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Application Smart Breaker System based on IoT for Lighting System at Building

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Abstract:-This research is in the form of designing and applying an IoT-based smart circuit breaker control circuit in lighting systems that will be applied to buildings. Where a trial of a series of control circuits based on IoT is carried out, before being applied to buildings. Equipment used as an IoT-based smart solver. This research is in the form of design, equipment details and application results of the IoT-based smart breaker control circuit.

Keywords:- *Control System, Internet of Things, and Smart Breaker.*

I. INTRODUCTION

In Indonesian, IOT started to become a hot topic in 2015. A number of multinational companies based in Indonesia are committed to developing IoT. This is a marker when electronic devices around us will be connected to the internet and can identify each other. And in 2020 the application of IoT is increasingly being initiated in academics and society.[1]

There are several IoT-based equipment that are commonly used by the general public today, such as incandescent lamps, CCTV, switches and so on. And from here, there are also many IoT equipment that can function as part of an electrical control equipment. And a lot of engineering that can be done on IoT equipment that is currently developing in Indonesia. one that will be developed in this research is an IoT-based equipment called a smart breaker.[2] [3] [4] [5] [6] [7]

II. METHOD

A. ABOUT SMART BREAKHER

Smart breaker is a connecting and disconnecting device that works magnetically based on IoT. Where the smart breaker contains a magnetic coil contact to work to attract and break the contact point on the breaker component. And this equipment is planted with a microcontroller that works as a controller of the coil contacts that can be connected wirelessly.

The equipment used in this application is Smart Breaker AI-BR01 and can be seen in Figure 1 and specifications can be seen in Table 1.

Fig. 1: Smart Breaker AI-BR01 & Construction of Smart Breakher AI-BR01

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Table 1: Specification of Smart Breaker AI-BR01

Input	100-240V AC 50/60Hz 10A
Output	100-240V AC 50/60Hz Max. Load: 10A
Operating systems	Android & iOS
Wi-Fi	IEEE 802.11 b/g/n 2.4GHz
RF	433,92MHz
Material	PC V0
Dimension	88x39x24mm

B. CONTROL OBJECT

The object of control in the application is the lighting system. Where the lighting equipment to be used is an 18 Watt LED TL lamp totaling 6 (six) pieces, with a different control system. This is to allow for a variety of controls on the control of the lighting system.

C. DESIGN

In general building equipment, there are several equipment that are commonly controlled in buildings. There are mechanical, electrical and electronic equipment. From each system many more parts. In this application, the application is carried out on the lighting system and this system enters into electrical equipment. So the design is divided into 2 (two) parts, which consist of the electrical system and network. [8] [9] [10] [11] [3] [12]

In the control design, it is necessary to know the division of functions or roles of each equipment. This is done to get qualified equipment durability and avoid repeated equipment damage. Control equipment is generally divided into several parts and based on their current carrying capacity. And in general function division, consisting of:

- Main control system: in the form of magnetic contactor, air circuit breaker and others. Which allows it to be connected to the main load.[13] [14]
- And pilot/command control systems: sensors, buttons and so on.
- So from the above, it is determined that several parts of the control in this smart breaker application, as for the parts:
- Main control system equipment: Magnetic Contactor 1 Phase 220 Volt/50 Hz
- Command control system equipment : Smart breaker AI-BR01
- The electrical design of the smart breaker can be seen in Figure 3.

