

# **BUILD A SMART HOME IN THINKERCAD WITH 2 SENSORS AN LED ,BUZZER AND SUBMIT IT**

## **ABSTRACT**

Smart Exterior Home Management System is all about managing the exterior activities of a house automatically without the efforts of a human. This paper involves the smart managing of four different tasks that are executed outside of the house. To begin with, the first idea is about automating the water motor based on the water level present in the water tank. The motor automatically turns on and off by constantly checking the water level in the tank. The next idea is to give notifications to the house members when any posts or deliveries like newspaper, milk packet, letters, etc., are received in the carriage box arranged outside of the main gate. Coming to the next automation that is related to the car parking shed. In this case, the gate of the car parking shed automatically opens and closes when a vehicle approaches and leaves the parking shed. Final idea is to ring a calling bell in the living room when any person is detected within the range of the main door while entering the house. The four ideas verified using simulated a virtual simulation tool (Tinkercad) with Arduino Uno as a microcontroller.

## **INTRODUCTION**

Home is the most indispensable idea and construction ever made in the history of human civilization. Throughout the ages, human houses have undergone many transformations right from small huts to modern smart homes [1,2]. Every transformation is made to get advanced facilities. Present-day homes are well developed with the best design, construction, facilities, etc. with modern civil engineering techniques. In the era of technology, every field of the world is striving to incorporate technology and automation to make their things smart and advanced [3,4]. Similarly, it is also most necessary to make homes smart since the habitat of human beings is their homes. In this generation, houses are well equipped with electronic gadgets to perform the regular tasks efficiently, smartly especially automatically. So, without the efforts of humans, all the tasks can be performed automatically instead of doing them manually [5,6]. A house can be said as perfectly automated when both the interior and exterior of the house is automated [7]. The main aim of Smart exterior home management system is to make the exterior of a home automated technically. Instead of putting much effort to perform the tasks, they will be done automatically by using smart techniques. Different kind of sensors, actuators, and hardware components along with the software is used to finish this paper.

## **PROPOSED METHODOLOGY FOR HOME MANAGEMENT SYSTEM**

The block diagram of the Smart exterior home management system is illustrated in figure 1. The heart of the proposed system is Arduino Uno. Which is connected to four sensors to monitor the exterior conditions of the home such as ultrasonic sensor, ultrasonic ping sensor, Passive Infrared (PIR) sensor, and photodiode. The Arduino Uno is also connected to four actuators such as DC motor, Liquid Crystal Display (LCD), servo motor, LED RGB, piezo buzzer. Also, L293D driver IC is used to drive the DC motor. The following subsections describe the methodology of the proposed system [8,9].

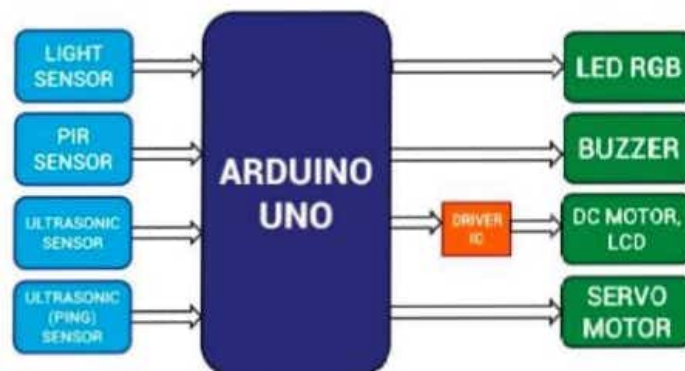


FIGURE 1. Block Diagram

### Idea1 (Automatic Working of Water Motor)

Idea 1 of the Smart exterior home management system is illustrated in figure 2. the main aim of idea 1 is to control the working of the water motor automatically based on the level of water in the tank.

