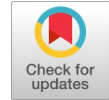# Smart Home Automation System using Ble

**Manchanda Sonam, Paul Aman, Thakral Bindu**

*Abstract: This paper presents technology which deals with low cost and efficient for example Bluetooth technology for controlling yeelight. This is achieved by incorporating java code into artik board. Technology has been developed at a high pace. Furthermore, it will never stop. Web of Things is getting to be prevalent nowadays because of putting tremendous effects on life. To structure an item utilizing current technology that ought to be gainful to the lives of others is an extraordinary test now a world. This paper exhibits cost effective technology for example ble, an artik board, yeelight, and test system simulator. The test system is utilized to control the shade of the yeelight in the scope of ble. The wireless communication has been established between the light and the board. This entire procedure will be incorporated according to popular request/response in accordance with the JSON format. The advantages of the light are it possesses low cost with less utilization of power.*

*Index Terms: Wireless communication, Technology, Bluetooth Technology*

## I. INTRODUCTION

Smart home automation system framework incorporates technologies and system control which results in a decrease of human labor. It not only reduces labor but also consumes less energy and time[1-2]. This quick development constrains us to control home apparatuses through our cell phones. Automation can diminish mistakes to zero[3]. Prior home automation system expected to decrease the human remaining task at hand yet nowadays it is well known for incapacitated and older individuals. In the USA, 1.6 million home robotization systems were introduced during 2012 and now it has been expanded by 45.1%. Home automaton can incorporate different interfaces for example WIFI [4-5], Bluetooth [6], ZigBee, and so forth. Gadgets which have Bluetooth interface has simple to arrange at low cost[7]. Bluetooth has a limit of 3 Mbps in a distance of 10-100 m. The home automation system can send voice call alarms utilizing the internet of the owner in the event that anybody has gone into his home. On the off chance that the individual is obscure or a cheat, at that point a security alert will be raised. Furthermore, in the event that an individual is known, at that point there will be the opening of entryway naturally, lights and fan will go on to make the visitor agreeable. This all should be possible with IOT as it were. These alarms can be produced using anyplace if there is an internet availability accessible.

A few home automation systems have been considered. Among them, there was a work containing full usefulness of home appliances associated through Bluetooth technology Board (Arduino) associated with the gadget and constrained by the OS mobile phone. This OS mobile phone did not support java application but rather just support python [8]. In any case, these days, java application has been incorporated into all mobile phones. So this model was not good with the present mobiles. Another examination was planned uniquely for supporting 4 electrical gadgets not more than 4 appliances [9]. Smart home research additionally introduced a model where diligent kit and Arduino Uno was implemented. This model utilized Bluetooth interface yet because of the surprising expense of utilized gadgets made the general model more expensive [10]. This model was not monetary. In addition, this changed the qualities of Bluetooth technology for which it is well known. When considering this purpose of the cost effectiveness of Bluetooth technology, one more research had been done. In any case, this examination was appropriate for older and incapacitated persons [11].In one research paper [12], by and large interfaces, for example, Zigbee, WIFI, Bluetooth had been looked at. It additionally abridged that Bluetooth technology is a cost effective solution inside a restricted range length.

## II. PROBLEM DEFINITION

Home automation has been developing quickly. It isn't to lessen human work yet in addition used to spare time and energy. The ble light has taken an interest in making a smart system. This was finished with Arduino board [8] yet because of cost this was not monetary. Another moved toward utilized diligent Kit with Arduino board to lessen cost however not unreasonably attractive [10]. There was a design which was intended for disabled people [11] which was not reasonable for people having knowledge. most of the research found in literature have been done are not appropriate for certain reasons either the expense is high or data bandwidth utilization is high. There was a need to build up a system which is practical, utilizes less bandwidth and reasonable for all periods of individuals. What's more, java is a language which is well known, developing quickly in each field and good with different languages as well. So we planned to framework a system which is java compatible and primary goal of this structure was to pursue a solitary statement i.e. "Everybody can do it". It implies uneducated individual can likewise get this chance. There is no need of having any knowledge to operate the system. It is much the same as an order as we likewise provide for other individual while speaking with others. We are utilizing an Artik board, which is supported by Samsung .Actually Samsung has given numerous functionalities to this board.

A ble light will change its shading just by sending one request sitting on a seat at a distance with the light. This spares the power and time as well.