➢ *ELECTRICAL SYSTEM*

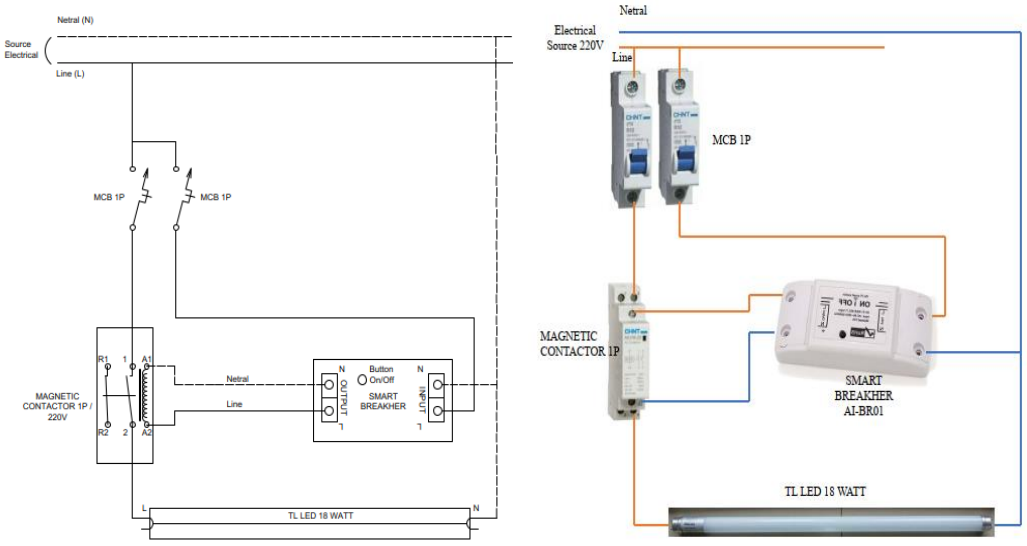

Fig. 2: Wiring Diagram For Smart Breaker Control & Real Wiring For Device

➢ *NETWORKS FOR SMART BREAKERS*

The network system that connects communication between applications with smart breaker equipment can be seen in Figure 3 below. Where smart breaker can only be connected to radio frequency (RF),[15] [16] so equipment can only be connected with equipment that has the same system. The communication tools between equipment used consist of:

- Smart Phones
- Wireless Routers
- Network Providers (Such as Telkom, Biznet, O2, First Media and so on)

- IoT Applications (Acome, Bardi, Smart Home and so on)

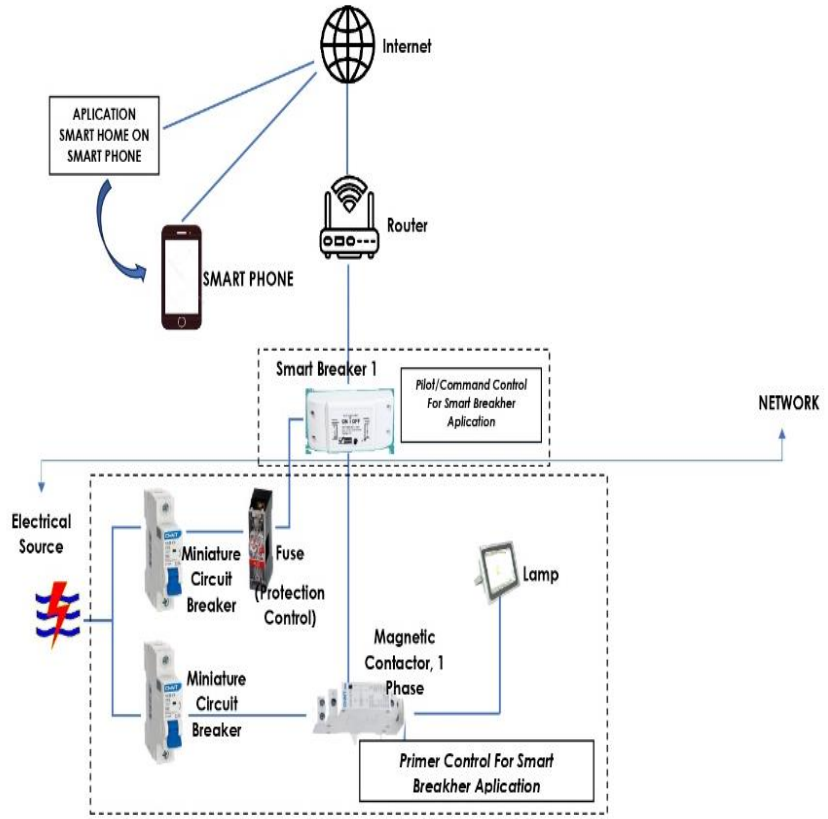

Fig. 3: Schema Network for Smart Breakher

➢ *Smart Breaker Application Plan*

The application plan for the smart breaker, the equipment will be made in 1 (one) control board. Consisting of : See in picture 4

