whereby straightforward control components are empowered through the web (for example turning on a light around evening time naturally from the web or by means of a movement sensor, yielding potential funds of up 20% [2] ) however total frameworks of entire house mechanization and control are as yet treated as recondite or of area of the rich [3]. Keen Homes however have tremendous potential to improve our lives - they can empower us to have better authority over our homes (especially at the assistive innovations level [4]), while give us various observing information which can be investigated further [5](e.g. what amount does my climate control system cost to run?, will it be less expensive to do 'x' versus 'y'?). Additionally mortgage holders have a high enthusiasm for decreasing their vitality utilization as it very well may be viewed as an essential cost factor. Anyway standard power meters and simple charging frameworks come up short on the input to make vitality mindfulness. This is the place savvy home control and vitality checking interfaced with expanded reality will abbreviate the input time from utilization of vitality to client charging framework and in the meantime increment clients vitality utilization mindfulness.

## II. COMPUTER VISION

PC vision has been utilized in Smart Homes for checking purposes and offer approaches to associate its apparatuses. Diverse approaches to interface with the house incorporate utilizing a gadget, for example, an advanced mobile phone [6], [7], [8], eye stare [9] and hand signals [10], [11], [12], [13]. Keen home ought to likewise have the capacity to screen the action [14], [15] and the prosperity of the occupants. PC vision empowers the savvy home to be increasingly available to clients with various capacities, it empowers the occupants to have a simple method to associate with their encompassing and adds to enhancement of their personal satisfaction. Jafri et al.[15] built up an assistive gadget utilizing Google Tango tablet to empower individuals who are outwardly disabled to explore inside and keep away from obstructions.

The profundity camera in Tango is utilized to recognize questions in the way of the client and a discourse based route data is given to the user. Takizawa et al, proposed a framework to help individuals who are outwardly disabled to look and find objects utilizing Microsoft Kinect. The framework was utilized to quantify the profundity of field to find items, for example, seats, floor, downwards and upwards stairs. In the investigation completed, it was discovered that the opportunity to find the article was significantly shorter than that of a customary white stick.

### **III METHODOLOGY**

#### **3.1 Hub Red and Augmented reality**

The framework was based over the Node-Red[20] structure running on a Raspberry Pi. Hub Red is a flow based advancement device created for wiring equipment gadgets, APIs (Application programming interface) and on-line benefits as a major aspect of Internet of Things (IoT). Also unique correspondence conventions can be utilized for interconnection of heterogeneous gadgets for instance an Arduino interfacing with a Raspberry Pi. Hub Red was incorporated into the shrewd attachment arranges so as to give ongoing information. Hub Red gives engineers the office to construct versatile inserted frameworks and in the meantime gives a web administration to control diverse gadgets regardless to its system innovation. NodeRed contains diverse hub which can be interconnected to speak with various gadgets and conventions.

#### **3.2 Influx DB**

Influx DB is an open source database streamlined for quick, high-accessibility stockpiling and recovery of time arrangement information in fields, for example, tasks observing, application measurements, IoT sensor information, and ongoing analytics. The information recorded in Influx DB are shown in Grafana.

#### **3.3 TP-Link HS110 reconciliation**

Vitality utilization observing gadgets ought to give a most extreme straightforwardness. TP-Link HS110 remote savvy plug was utilized to get vitality utilization information of plugged-in gadgets. TP-interface HS110 associates with the remote system and gives data, for example, current, power, voltage and some more. To coordinate the TP-Link HS110 usefulness, Node-Red flows were made inside the Node-Red condition.

#### **3.4 OpenCV**

OpenCV is an open source PC vision and machine learning programming library. This library contains more than 2500 calculations.

#### **3.5 Python**

Python is a deciphered abnormal state programming dialect for broadly useful programming.

#### **3.6 Raspberry Pi Camera**

The Raspberry Pi camera we utilized was a 8 super pixel Sony IMX219. This is generally accessible and minimal effort.

#### **3.7 Coordinated System Architecture**

Figure 1 gives a flow outline of the framework. The design flow is contained 3 principle segments: the TPLink 110, Raspberry Pi and Augmented Reality application. These parts are for the most part associated. The Raspberry Pi is a miniaturized scale controller facilitating the essential framework like Influx DB, Node-Red etc. The proposed application goes for coordinating vitality utilization into a savvy home foundation and furnishing UI to collaborate with the savvy home framework. A portable interface enables the client to control the shrewd attachment and envision the live information. Vitality utilization is checked utilizing a TP-LINK HS110 shrewd attachment associated with the keen home remote system. On their cell phones, clients can specifically get to the keen attachment by means of a hub red dashboard.

