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SMART UMBRELLA FOR AGRICULTURE TOPREVENT THE GRAINS FROM RAIN USING RASPBERRY PI PICO

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Abstract
This project presents the development of a smart umbrella system, 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, you are going to learn about how to make a smart umbrella. 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 Rain sensor, temperature sensor, Light sensor. During monsoon, sellers with an open shop, neighbours drying clothes outside and many similar situations cause inconveniences in our life. In case of street vegetable sellers, they need to protect the vegetables, fruits and customers from rains in monsoon season. Even the tarpaulins don't prove to be of any use during torrential rains accompanied by a thunderstorm. To overcome such problems and help us live with the inconvenience raining system. this auto rain- sensing umbrella smart system comes up with a solution. This smart rain sensing system can detect the rain and opens up the umbrella. In this smart system, we have a raindrop sensing system, which gives a reading proportional to the amount of rain pouring on it. The smart system consisting of a rack andpinion 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. Then the motor starts rotating and the umbrella opens.

1. INTRODUCTION
Natural resource elements are associated with day-to-day activities such as rainfall and sun light which is having both positive as well as negative impact on our lives and property. The sun emits ultraviolet energy which is one of the sources for vitamin D, staggering the growth of oncogenes and also used by plants during photosynthesis which is indirectly source of food for all living creature. Rainfall also having its very negative impact and such as destruction and damage of nursery bed herbs or plants and various ornamental flowers, skin disorder in humans, fever and sickness, and increase in mortality of living stocks, structural and materialistic deformation of properties such as fabrics [1]. A larger number and various types of structural and control system have been proposed in the past for particularly management, regulation, controlling and

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moderation of weather element to the life and property, but the retractable roof is the most suitable form for moderating these weather elements (Rain and Sunlight). Unlike permanent structures for the same purpose, the self-adjustable system only acts when a threshold is attained [2, 3]. The problem identified in previous model was for the continuous power supply so our designed model can be installed anywhere.

It could be possibly access to renewable source of energy like sunlight which is cheaper and cleaner source of energy. The problem associated with the proper design of the umbrella which can be possibly be made portable and easy to use is also there and other components with that which are to be protected from the extreme weather conditions. The design proposed for many systems uses retractable roof of wooden which can possibly be damaged by rain so proper material selection has to be done for longer life [4, 5]. Sunlight and rainfall Activated Retractable Illustrates through his paper that natural climatic elements like sunlight and rainfall have a very huge importance in our day-to-day life. These two weather elements have both positive and negative impacts in our life.

These two weather elements have some positive consequences so they cannot be ignored completely [6, 7]. To avoid the complete isolation of sunlight and rainfall a system is developed which will economical and give space reuse whenever the threshold value exceeds then roof automatically gets open up. An Algorithm is developed by the author to facilitate the automatic working of the roof whenever the intensity of these two weather elements exceeds the present value. In this system author has used an LDR sensor to detect to intensity of sunlight and ultrasonic and rain sensor for detection of rainfall intensity and pressure which will be helping in smart decision making. This system has a programmable device Arduino which will help in controlling of stepper motor for opening and closing of roof and two switches aiding for better control in all direction. 'Smart Automation System Using Arduino and Rain Drop Sensor' illustrated in his project that during rainy season the crops gets affected due to unexpected rainfall or even with hailstorm sometime in order to eliminate such things he developed a system to protect it from heavy rainfall [8]. The basic idea behind this research is to protect or to save the crops along with the rain water harvesting system. The rain sensing device along with the soil moisture sensing device is used in this system which will help in opening and closing of the automated roof. Automatic Rain Water and Crop Saving System discuses in his paper that agriculture is one of the most important sectors as it employs more than 45% of working population.

2. LITERATURE SERVEY

An automated umbrella means that it works flawlessly. In 1928, Hans Haupt invented the pocket umbrella. In Vienna, Hans Haupt was a student studying sculpture when she developed a prototype for an improved compact foldable umbrella for which she received a patent in September 1929. The umbrella was made by an Austrian company. In Germany, the small foldable umbrellas were made by the company Knirps. At the US University of central Florida students worked on automated umbrella. They designed an automated umbrella that worked with the help of a control system. The umbrella canopies of the 1600's were woven out of silk, which provided limited water resistance when compared to today's rain umbrellas, but the distinct canopy shape was unchanged from the earliest documented designs., even rain umbrellas were still considered a product only for distinguished women, while men facing ridicule if they were seen with one. Hanway came up

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and took the rain umbrella on the streets of London in 1750. Infect, in the late 1700's and early 1800's, a "Hanway" evolved to become another name for a rain umbrella (Vaghela et al., 2017). Through the 1800's until the present time, the materials used to make rain umbrellas have evolved, but the same basic canopy shape remains. One of the most important discoveries came in the early 1850s, when Samuel Fox took the idea of using "U" molded metal rods on the ribs and stretcher to make a simple, stronger frame. Previously, English umbrellas were made of cane or whalebones. Modern umbrellas are made by a hand- assembled process that, with the exception of a few sensitive areas, can be made by skilled workers. First, a shaft - whether of wood, metal, or fiberglass - is made and the ribs and tails are attached. Next, the nylon canopy is handstitched in sections. They were large and unpopular. Ribs and stretchers are often seen only today on parasols and patio umbrellas. Advances in metal technology have made round metal ribs and holes easily accessible, but some manufacturers are producing umbrellas with these features.

