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Controlling Electricity Consumption in a room through Human Presence Detection

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Abstract:

Automating the control of electricity can be very helpful in reducing electricity consumption, which is the need of the hour. With a smart human presence detection system an intelligent decision will be made on whether the electrical appliances should be 'on' or 'off'.
This helps in reducing electricity wastage and controlling the usage of non-renewable resources of energy, while also reducing the cost of electricity bills.
The amount of electricity that is saved using our intelligent system would be measured, and the data would be sent to the OneM2M server, which would help in energy management.

Introduction:

Problem Statement:

You will be given access to the electricity controls of a room, and using various sensors and a microcontroller, you need switch 'off' the lights when there is no human presence in the room. The data on how much electricity is saved should be collected and pushed onto the OneM2M server for analysis.

Project Overview:

Our project will deploy the ESP32 microcontroller and various sensors in combination to detect human presence inside the room. In case the system detects human absence for a

prolonged interval of time, it would intelligently switch 'off' the electrical appliances. A button would be present in the room, which when pressed, will switch 'off' all the intelligent systems. This is necessary in case of false detection. Also, the system would measure the time until human presence is detected again, which would give us the amount of electricity that would have been wasted otherwise. This data collected over a period would be sent to the OneM2M server for analysis.

Physical Quantities Measured:

The measuring of various physical quantities depends upon the availability of various sensors. Hence some of these functionalities might not be available in the actual project, if the required sensors are not available.

- Changes in light intensity (using LDR sensor)
- Infrared radiation (heat) emitted by humans (PIR motion sensor)
- Electrical power consumed by various appliances
- Physical distance

How will we use the physical inputs?

- Change in light intensity would indicate movement, and hence human presence.
- Change in IR (heat measured) would again confirm movement, and hence human presence.
- Electrical power measured would help in calculating the amount of electricity consumed by various devices.
- The physical distance of the *nearest object* from various points within the room will help in detecting human presence.