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IoT Based Smart Umbrella

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Abstract: Automatic sensor-based umbrella can be used during rainy, summer, snowfall and dense foggy seasons. It can be helpful not only to save the life of the cloth, street vegetables, fruits but in some situations also to save the human life. The idea is to design an umbrella that can be open and shut automatically with the help of NodeMCU programming. In present research work has come over with a smart rain sensing system that can detect the rain and opens up the umbrella's link support. A raindrop sensing system is adding in this smart system, which gives a reading proportional to the amount of rain pouring on it. The smart system consists of a rack and pinion system, the rack is fixed to an umbrella such that when a sensor senses the exceeding value of rain drops, it gives a signal to the pinion attached to a motor. Then the motor starts rotating and the umbrella opens.

Keywords: NodeMCU, Arduino uno, Blynk

I. INTRODUCTION

Automatic sensor-based umbrella can be used during rainy, summer, snowfall and dense foggy seasons. It can be helpful not only to save the life of cloth, street vegetables, fruits but in some situations also to save the human life. The idea is to design an umbrella that can be open and shut automatically with the help of NodeMCU programming. In present research work has come over with a smart rain sensing system that can detect the rain and opens up the umbrella's link support. The smart umbrella not only blocks a rain but also provides a variety of services to customers. Existing smart umbrellas have various features such as giving an alarm for raining and a loss prevention. In this project, we propose new smart umbrella that guides the way to the destination on rainy days, collaborating with smartphone based on the IoT environment. It prevents accident which occurs due to operating the smartphone for navigating. Also, it provides a convenience to customer according to self navigating.

II. LITERATURE SURVEY

Smart Umbrella for Safety Directions on Internet of Things [1], In this paper, they proposed new smart umbrella that guides the way to the destination on rainy days, collaborating with smartphone based on the IoT environment. It prevents accident which occurs due to operating the smartphone for navigating. Also, it provides a convenience to customer according to self-navigating. Existing smart umbrellas have a variety of features such as weather alarm, loss prevention but they can't be a solution for safety problems. In this paper, to solve the safety problem, they proposed a smart navigation umbrella to guide a way intuitively through the interaction between the umbrella and the smartphone. A customer does not need to see the screen of smartphone finding and identifying a way. Proposed system attaches LED light to the end of the umbrella ribs pointing to direction and it informs the direction to customer. It not only reduces the problem that the customer has to see the screen of smartphone, but also provides a more convenient navigation service with safety. It has been developed based on the MinT (Middleware for Cooperative Interactions of Things) framework to interconnect with umbrella and smartphone. The smartphone application has navigator to guide way from the current location to destination, and it sends the direction information to umbrella. When the smart umbrella receives the direction information from smartphone, it displays the direction using the eight LEDs attached to umbrella ribs. It updates the direction periodically using three-axis electronic compass sensors. The calculated direction is used to control of LEDs indicating direction to go. The Bluetooth communication module advertises itself continuously to connect with smartphone at the same time as the power on. The smartphone application consists of the Bluetooth controller for communication with the umbrella, the GPS controller for directions feature and the user location information. If a customer starts to use the application, it tracks the customer's location by GPS. User can specify a destination through searching or selecting a certain position on the map. When the application validates a connection with the umbrella, it sends the direction information to the umbrella using Bluetooth communication. A Way to Beautify Future Smart Cities [2], This project was chosen to improve existing umbrellas because umbrella is one of the indispensable tools in human life. However, the function of traditional umbrella has been limited to "rain" or "shade". Regions of world having tropical weather condition facing rains usually after every 2 hours required umbrella as mandatory tool/ equipment. Here In this paper, they proposed new smart umbrella the need of future cities are now of smart umbrella which can open up by its own using sensory signal during rain on large opening spaces of cities such as car parking's, pedestrians outside buildings, restaurant and also for individual need with option of connectivity with Wi-Fi and also able to closed itself as rain goes down.