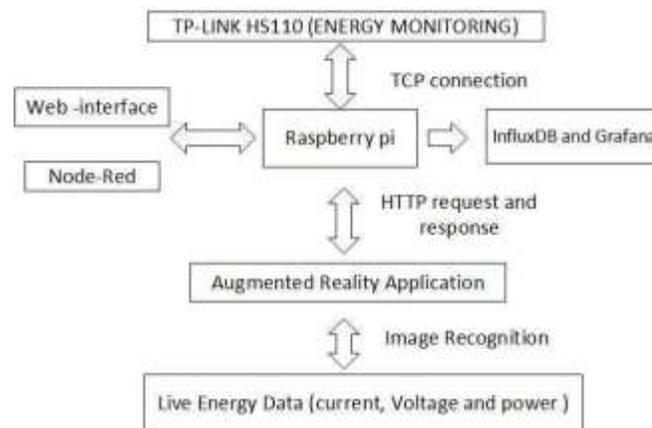


FIG 1

It perceives the shrewd attachment utilizing picture handling procedures and showcases vitality utilization of the gadget. The information caught from the shrewd fitting are put away in an Influx DB database which is then asked for by a Grafana interface. Moreover, the application empowers the client to see the information on both a Node-Red dashboard and the Grafana interface. In future, shrewd homes vitality efficiency will be a noteworthy issue, while considering headways in the zone of brilliant metering and savvy matrices. For instance, time-of use and continuous estimating may encourage both, buyers to spare vitality costs in families and vitality suppliers to enhance stack management. Also, the client would be able to realize which kind of vitality he is utilizing, for example, inexhaustible or nonrenewable sources. For instance the client can be compensated when utilizing environmentally friendly power vitality and subsequently diminishing his month to month bill. Along these lines, vitality mindful keen home applications needs to find a harmony between supporting the client in sparing vitality and in the meantime not diminishing convenience [6]. An ongoing observing framework is furnished with the incorporation of a database framework to keep a definite record of the vitality use.

### 3.8 Increased Reality and Computer vision in Air Quality Monitoring

For the PC vision part of the undertaking we ran with a Raspberry Pi camera which is both dependable and simple to use. This was utilized related to OpenCV to catch and dissect a surge of pictures to identify movement in the room. This enables us to decide movement in the room.

### 3.9 Inhabitation following

In this segment, we detail how we could decide the inhabitation of a room utilizing OpenCV and a Raspberry Pi camera.

**1) Algorithm:** OpenCv and Python were utilized to distinguish movement in a room. We additionally utilized a JSON (JavaScript Object Notation) file rather than line contentions. This took into account speedy and simple set-up for the python contents. The classes we utilized from the PyImageSearch bundle are as per the following. • TempImage: This take into account impermanent pictures to be put away in a cradle • PiRGBArray: Allow for exhibit control of RGB • PiCamera: Allow for catch of a surge of pictures from the camera To begin picture accumulation, we set-up our Raspberry Pi Camera and consider a warm up time of up to a couple of moments to guarantee that the catch sensors are given enough time to adjust. We likewise instate the normal foundation outline. The first procedure is to re-estimate the edge to a width of 500-pixels. This is done to have standard video yield. Following this procedure we convert the pictures to dark scale and apply a Gaussian haze to evacuate high recurrence commotion which enables us to concentrate on the "auxiliary" objects of the picture. This is appeared in 2.

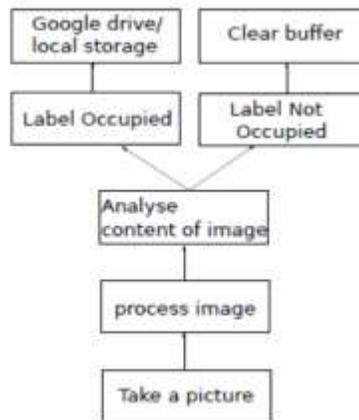


FIG 2: Motion detection sequence

**2) Weighted normal:** The first casing of the stream isn't generally a decent portrayal of the foundation we need to demonstrate, factors, for example, lighting condition change or individuals going into room can influence the model. Therefore we rather take a weighted mean of the past edge alongside the present casing. This implies the python content powerfully conform to the foundation at various occasions in the day. Along these lines making a superior model for the foundation in connection to the forefront. In view of the weighted normal of edges, we at that point subtract the weighted normal from the present edge. This outcome in

$$\text{delta} = |\text{background demonstrate} - \text{current frame}| \quad (1)$$

**3) Threshold:** We can then limit this delta to find district of the picture that contains contrast from the foundation. These zones are then recognized as movement in the video stream. **4) Contour identification:** The regions in the picture that finish the edge test are then exposed to form location. In the event that the locales are sufficiently enormous, we demonstrate that we have discovered movement in our present casing. We at that point register a bouncing box of the form and draw a container around the movement.

### 3.10 AR in air quality checking

AR can have numerous down to earth employments. One of them is showing information. In the shrewd home there are a huge number of sensors run of the mill model are temperature and stickiness. As of late air quality has been a variable of enthusiasm as we look for more advantageous ways of life and furthermore have been added to shrewd homes frameworks. Our present AR framework has been created to associate with bespoke air quality screen frameworks. Structure of the hub is appeared in 3

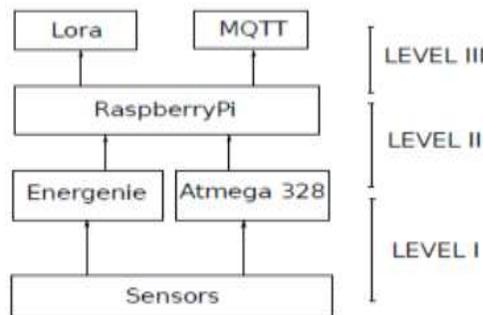


FIG 3 Air quality node flow diagram

This framework would work like this

- 1) One time download of the application
- 2) Point at the air quality framework
- 3) Read information for the framework