## III.  SIMULATION AND RESULTS

Prior, Bluetooth technology has been expanded quickly in cell phones. Moreover this technology has brought a move into home automation system. BLE light can be controlled starting with one story then onto the next floor in a structure. There is no compelling reason to go close to the light and after that turn on/off. It has given a dimension of simplicity to the lives of people. A BLE light is associated with the Artik board by turning the light on then send a json response to filter the light. The board will gets this request and after that begin filtering as indicated by the code embedded into it in java language. Also, return the json response which contains characteristics of checked ble light. After that another request is raised to arrangement the ble light. In this request, properties of ble light are stored in the database and association with the light is made for further operation. After that a request to change color of the light is made and accordingly we get the light of the shading is changed just as a entry is additionally recorded into db. Along these lines, artik board which contained java code and light interacts.
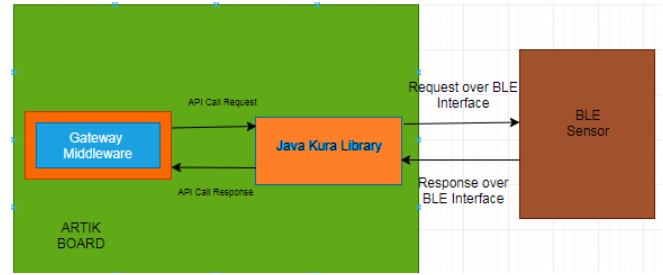


**Fig 1 BLE Sensor interaction with board**

There are following messages which can be sent to gateway middleware through mobile app:

PROVISION_SENSOR: It will add the particular sensor into artik board.

DELETE_SENSOR: It will delete the provisioned (added) sensor.

SENSOR_COMMAND: It will control the sensor which is controllable i.e. ble yeelight.

SCAN_SENSORS:  It will scan all available sensors.

GET_SENSOR_CAPABILITIES: It will give information related to provisioned device.

| Type of Request | Request | Response |
|---|---|---|
| **WifiStationModeOn :**This request will give internet to the gateway or device on which java code is running. | {<br>    "command": "WifiStationModeOn",<br>    "userID": "EGrv8kQhp6TptTtqzOCuoRnP3In1",<br>    "message": {<br>        "ssId": "gw_middleware",<br>        "password": "12345678",<br>        "keyType": "WPA-PSK2"<br>    }<br>} | Gateway has successfully connected to WIFI |
| **Scan Sensor:** This request will scan all Bluetooth lights which is nearby to the device so that it can be controlled further. | {<br>    "interfaceTypes": ["BLUETOOTHLE"],<br>    "params": {<br>        "cSeq": 234,<br>        "ciType": "NRT",<br>        "timeout": 4332487532875<br>    },<br>    "messageType": "SCAN_SENSORS",<br>    "gatewaySerial": "20180322011G"<br>} | {<br>    "messageType": "SCAN_SENSORS_RESPONSE",<br>    "gatewaySerial": "20180322011G",<br>    "results": [{<br>    "interfaceType": "bluetoothle",<br>    "sensorList": [{<br>    "networkInterfaceType": "bluetoothle",<br>    "type": "Yeelight Blue II",<br>    "deviceTypeId": 10001,<br>    "macAddress": "F4:B8:5E:F6:1B:63",<br>    "manufacturerName": "avighna",<br>    "provisioned": true,<br>    "bundleAttribute": "colorintensitylight",<br>    "isStartUpCall": false<br>        }]<br>    }]<br>} |

| | | |
|---|---|---|
| **Add Sensor:** This request will bind Bluetooth light with the device so that it can be controlled. | <pre>{<br>    "messageType":<br>"PROVISION_SENSOR,<br>"gatewaySerial":<br>"530MWC2R10400557",<br>  "sensorSerial":<br>"F4:B8:5E:F6:28:F5",<br>"message": {<br>"type": "Yeelight Blue II",<br>"macAddress":<br>"F4:B8:5E:F6:28:F5",<br>"deviceTypeId": 10001,<br>"manufacturerName": "avighna",<br>"bundleAttribute":<br>"colorintensitylight",<br>"networkInterfaceType":<br>"bluetoothle"<br>      }<br>}</pre> | <pre>{<br>"messageType": "PROVISION_SENSOR_RESPONSE",<br>"sensorInfo": {<br>"macAddress": "F4:B8:5E:F6:28:F5",<br>"manufacturer": "avighna",<br>"type": "Yeelight Blue II",<br>"networkInterfaceType": "bluetoothle",<br>"isControllable": true,<br>"attributes": [{<br>"name": "setcolor",<br>"type": 2,<br>"minValue": "#000000",<br>"maxValue": "#ffffff"<br>    }, {<br>"name": "setintensity",<br>"type": 2,<br>"minValue": "0",<br>"maxValue": "100"<br>    }, {<br>"name": "setonoff",<br>"type": 1,<br>"allowedValues": ["on", "off"]<br>    }]<br>},<br>"status": true<br>}</pre> |
| **Sensor Control Command :** This request will change the color of a light. | <pre>SET COLOR COMMAND<br>{<br>    "messageType":<br>"SENSOR_COMMAND",<br>  "params": {<br>    "cSeq": 234,<br>    "ciType": "NRT",<br>    "timeout": 4332487532875<br>  },<br>  "sensorDetail": {<br>    "serial": "F4:B8:5E:F6:28:F5",<br>    "command": {<br>      "name": "setcolor",<br>      "value": "#ff00aa"<br>    }<br>  }<br>}</pre> | <pre>{<br>  "messageType": "ACTUATOR_ACTION",<br>  "params": {<br>    "cSeq": 234,<br>    "ciType": "NRT",<br>    "timeout": 4332487532875<br>  },<br>  "sensorDetail": {<br>  "serial": "F4:B8:5E:F6:28:F5",<br>  "command": {<br>    "name": "setcolor",<br>    "value": "#ff00aa"<br>    }<br>  },<br>  "timestamp": "1542277142808",<br>  "status": true<br>}</pre> |
| **Delete Sensor:** This request will unbind the light with the device or Disconnect the light. | <pre>{<br>  "messageType": "DELETE_SENSOR",<br>  "params": {<br>    "cSeq": 234,<br>    "ciType": "NRT",<br>    "timeout": 4332487532875<br>  },<br>  "gatewaySerial": "20180329GW01",<br>  "sensorMacAddress":<br>"F4:B8:5E:F6:28:F5"<br>}</pre> | <pre>{<br>  "messageType": "DELETE_SENSOR_RESPONSE",<br>  "params": {<br>    "cSeq": 234,<br>    "ciType": "NRT",<br>    "timeout": 4332487532875<br>  },<br>  "gatewaySerial": "20180329GW01",<br>  "sensorMacAddress": "F4:B8:5E:F6:28:F5",<br>  "status": true/false<br>}</pre> |