- Application Board, Dimension 80cm x 120cm @ 1 Board
- Miniature Circuit Breaker @ 8 Pcs
- Magnetic Contactor 1 Phase @ 6 Pcs
- TL LED 18 Watt @ 6 Pcs
- Digital Metering @ 1 Pc
- Accessories @ 1 Ls

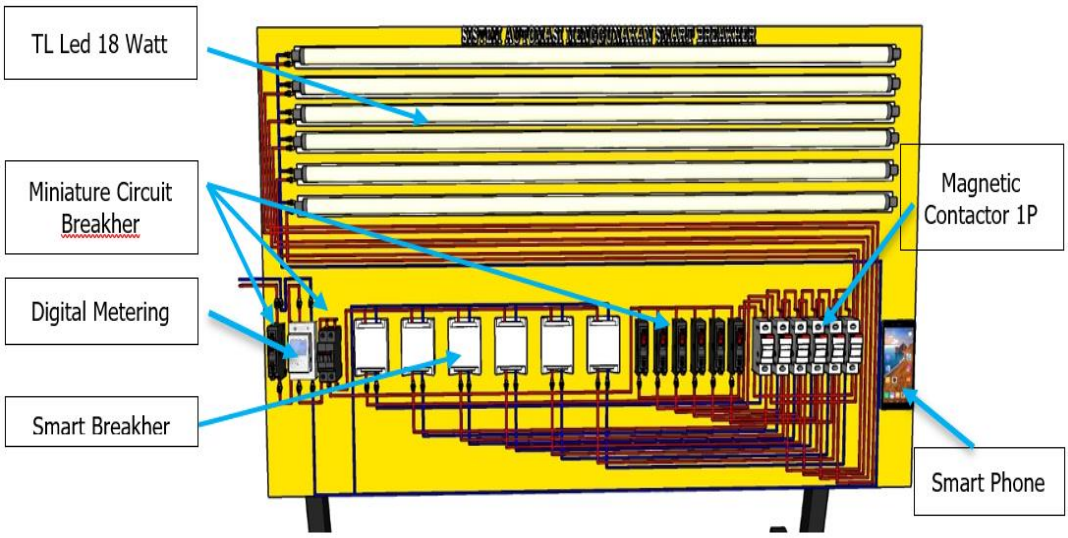

Fig. 4: Smart Breaker Application Plan

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➢ *Steps for Equipment Installation*

After assembling the application circuit has been completed. To run from smart breaker control, several steps must be taken in advance from the desired network control side. The steps are as follows:

- Install the Smart Control Application on the smart phone, the Application must support the equipment or be recommended by the equipment. So that the process for reading the device can run on the application.
- Register User in the application, user registration is required, so that Manage controls in the application have an ID.
- Install an Internet network, this network is really needed for control with a smart breaker. Because the application used depends on the internet network and cannot be connected to the local area network only, via the radio frequency (RF) that each equipment has.
- Initializing each equipment in the application, in general equipment there will be a button for RF activation. This activation is used for reading IoT equipment in applications installed on smart phones.

After each equipment has been installed on the application on the smart phone, the equipment can communicate with each other and can be used. See picture 4.

