A New Method of Lighting Using Internet of Things and Gesture

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Abstract : Generally, we do lighting of an electric bulb through a switch. Rocker switch is commonly used for this purpose. It is an on/off switch which rocks when pressed. After many pressed the rocker switch gets damaged or gets jammed. When many switches are placed in a single board, and if any switch gets heated, then it affects other switches normal operation. Sometimes it also causes electrical accident. To deal with such problems, in this paper we propose a model for lighting through internet of things and gesture technique which work by replacing the mechanical switch.

IndexTerms **- Internet of Things (IoT), Gesture, Tiles, Smart bulb, App, Voice assistance.**

I. INTRODUCTION

Internet of things (IoT) tell that, the way devices are connected to the internet and how they share data among all [1]. A wide range of devices come under IoT umbrella such as computers, laptops, smart phones, and objects equipped with chips to gather and communicate data over a network. Nowadays internet landscape increases rapidly. Now it's applications are not limited to computers, laptops, tablets, and smart phones anymore. Now a group of devices are internet connected instead of their architecture. A list of "smart" devices consists of washing machines, robotic vacuum cleaners, door locks, toys, and toasters [3] [4]. Now a variety of IoT devices are available for daily uses. Users often use smart phones to communicate with IoT devices, like to control smart speaker or home thermostat. The devices access through IoT are very convenience, like it helps to make a grocery list, or savings it, turning down the heat at home while someone is outside of the home, etc.

At present gesture is an iinterface for IoT enable devices [2]. A human body communicates with the physical world in subtle and sophisticated manners. Human eyes see a rainbow of color, ears hear a range of frequencies, and hands are great for grabbing whichever tool creative a brain can think and design [3]. But, the technologies sometime shows that it is out of sync with human senses as they peer at small screens, flick and pinch fingers across smooth surfaces, and read tweets "written" by programmer-created bots [6]. Therefore, these technologies reduce human labor to do a work. As a result people and industry are ready to adapt IoT, with its open up focus on machine-to-machine (M2M) communication [5]. The future of human-to-machine (H2M) communication seem a world where the physical objects are more networked than earlier, and even having their own conversations around the world [8]. Gestures technique provide human-to-machine interaction. In present days, people are familiar with gesture technology. Besides, apart from smart phone screens (pinch to shrink and sweep to scroll) to infrared sensors in bathroom faucets, human beings train to interact with "smart" objects in particular ways [10].

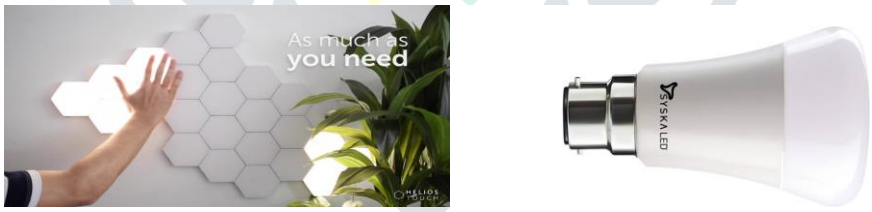

Fig 1.Helios Touch Light (Left Picture) And Syska Smart Wifi Enabled Bulb (Right Picture)

Keeping the problems of the rocker switch in mind we have developed the prototype model of a light which is switchless as well as smart enough to keep up with the demands of the internet era. This light doesn't have any mechanical switch. All we have to do is install the device in a wall and connect the device with electrical supply. The light can be controlled by simple gestures. The light can also be controlled from anywhere in the world using mobile app as well as virtual assistant. The light also comes with a color changing facility. The most striking feature of the light is that the light has four hexagonal shaped tiles which can be controlled individually i.e. we can control any tile we want, we can turn on or off any tiles, change the color of any tiles. The bulbs used here are LED strips power saving in nature.