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Similarly this paper also proposes also a smart umbrella for individuals with design patterns, colors which help them to connect with Wi-Fi, USB, Music App easily so that it can able user to enjoy the rain. In order to save time, energy smart umbrella is solution of large car parking lots, covered pedestrians, outdoor dining areas which not only works efficiently by its self but also adds value on the side of beautification of the cities. Navigation assistance using an umbrella [3], Internet of Things (IOT) is one of the fastest growing technologies which allow versatile creation of worldly applications with devices that communicate via computer based systems. It has made way for exceptional innovations which has made our lives assisted and easy. One such example is smart umbrella, which not only acts a shield from rain but also consists of various other features such as alerts of weather and virtual assistance for the elderly. This paper proposes an umbrella which acts as a navigation assistant to pedestrians to reach their respective destinations. The primary usage of an umbrella is to protect its users from rain and sun. And as days change, smart umbrellas now redefine its traditional purpose. The new smart umbrella is now a navigation assistant for pedestrians. Other significant features include theft prevention using SMS alerts, speech assistance, and weather forecasting. The expansion of usage of electronic devices while driving and walking on the roads have had an increased effect on the road accidents that occur annually. This proposed system reduces this risk of accidents by eliminating the need to look at mobile phones and assists in navigation. The umbrella is made of 8 LED bulbs. These are attached to tip of umbrella ribs. These LED bulbs assist the users by pointing to the direction they are supposed to take based on the destination. Raspberry Pi interacts with the LED bulbs by providing direction information which is obtained by the Google Maps Direction API. A developed Android application is used that sends real time co-ordinates to Raspberry pi through Bluetooth. This helps track the location pinned. The module helps pedestrians travel with ease and safety that doesn't require them to look at smart phone screens. IoT Based Smart Umbrella System Using Raspberry Pi [4], This paper presents the development of a smart umbrella system using IOT, which can measure rainfall and it can predict the weather condition with the notion in your smartphone. It's about the real-time weather condition. In this project, we learn about how to make a smart umbrella using IOT that will be connected to Wi-Fi. It can notify you before about the climate by giving audio output of the weather conditions. Which is being implemented using the smart sensor like humidity sensor, temperature sensor, Light sensor which will act as Wireless Sensor Network (WSN) and are connected to a single board computer i.e. Raspberry pi which will store all the sensor data using SPI protocol and will send it to the server from where we can get the update of the weather condition at the place you are. A software i.e. ESPEAK will be useful which will give the audio output of the weather condition with a buzzer alert if any unconditional weather. A webpage in made where all the weather conditions will be updated and can be used or can be connected to any device to know the status of that area. Step towards the digital world, main factor of many industry is to predict the climatic changes, here we are using IoT for monitoring the weather as well as atmospheric changes throughout the time by using a smart E-Umbrella which will tell the weather condition as audio output and buzzer alert in unconditional weather to indicate if we have to take our smart umbrella with us or not. In the existing system, all weather prediction and environmental change are done manually and people are using some websites or cloud to know the weather condition of a particular city not even area. In this proposed system, both sensors and weather forecasting ESPEAK module is used in order to give perfect weather condition as audio throughout the whole time which is very important and a step towards the digital world where we don't have to depend on any in built cloud or website to know the weather status.

III. SYSTEM REQUIREMENT

A. NodeMCU



Fig: NodeMCU

The NodeMCU ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates 80MHz to 160MHz adjustable clock frequency. NodeMCU has 128KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi/Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

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B. Rain drop Sensor



Fig :Rain Drop Sensor

Raindrop sensor is basically a board on which nickel is coated in the form of lines. It works on the principal of resistance. Rain Sensor module allows to measure moisture via analog output pins and it provides a digital output when a threshold of moisture exceeds. The module is based on the LM393 op amp. It includes the electronics module and a printed circuit board that "collects" the rain drops. As rain drops are collected on the circuit board, they create paths of parallel resistance that are measured via the op amp. When rain drop present, it reduces the resistance because water is a conductor of electricity and presence of water connects nickel lines in parallel so reduces resistance and reduces voltage drop across it.

C. Motor Driver

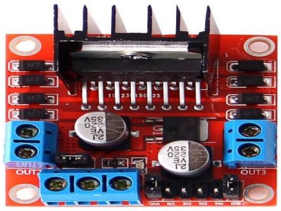


Fig :Motor Driver

Motor driver acts as an interface between the motors and the control circuits. So the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor.