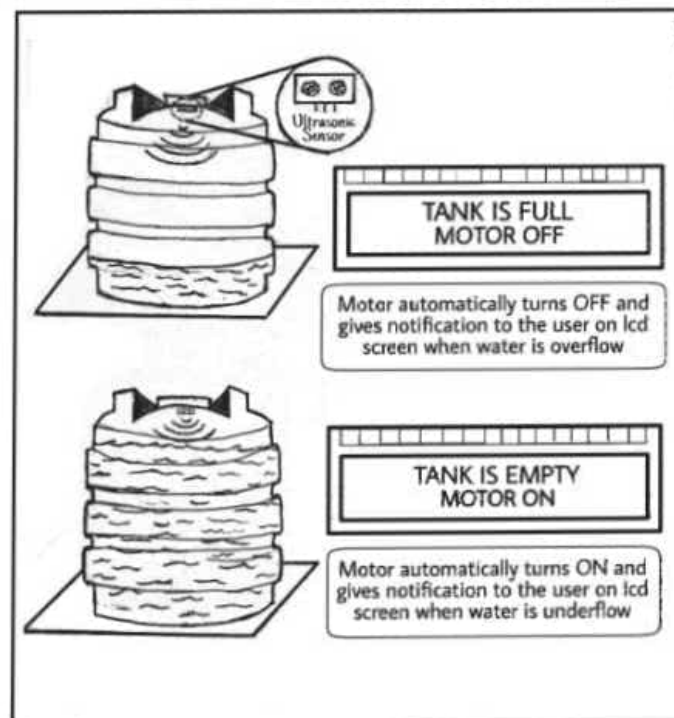


FIGURE 2. Ideology of automatic water motor

**Construction:** Ultrasonic sensor is placed at the top of the tank which will not get touched or submerged in the water. LCD is placed inside the house at a convenient location for the users. All the required technical setup is arranged at the place of the DC motor.

**Working:** There are some test cases to be satisfied based on the water level. The cases are as follows:-

- Case 1: If the water level is very less, then the motor will be turned on and the information will be displayed on LCD as "TANK IS EMPTY, MOTOR ON".

Case 2: When the water level is increasing and reaches half of the level of the tank then the message displayed on LCD will be "HALF FILL, MOTOR ON".

Case 3: Finally, if the tank is filled and about to overflow, then the motor will be automatically turned off and the message will be displayed on LCD as "TANK IS FULL, MOTOR OFF".

Case 4: When the water level is decreasing, the motor will be kept turned off until the water level reaches the specified limit at bottom of the tank. Once the water level goes beyond that limit, the motor will be turned on and a similar process will be continued as mentioned in the above cases.

### Idea2 (Indication about Object Received in Carriage Box)

Idea 2 of the Smart exterior home management system is illustrated in figure 3. The main aim of idea 3 is to inform the user about the posts or the things received with the help of a carriage box arranged outside the main gate.