II. DEVELOPMENT OF PROPOSED MODEL

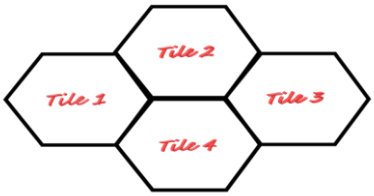

Fig 2. Tiles representation

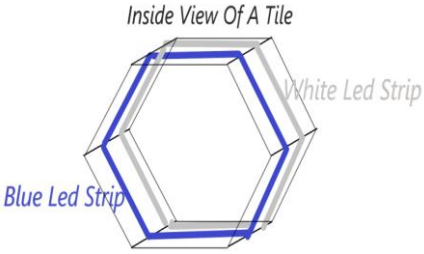

Fig 3. Tiles with blue light srtip

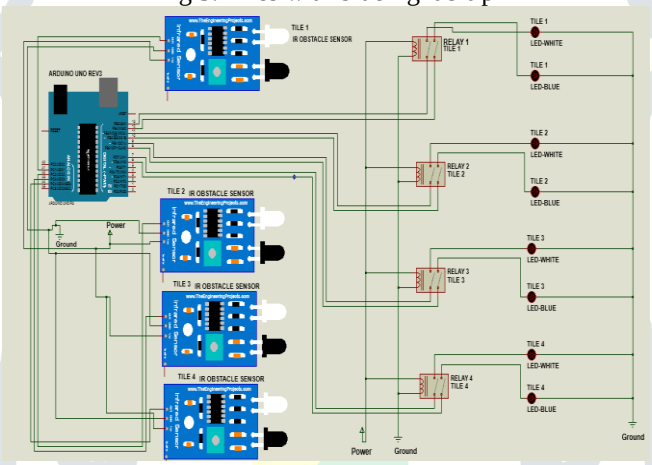

Fig 4.Circuit Diagram of the model

The model i.e the hexagonal blocks are made with the help of Polystyrene. Each of the tile contains an infrared obstacle sensor, a white LED strip and a blue LED strip and a two channel relay module. The LED strips are driven by a 12v DC adapter. The setup consists a ESP82 wifi shield. The sensors, relays, wifi shield all are interfaced together using Arduino Uno R3. The Arduino is internally programmed for controlling each of the tiles. The model works in three different modes.

The modes are: (1) Sensor operated mode (a type of gesture detection approach). (2)App based mode. (3).Voice assistance mode

1 Sensor operated mode

We have created four similar type functions for each tile where there is a counter variable present on each function. When the sensor senses something then it sets the counter value as 0, 3, 2, and 1.

Counter value 0 indicates the tile is presently off.

Counter value 1 indicates the tile is presently glowing as white.

Counter value 2 indicates the tile is presently glowing as blue.

Counter value 3 indicates the tile is presently glowing as both blue and white.

When the counter value is 0 and the sensor is sensing obstruction then the white LEDs are turned on and update the counter value as 1. When the counter value is 1 and the sensor is sensing obstruction then the white LEDs are turned off and the blue LEDs are turned on and update the counter value as 2. When the counter value is 2 and the sensor is sensing obstruction then both the white LEDs and blue LEDs are turned on and update the counter value as 3. When the counter value is 3 and the sensor is sensing obstruction then both the white LEDs and blue LEDs are turned off and update the counter value as 0.

Four individual functions are there for each tile with same functionality as discussed above.

2 App based mode

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3 Voice assistance mode

When a correct voice command is given to google assistant or alexa then an event triggers which in turn triggers another action at some other place specified by some URL (location of the blynk server). This is achieved by webhooks . Webhooks are basically

user defined HTTP callbacks (or small code snippets linked to a web application) which are triggered by specific events. Whenever that trigger event occurs in the source site, the webhook sees the event, collects the data, and sends it to the URL specified by you in the form of an HTTP request. We can even configure an event in one site to trigger an action in another site.

III. WORKING PROCEDURE OF THE MODEL

The device is operated in three different modes as described in this section.

Gesture Mode

The sensors are fitted in each of the tiles. Suppose we want to turn on a particular tile then we should place our palm in front of the sensor of that particular tile. As soon as we place our palm in front of the sensor then that particular tile starts glowing as white. If we want to change the color of that tile then again we will have to place our palm in front of the sensor of that particular tile. Now from white the color changes to blue. Now if we want to turn off that particular tile then again we will have to place our palm in front of the sensor of that particular tile and the tile turns off. So we can state that while a particular tile is off on first gesture it will turn on and glow as white on second gesture it will glow as blue and on third gesture the tile will turn off again. Using gesture we can control each tile individually.

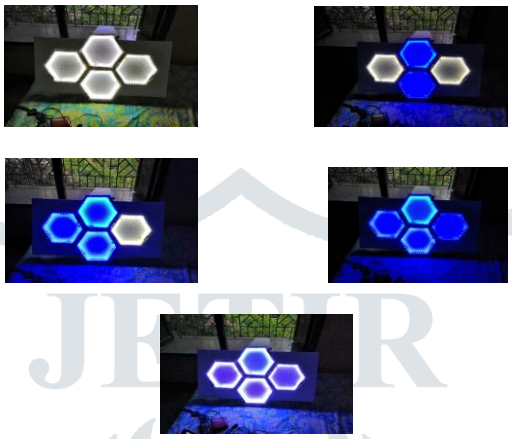

Fig 5.Prototype picture

App Mode:

The gesture mode is only possible when we very close to the device and we can place our palms very close to the sensor (nearly 1cm). The app can be used from anywhere since the device is IOT enabled. Using app controlling the device is much easier. This is a screenshot of the app when all the tiles are off.

ALL TILES WHITE: Pressing this button will turn on all the tiles as white and the button will display ON and repressing it will turn off all the tiles glowing as white and the button will display OFF.

ALL TILES BLUE: It works in the same way as ALL TILES WHITE. The only difference is that the tiles glow as blue in this case.