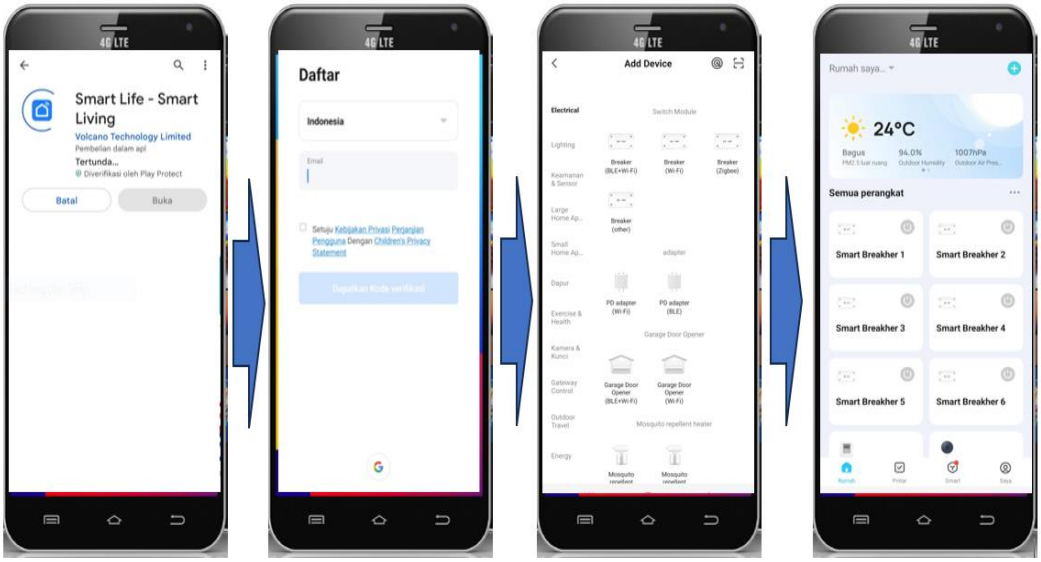

Fig. 5: Step forDevice Installation

III. IMPLEMENTATION & RESULTS

A. Implementation

The implementation of the application is in accordance with the design plan from Figure 4 and the distribution of control functions is divided according to the division with the electrical system in the smart breaker. Real application can be seen in Figure 5.

Fig. 6: Real AplicationFrom Smart Breaker Control

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B. Results

At the time of testing, there were several things that were obtained from applying the smart breaker control. Among others :

- The application can work properly, when the internet network conditions are good and this equipment depends on the internet network. The experiment can be seen in Figure 7.

Fig. 7: Real Applicationfrom Smart Breaker Control

- The condition of the equipment can be monitored on the application installed on the smart phone. If the device cannot be connected, there will be an offline indication on each equipment label. See figure 8.

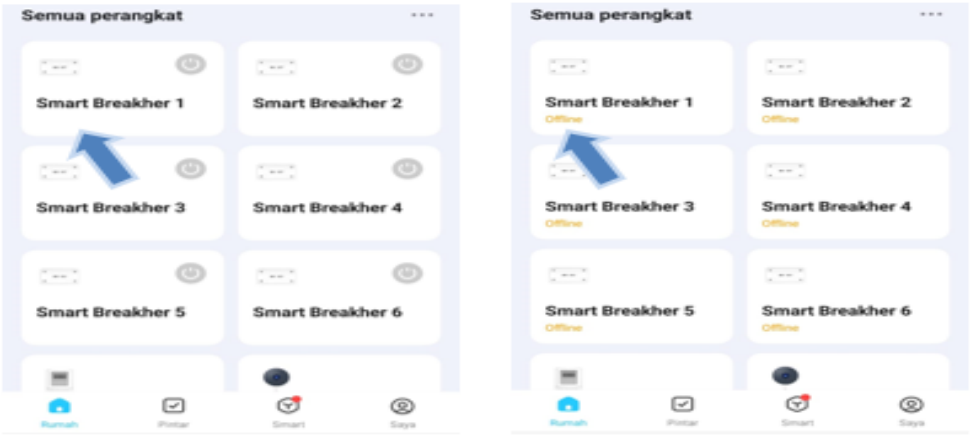

Fig. 8: Normal Condition (Nothing indication at device table) & Not Normal Condition (there is an indication on the device table)

- Each equipment can work automatically by setting a schedule for each equipment. Can be seen in fig.9.

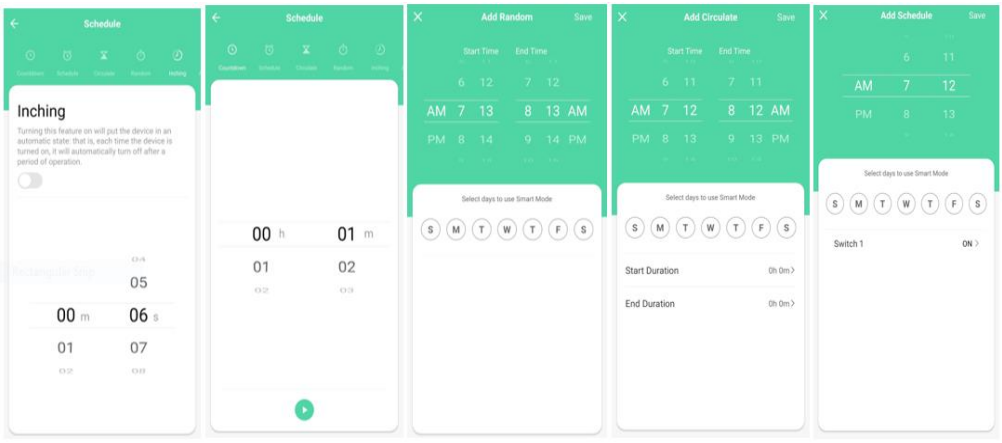

Fig. 9: Variant Schedule FromAplication in Smart Phone

- Each equipment can be system engineered, where the equipment can work or be commanded with several IoT sensors or other IoT equipment. See figure 10.