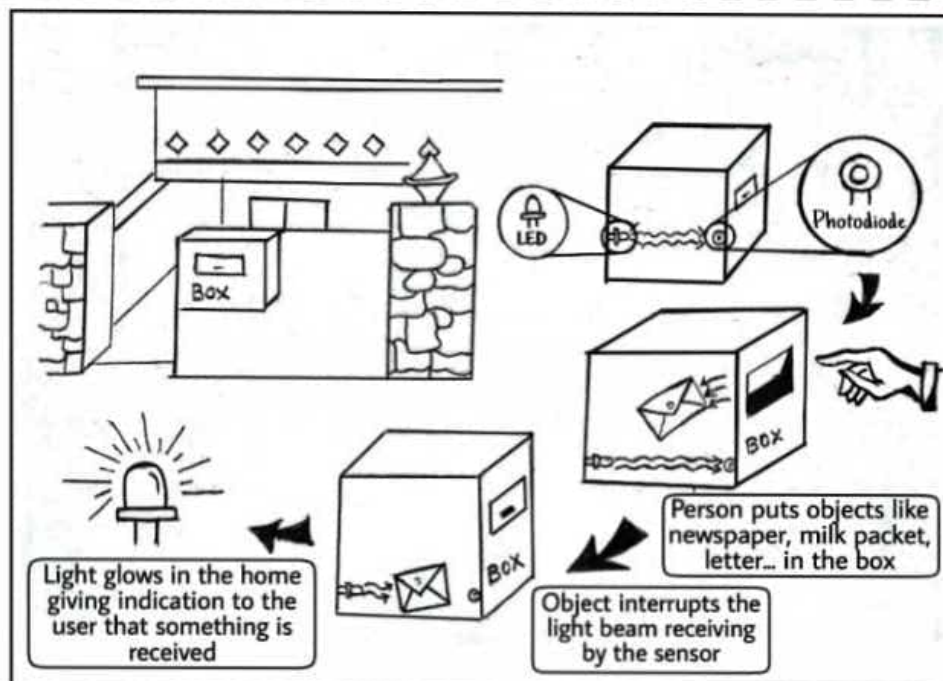


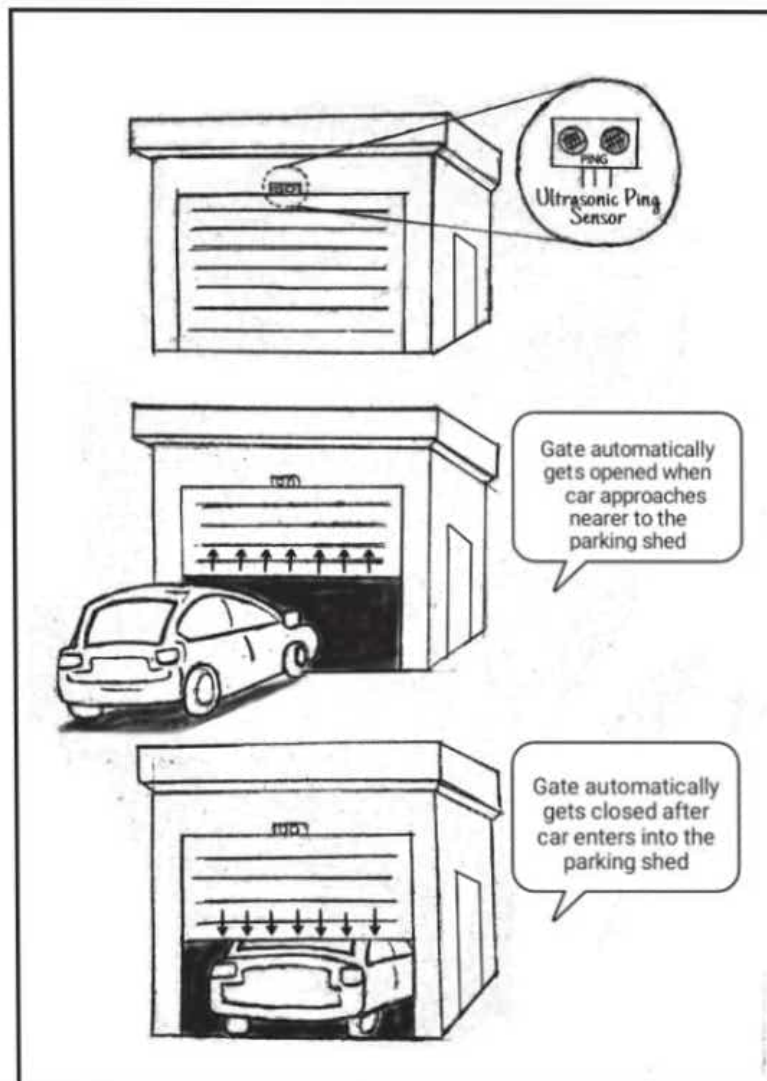
FIGURE 3. Ideology of carriage box

**Construction:** A Light sensor and a consistent glowing led light are fixed inside the box facing opposite to each other in such a way that the LED light beam is allowed to fall continuously onto the photodiode sensor.

**Working:** When any person delivers or puts the things like newspaper, milk packet, letter, etc. in the carriage box, it interrupts the light beam receiving by the photodiode sensor resulting in less intensity of the light. Immediately, when the light sensor detects less light intensity, it gives a signal to the RGB LED light placed in the home and the light starts blinking to indicate to the user that something is received. Light in the home continues to blink until the user takes out the object or post from the box and gets turned off if the box is empty.

### Idea3 (Automatic Working of Car Shed Gate)

Idea 3 of the proposed system is shown in figure 4. The main aim of idea 3 is to automate the working of the car parking shed gate. The idea is to open and close the parking shed gate automatically when the car approaches and leaves the shed.



**FIGURE 4.** Ideology of automated parking shed gate

**Construction:** To achieve this, an ultrasonic ping sensor is arranged at the top location of the parking shed gate and a servo motor is fixed to the gate of the car garage.

**Working:** Whenever the ultrasonic ping sensor detects the vehicle coming towards it, the doors automatically open with the help of a servo motor, and when the vehicle is passed through the gate inside to the parking shed or far away from the sensing region of the ping sensor, gate gets automatically closed.