Fig 6. Mobile App Picture

If both “ALL TILES WHITE” and “ALL TILES BLUE” are pressed together then all the four tiles will glow as blue and white giving a mixture tone of light blue.

There are also buttons for controlling individual tiles and they are named in the following syntax :- TILE <TILE NUMBER IN WORDS> COLOR

For example: TILE ONE WHITE.
TILE TWO BLUE.

If we want to turn on or off a particular tile for a particular color then we just have to select the right tile number and the color we want. For example if we want to turn on tile two as blue then we have to select the button TILE TWO BLUE and then press it.

Voice Assistant Mode

If we don’t want to use the gesture mode or the app mode then we can opt for voice assistant mode. In this mode we have to give simple voice commands to virtual assistants like google assistant and alexa.

If we want to control all tiles

Voice command syntax for turn on is “TURN ON<COLOR> TILES”.

Example 1:“TURN ON WHITE TILES” – This will turn on the white lights of all tiles.

Example 2:“TURN ON BLUE TILES” – This will turn on the blue lights of all tiles.

Voice command syntax for turn off is “TURN OFF<COLOR> TILES”.

Example 1:“TURN OFF WHITE TILES” – This will turn off the white lights of all tiles.

Example 2:“TURN OFF BLUE TILES” – This will turn off the blue lights of all tiles.

If we want to control individual tiles

Voice command syntax for turning ona particular tile is “TURN ON TILE <NUMBER><COLOR>”

Example 1: “TURN ON TILE ONE WHITE” – This will turn on the white lights of tile one.

Example 2: “TURN ON TILE TWO BLUE” – This will turn on the blue lights of tile two.

Voice command syntax for turning off a particular tile is “TURN OFF TILE <NUMBER><COLOR>”

Example 1: “TURN OFF TILE ONE WHITE” – This will turn off the white lights of tile one.

Example 2: “TURN OFF TILE TWO BLUE” – This will turn off the blue lights of tile two.

IV. CONCLUSION

The light is constructed in such a way that it stays connected to electrical supply 24x7. It has no rocker switch for operation, instead it is provided with next generation controls like gesture, app and voice assistants. This prototype supports only two colors white and blue. Most striking feature in this device is that we can control each tile individually i.e a tile can be kept off while keeping the rest of the tiles to remain on with different color combination. The main motto of this device is “Use Light as per Your Choice and Requirement.” The prototype can be upgraded further by removing the relays hereby reducing costing. The blue and white led strips can be replaced with RGB led strips and from this we will be to generate 16777216 color shades. We can also add other voice assistant support to the device for SIRI (Apple) and Cortana (Windows).

REFERENCES

[1] Bandyopadhyay, D., & Sen, J. (2011). Internet of things: Applications and challenges in technology and standardization. *Wireless personal communications*, 58(1), 49-69.

[2] Han, X., & Rashid, M. A. (2016, June). Gesture and voice control of Internet of Things. In *2016 IEEE 11th Conference on Industrial Electronics and Applications (ICIEA)* (pp. 1791-1795). IEEE.

[3] Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). Internet of Things (IoT): A vision, architectural elements, and future directions. *Future generation computer systems*, 29(7), 1645-1660.

[4] Khan, R., Khan, S. U., Zaheer, R., & Khan, S. (2012, December). Future internet: the internet of things architecture, possible applications and key challenges. In *2012 10th international conference on frontiers of information technology*(pp. 257-260). IEEE.

[5] Balevi, E., Al Rabee, F. T., & Gitlin, R. D. (2018, May). ALOHA-NOMA for massive machine-to-machine IoT communication. In *2018 IEEE International Conference on Communications (ICC)* (pp. 1-5). IEEE.

[6] Fattibene, P., Trompier, F., Wieser, A., Brai, M., Ciesielski, B., De Angelis, C., ... & Juniewicz, M. (2014). EPR dosimetry intercomparison using smart phone touch screen glass. Radiation and environmental biophysics, 53(2), 311-320.

[7] Erdel, T., & Crooks, S. (2000). Speech recognition technology: an outlook for human-to-machine interaction. Journal of healthcare information management: *JHIM*, 14(2), 13-21.

[8] Ghosh, A., Sinha, S., Pal, S., & Sarkar, P. K. (2018, November). Voice Over Appliance Management System. In *2018 Fourth International Conference on Research in Computational Intelligence and Communication Networks* (ICRCICN) (pp. 188-192). IEEE.

[9] Bohora, B., Maharjan, S., & Shrestha, B. R. (2016). IoT Based Smart Home Using Blynk Framework. *Zerone Scholar*, 1(1), 26-30.

[10] Adiono, T., Putra, R. V. W., Fathany, M. Y., Afifah, K., Santriaji, M. H., Lawu, B. L., & Fuada, S. (2016, May). Prototyping design of electronic end-devices for smart home applications. In 2016 IEEE Region 10 Symposium (TENSYMP) (pp. 261-265). IEEE.