D. Gear Motor



Fig :Gear Motor

A gearmotor is an all-in-one combination of an electric motor and a gearbox. This makes it a simple, cost-effective solution for high-torque, low-speed applications because it combines a motor with a gear reducer system. Most importantly, gearmotors ensure a well-matched electric motor and gearhead, helping to achieve optimal energy efficiency in addition to extending the life of your equipment.

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E. Rack and Pinion



Fig :Rack and Pinion

A rack and pinion is a type of linear actuator that comprises a circular gear (the *pinion*) engaging a linear gear (the *rack*), which operate to translate rotational motion into linear motion. Driving the pinion into rotation causes the rack to be driven linearly. Driving the rack linearly will cause the pinion to be driven into a rotation. A rack and pinion drive can use both straight and helical gears.

F. Power Supply



Fig :Power Supply

A power supply is an electronic circuit that converts the voltage of an alternating current (AC) into a direct current (DC) voltage. It is basically consisting of the following elements: transformer, rectifier, filter and regulator circuits

G. MS Pipe and MS Plate

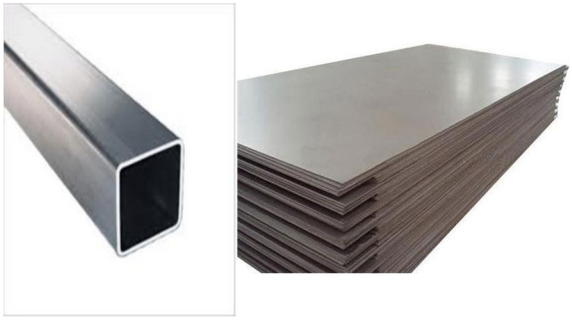


Fig :MS Pipe and MS Plate

MS Pipe and MS Tube refers to Mild Steel Pipe or a Mild Steel Tubes. Mild Steel (MS) pipes are manufactured using low carbon steel. And the state of the mild steel plate is rectangular in shape and is utilized in different mechanical and industrial areas. Both are used to construct the umbrella.

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IV. SYSTEM IMPLEMENTATION

Chargeable battery is connected to NodeMCU (ESP8266), then remaining battery percentage is calculated and uploaded to the cloud. This module is attached to the umbrella. In this smart system, we have raindrop sensor on top of the umbrella, which gives a reading proportional to the amount of rain pouring on it. It also consists of a rack and pinion system, the rack is fixed to umbrella such that when a sensor senses the exceeding value of raindrops, it gives a signal to the pinion attached to a motor. The relay is responsible for the motor to take action. The Blynk application notifies the event taking place.