#### **Idea4 (Automatic Ringing of Calling Bell)**

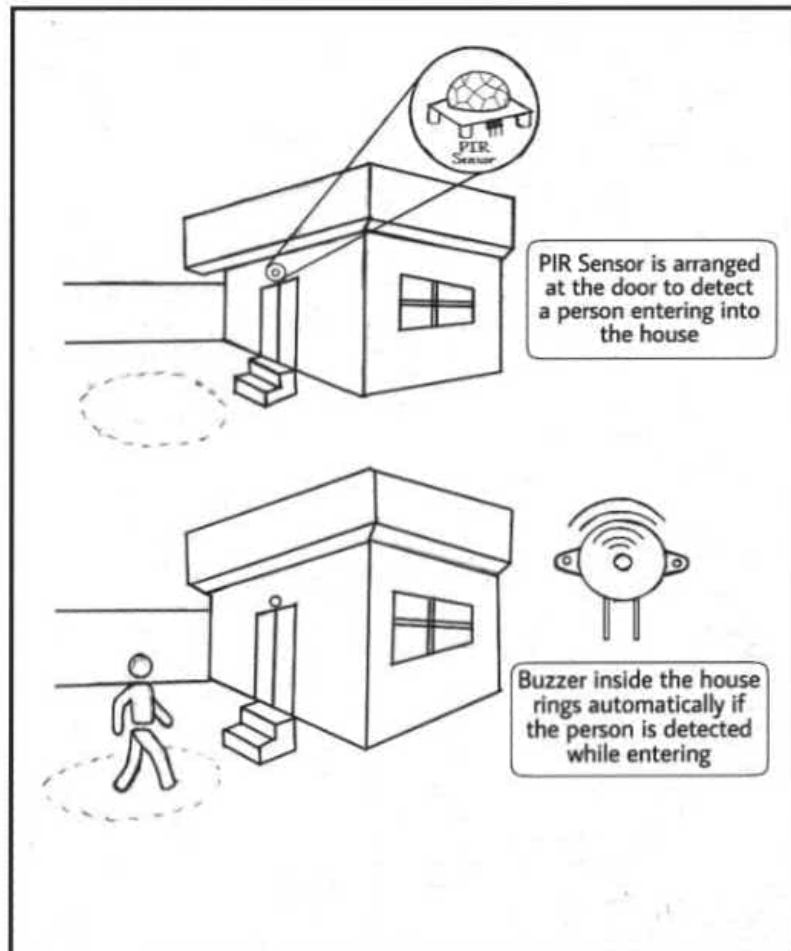
Idea 4 of the Smart exterior home management system is illustrated in figure 5. The main aim of idea 4 is to ring the calling bell automatically when a person is detected while entering the house.

**Construction:** The two main components required are the PIR sensor and the piezo buzzer. PIR sensor is arranged near the door which detects the presence of a human if he is Within the range of the door and a piezo buzzer is arranged in the room which acts as a calling bell.

**Working:** A PIR sensor is used for detecting humans when someone comes closer to the door. The piezo buzzer will produce a sound when the motion of a human is detected by PIR. This Setup acts as an automated calling bell in which the visitors or guests arriving at the door no need to push any doorbell or knock on the door, instead it will



produce sound automatically. Whenever the person goes beyond the sensing region the doorbell stops ringing automatically.



**FIGURE 5.** Ideology of automatic calling bell

**Construction:** A Light sensor and a consistent glowing led light are fixed inside the box facing opposite to each other in such a way that the LED light beam is allowed to fall continuously onto the photodiode sensor.

**Working:** When any person delivers or puts the things like newspaper, milk packet, letter, etc. in the carriage box, it interrupts the light beam receiving by the photodiode sensor resulting in less intensity of the light. Immediately, when the light sensor detects less light intensity, it gives a signal to the RGB LED light placed in the home and the light starts blinking to indicate to the user that something is received. Light in the home continues to blink until the user takes out the object or post from the box and gets turned off if the box is empty.

## RESULTS AND DISCUSSIONS

Tinkercad [10] is used as a virtual online simulator for simulation of the proposed system. The schematic of the smart exterior home management system is shown in figure 6. The four different ideas which are incorporated in the proposed system are validated with the following results.