The utilization of AR, as appeared in figure 4, makes the entire thing exceptionally natural to the client. In addition to the fact that it allows for showcase of information, it demonstrates a breakdown of the distinctive sensor information. This does not stop at customary client however. Performing support on these gadgets additionally winds up simpler. For somebody doing support of these gadgets, an offices chief for instance could go and check the status of the building sensor with just their advanced cell, this makes it less demanding to work in the fields. This takes into account the fast investigating and the spotting of broken sensor hubs. Another part of the AR here is the capacity of a super user (maintenance officer) to change the framework programming. This would require no link association or bulky VPN or VNC association with the gadget, whereby the officer could point the advanced cell at the gadget to be updated. This could mean snappier, increasingly visit updates to the gadgets in a building.

## IV RESULTS

As of now the vitality utilization esteems are spared into a database and the client needs to get to it physically so as to imagine the information. This turns out to be very entangled and unwieldy for the client to get to the database each time he needs to envision. In this manner, it is vital to enable the client to envision his information in a simple and intelligent way. In the accompanying, we present association strategies which the client can utilize to imagine his vitality utilization data.

### 4.1 Consequences of OpenCV

In this area, we show results from our python content recognizing movement in a room. Initial a flood of pictures is taken from the Pi-Camera. At that point this surge of picture was handled to get the dim scale and the Gaussian-obscure. The outcome is appeared in figure 5.

This picture would now be able to be utilized as a kind of perspective edge for future catches. As new edges are caught they are contrasted with the reference image (Gaussian-obscure) by thresholding. Forming is done to enclose the movement zones the casing and we end up with figure 6. The following framework ended up being dependable in identifying movement and in marking the room as possessed when really involved.

### 4.2 Application

An immediate utilization of the movement identification could be the exchanging of roof lights of portions in a room by mapping lights position. In its final usage this could save vitality as it would just light significant fragments in the room.

### 4.3 Enlarged Reality

The least demanding method for getting data from a gadget in reality is specifically from the gadget. For this to be conceivable, the gadget should be enlarged with data. Therefore a middle of the road gadget, for example, an advanced cell should be utilized to make the data basically obvious for the client. For this reason, we have utilized a PDA to enable the client to see increased information on their screen. Figure 7 and Figure 8, demonstrates a working model where information is anticipated into Augmented Reality and Figure 9 indicates information caught from the brilliant attachment into Grafana dashboard when the database catch is squeezed. MQTT is utilized to send the information into the configuration of a JSON file that incorporate current, control voltage, gas, PM2.5, PM10, temperature, weight and dampness readings from air quality observing units.

The idea exhibited above is utilizing an advanced cell running android and Vuforia with an inward picture acknowledgment database. The camera picture of the cell phone is contrasted with the picture acknowledgment database. It perceives the picture by utilizing trackers. At long last, the cell phone ask for the live information from Node-Red server alongside its GPS area, the arrival information depends on the specific organizes gave. In addition, the client is additionally ready to cooperate with the item through the cell phone. At the point when the article is exchanged on, a HTTP reaction is sent to the Node-Red server which switches the shrewd fitting on and expands the intensity of the savvy plug. Figure 8, demonstrates a case of the attachment exchanged on. A similar procedure is utilized to kill the power. The upside of Vuforia association system is its instinctive and simple dealing with. It utilizes Computer Vision to perceive and follow planar pictures .Its picture enlistment capacity enables it to follow the position and introduction of the picture progressively.

## VI CONCLUSION

This venture speaks to the start of our exploration work on the ACADEMIC stage. We examined in this paper a few of the advancements that were available in our framework. Amid the previous couple of years, the reception of electric and electronic gadgets has conveyed tremendous advantages to human creatures, for example, expanded efficiency, enhanced amusement also, correspondence and considerably more. The expansion of vitality utilization mindfulness in the society will lead individuals to use vitality all the more effectively furthermore, intentionally. We have conveyed this idea closer to the objective of expanding vitality wastage mindfulness. The clients are ready to imagine their vitality utilization and dependent on this learning they are in a superior position to actualize systems for vitality sparing. As savvy home frameworks ends up more astute, they will be ready to create vitality sparing systems for the client, for example, specifically exchanging of the lights. The difficulties talked about in this paper demonstrate that there are a lot more open doors for further research. For the current examination just a single savvy fitting and air quality sensors are being utilized. For further advancement, we intend to coordinate a few brilliant home gadgets into Augmented Reality and work with Computer Vision rather than picture acknowledgment. In addition we are additionally wanting to enhance the execution of vitality utilization utilizing disaggregated vitality checking framework also, focus on the overhead of the checking framework in terms of vitality use/costs. The models will be sent in a classroom/address theater condition both for checking air quality and furthermore to furnish understudies with data about indoor/outside air quality being measured with our current sensor hubs.

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