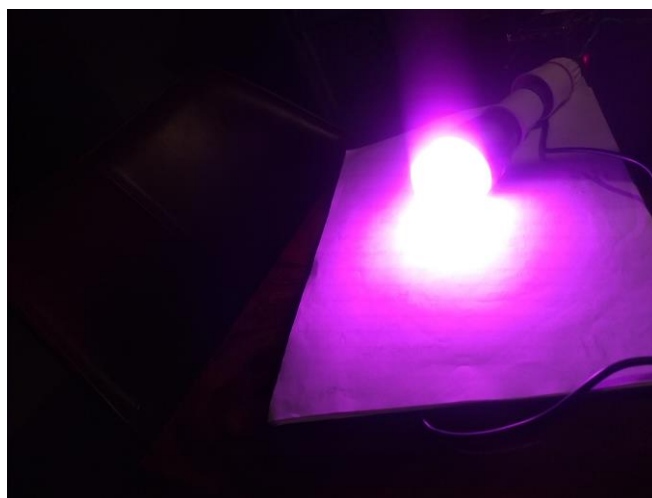| Get Sensor Capabilities | {<br>   "messageType":<br>"GET_SENSOR_CAPABILITIES",<br>  "params": {<br>    "cSeq": 234,<br>    "ciType": "NRT",<br>    "timeout": 4332487532875<br>  },<br>  "gatewaySerial": "20180329GW01",<br>  "sensorSerial": "F4:B8:5E:F6:28:F5",<br>  "message": "sensorAttributes"<br>} | {<br>    "messageType": " GET_SENSOR_CAPABILITIES ",<br>    "command": "sensor_capabilities",<br>    "params": {<br>     "cSeq": 234,<br>     "ciType": "NRT",<br>     "timeout": 4332487532875<br>    },<br>    "status": true,<br>    "message": {<br>  "data": [{<br>  "sensorType": "bluetoothle",<br>  "deviceType": "BLUETOOTHLE",<br>  "deviceTypeId": 10001.0,<br>"macAddress": "F4:B8:5E:F6:28:F5",<br>  "controlAttributes": [{<br>  "name": "setcolor",<br>  "controlParameters": [{<br>  "type": 2.0,<br>  "minValue": "#000000",<br>  "maxValues": "#ffffff"<br>      }]<br>    }, {<br>  "name": "setintensity",<br>  "controlParameters": [{<br>  "type": 2.0,<br>  "minValue": "0",<br>  "maxValues": "100"<br>    }]<br>    }, {<br>  "name": "setonoff",<br>  "controlParameters": [{<br>  "type": 1.0,<br>  "allowedValues": ["on", "off"]<br>    }]<br>    }],<br>    "provisioned": true,<br>    "sensorStatus": {<br>    "isConnected": true,<br>    "battery": -3.0,<br>"lastCommunicationTime": 1.525787508414E12,<br>"sensorMac": "F4:B8:5E:F6:28:F5",<br>    "data": "1",<br>      "onOffStatus": "on",<br>      "colorValue": "#ffffff",<br>    "intensityValue": "1"<br>    }<br>    }]<br>  }<br>} |



**Fig 2: Controlled BLE Yeelight (Pink in color)**

## IV. CONCLUSION

The work has been done on Bluetooth technology since this innovation is cost effective and wireless. This isn't just helpful to the typical people yet in addition for incapacitated and old matured people. Presently they don't have to rely upon others for switching on/off their lights. They can do it by single order without anyone else's input as it were. We can give it an inviting User Interface (UI) by building a mobile application for this in future. Moreover there are numerous interfaces which can be bolstered with a similar code with little change so that with a similar code numerous sensors might be mechanized. With a straightforward GUI, a versatile application can be made for client so it resembles a control remote of power on his hand. At whatever point or any place the client is available, he can switch on/off his lights of home to spare power and lessen bills.

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