**Idea 1 validation:** DC motor is automatically getting switched on and off based on the level of water in the tank detected by the ultrasonic sensor and also appropriate information is being displayed on the LCD screen. Results are shown in figure 7.

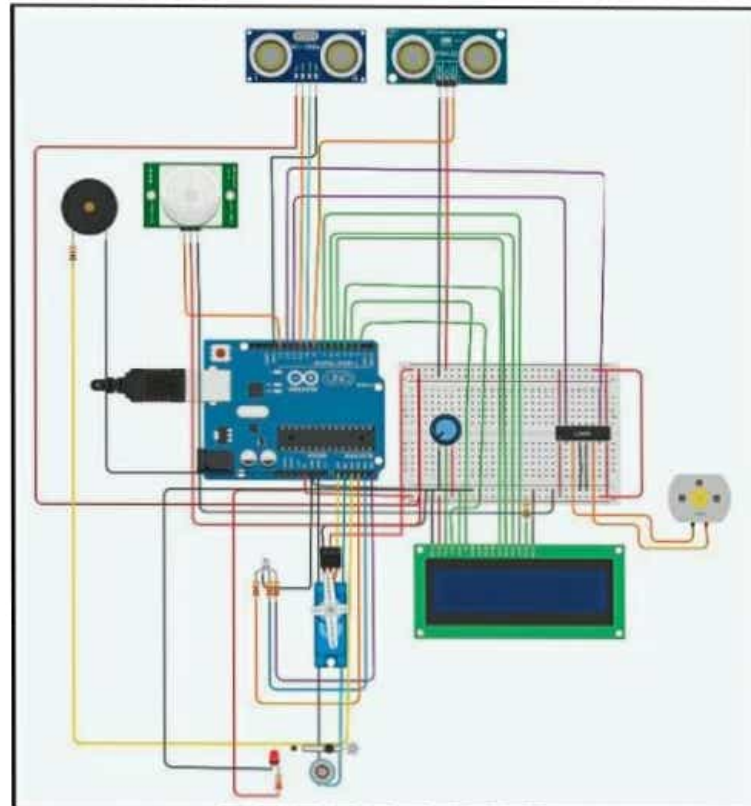


FIGURE 6.Schematic diagram

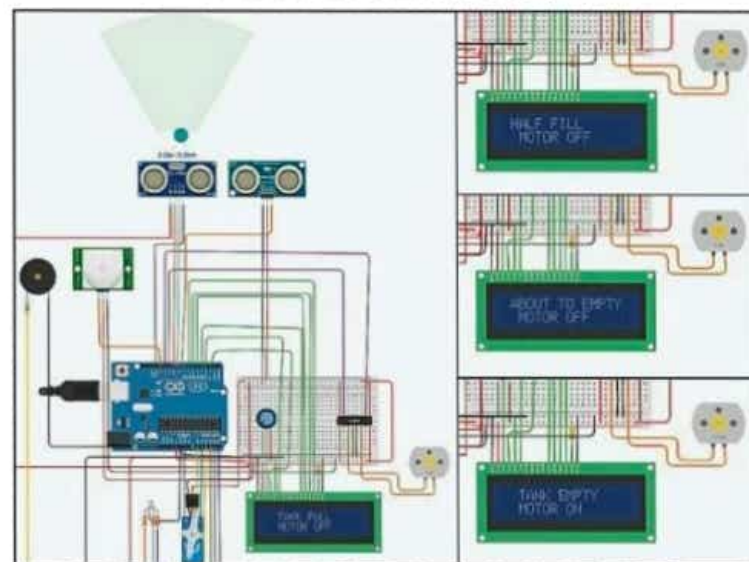


FIGURE 7.Experimental results of-Automatic water motor

**Idea 2 validation:** LED RGB is-blinking when photodiode detects the-less light intensity i.e., when something is received in the carriage box, and turning off when it detects high light intensity i.e. when the box is empty. Results are shown in figure 8.

**Idea 3 validation:** Gate of the car shed is opening automatically with the help of a servomotor when a vehicle comes towards the gate which is detected by the Ultrasonic ping sensor and shutting down when the vehicle leaves the shed or moves away from the gate. Results are shown in figure 9.