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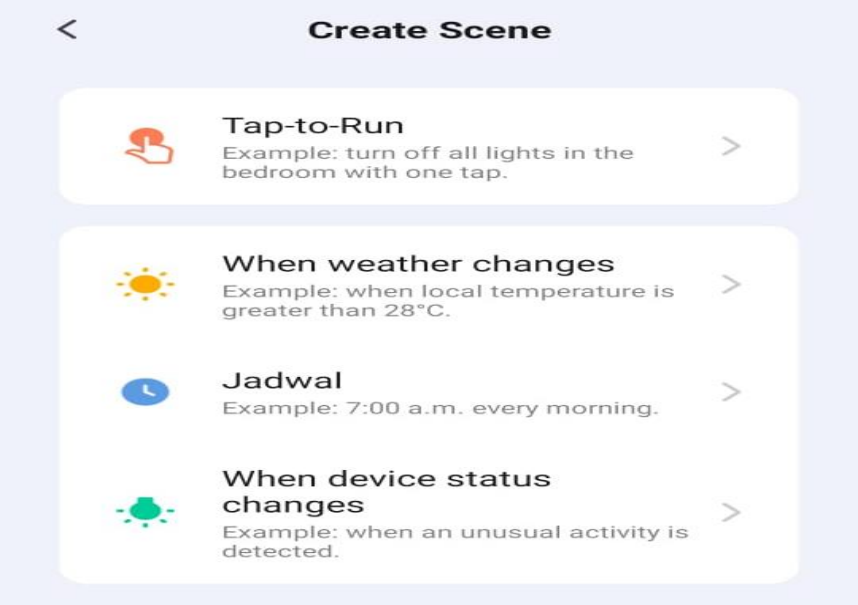

Fig. 10: Create Scene from Aplication in Smart Phone

- Equipment can be controlled manually by pressing the direct button embedded in the smart breaker. This can be done if the internet network conditions are problematic and direct control is carried out on the control board. See figure 11.

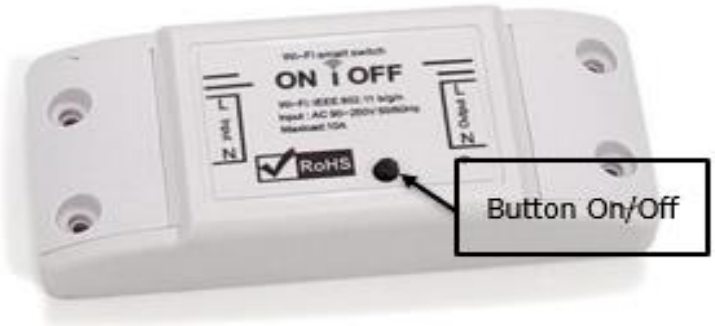

Fig. 11: Button On/Off in Smart Breaker

- Equipment can be controlled by more than 1 (one) smart phone or PC used for monitoring and control. by sharing the User ID and Password with other users.
- Only the main user can disconnect every other user, this can be done by changing the password from the User ID.
- Equipment can be controlled or changed by other users, this happens if the IP of the Wireless Router is known by other users. Such as wireless router users and passwords that are connected to IoT equipment.

IV. CONCLUSION

From the results of this application, it can be concluded that IoT equipment can be developed for large control systems and can be used properly in controlling lighting in buildings. With load conditions and main control or command control determined according to the capacity or character of the load to be controlled. IoT-based smart breaker equipment makes it very easy to control remotely, there is time efficiency given and much more can be developed with this smart breaker, apart from the lighting system. And the process of installing applications and initializing controlled IoT equipment is quite easy to understand, this makes users independent of the IoT equipment provider.

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