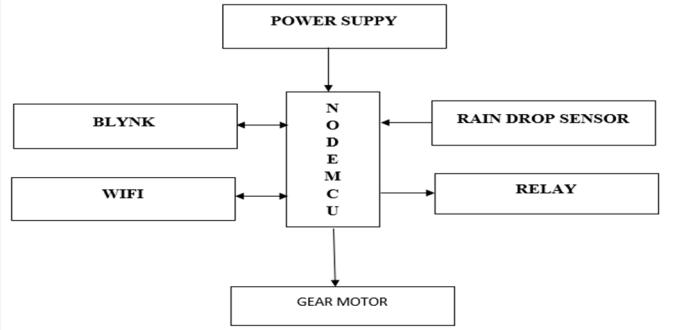


Fig: Block diagram of smart umbrella using IoT

V. RESULT

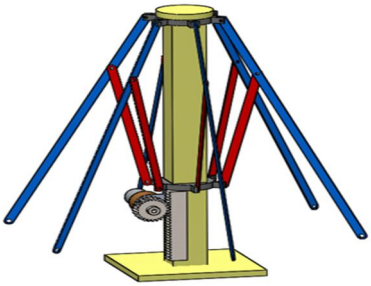


Fig : Umbrella model

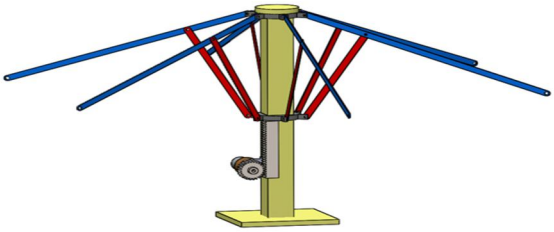


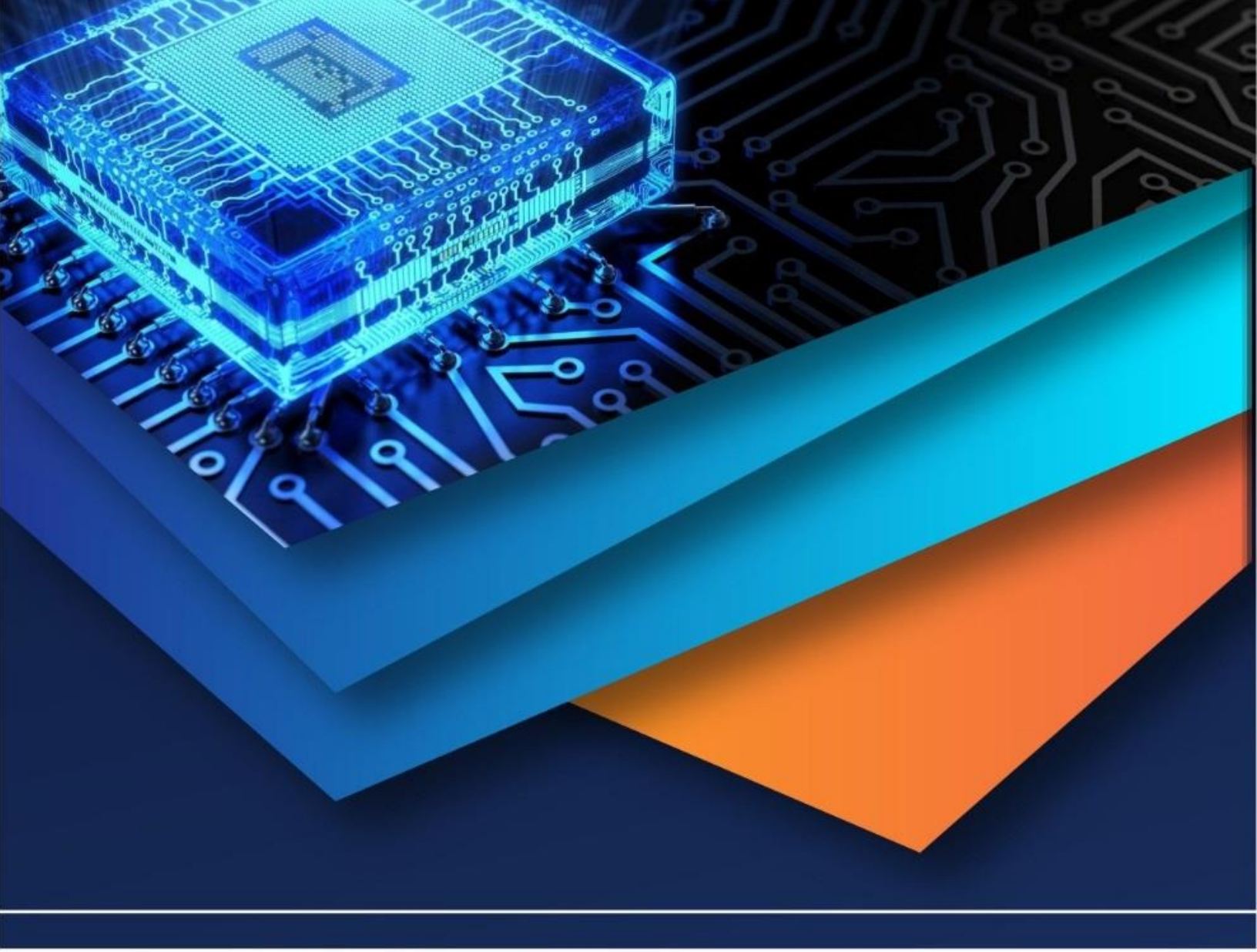
Fig : Opening of umbrella

Fig 9 shows the final model of smart umbrella using IoT and the fig 10 shows the umbrella opened due to the rain drops sensed by the rain drop sensor. The rain drop sensor will detect the rain pouring on the sensor and sends signal to the gear motor through the relay to operate so that the umbrella opens. It also notifies the user through Blynk application. When the rain stops pouring, the rain drop sensor again sends signal for the motor to close the umbrella.

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