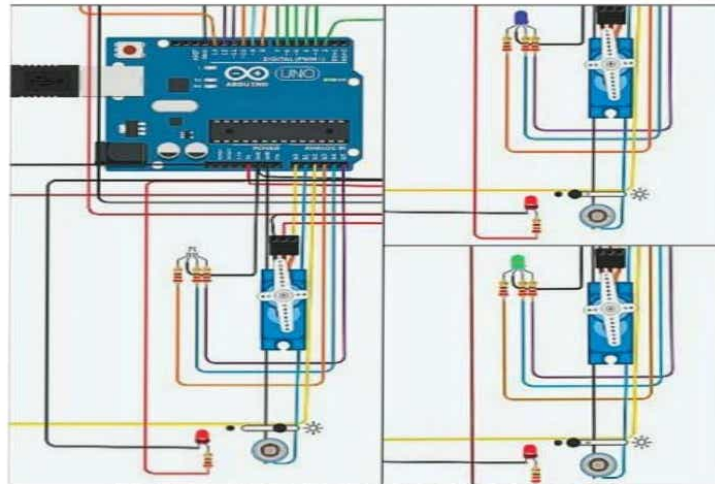


FIGURE 8.Experimental results of Carriage box

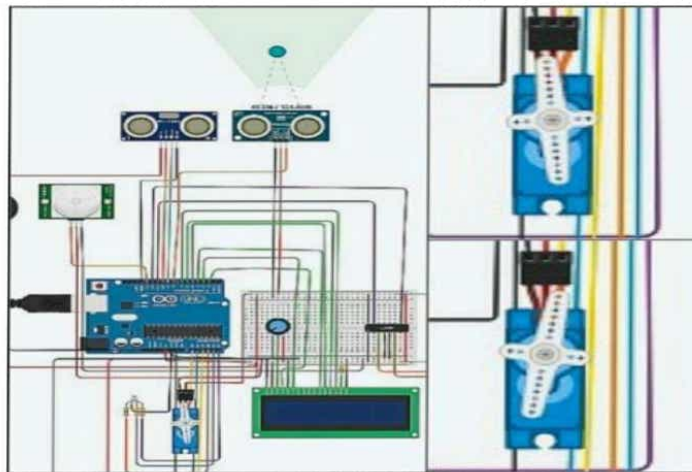
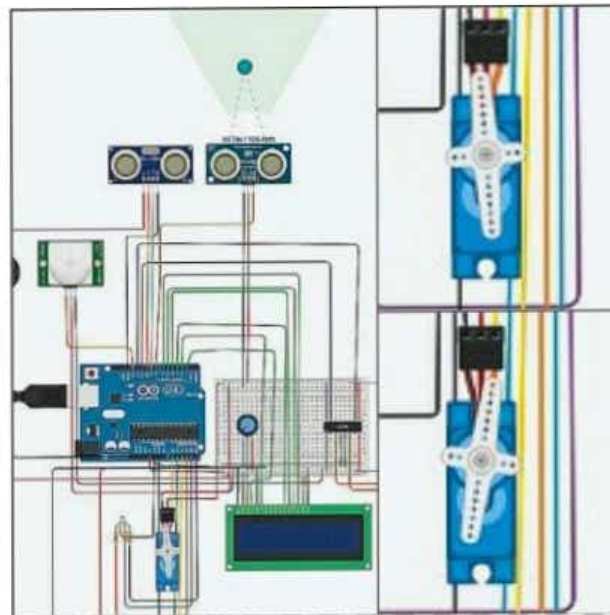


FIGURE 9.Experimental results of Automatic-parking-shed gate

**Idea 4 validation:** Calling bell is ringing automatically when any person is detected while entering the house. If there is no person present within the premises of the main door, simply calling bell turns off. Person presence is detected with the help of the PIR sensor and the component used as a calling bell here is the piezo buzzer. Results are shown in figure 10.



**FIGURE 10.**Experimental results of Automatic calling bell

## CONCLUSION

The main objective of the smart exterior home management system is about ensuring the user an effortless and simplified task. It enables the user to complete the daily activities without any manual efforts using automation of the machines in the home. Each concept or idea in this product would beneficially satisfy the user by meeting his day to day requirements in the home to execute them without any minor human flaws. People's everyday basic tasks in their homes can completely be automated with the help of this smart system. This automation can be easily operated and understandable by anyone.

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