3. EMBEDDED SYSTEMS

3.1 Computer Instruction Set

There are two different types of computer instruction set there are:

- RISC (Reduced Instruction Set Computer) and
- CISC (Complex Instruction Set computer)

3.1.1 Reduced Instruction Set Computer (RISC)

A RISC (reduced instruction set computer) is a microprocessor that is designed toperform a smaller number of types of computer instruction so that it can operate at a higher speed (perform more million instructions per second, or millions of instructions per second). Since each instruction type that a computer must perform requires additional transistors and circuitry, a larger list or set of computer instructions tends to make the microprocessor more complicated and slower in operation.

Besides performance improvement, some advantages of RISC and related design improvements are:

- A new microprocessor can be developed and tested more quickly if one of its aims is to beless complicated.
- Operating system and application programmers who use the microprocessor's instructions will find it easier to develop code with a smaller instruction set

3.1.2 Complex Instruction Set Computer (CISC)

CISC, which stands for **Complex Instruction Set Computer,** is a philosophy for designing chips that are easy to program and which make efficient use of memory. Each instruction in a CISC instruction set might perform a series of operations inside the processor. This reduces the number of instructions required to implement a given program, and allows the programmer to learn a small but flexible set of instructions.

3.2 Memory Architecture

There two different type's memory architectures there are:

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- Harvard Architecture
- Von-Neumann Architecture

3.2.1 Harvard Architecture

Computers have separate memory areas for program instructions and data. There are two or more internal data buses, which allow simultaneous access to both instructions and data. The CPU fetches program instructions on the program memory bus.

The **Harvard architecture** is a computer architecture with physically separate storage and signal pathways for instructions and data. The term originated from the Harvard Mark I relay-based computer, which stored instructions on punched tape (24 bits wide) and data in electro-mechanical counters. These early machines had limited data storage, entirely contained within the central processing unit, and provided no access to the instruction storage as data. Programs needed to be loaded by an operator, the processor could not boot itself.

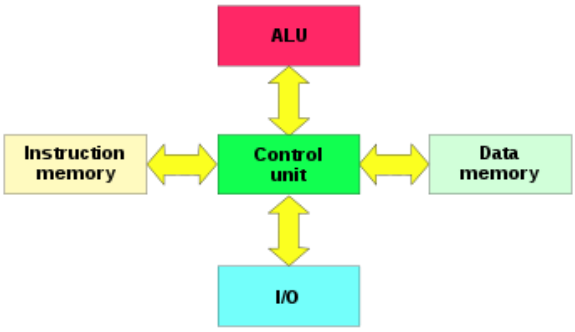

Figure 3.2.1 Harvard Architecture

3.1.1 Von-Neumann Architecture

A computer has a single, common memory space in which both program instructions and data are stored. There is a single internal data bus that fetches both instructions and data. The**von Neumann architecture** is a design model for a stored-program digital computer that uses a central processing unit (CPU) and a single separate storage structure ("memory") to hold both instructions and data. It is named after the mathematician and early computer scientist John von Neumann. Such computers implement a universal Turing machine and have a sequential architecture.

A **stored-program** digital computer is one that keeps its programmed instructions, as well as its data, in read-write, random-access memory (RAM). Stored-program computers were advancement over the program-controlled computers of the 1940s, such as the Colossus and the ENIAC, which were programmed by setting switches and inserting patch leads to route data and to control signals between various functional units. In the vast majority of modern computers, the same memory is used for both data and program instructions. The mechanisms for transferring the data and instructions between the CPU and memory are, however, considerably more complex than the original von Neumann architecture.

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The terms "von Neumann architecture" and "stored-program computer" are generally used interchangeably, and that usage is followed in this article.

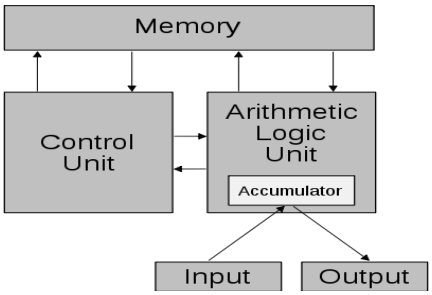

Figure 3.2.2 Schematic of the Von-Neumann Architecture.

4. POWER SUPPLY

4.1 Block Diagram

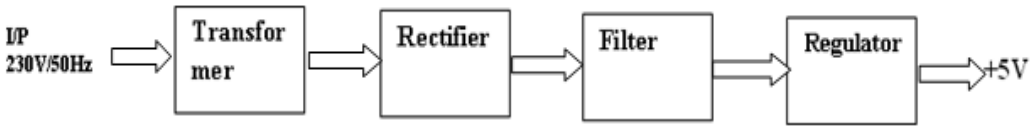

Figure 4.1 Power Supply

4.2 Circuit Diagram

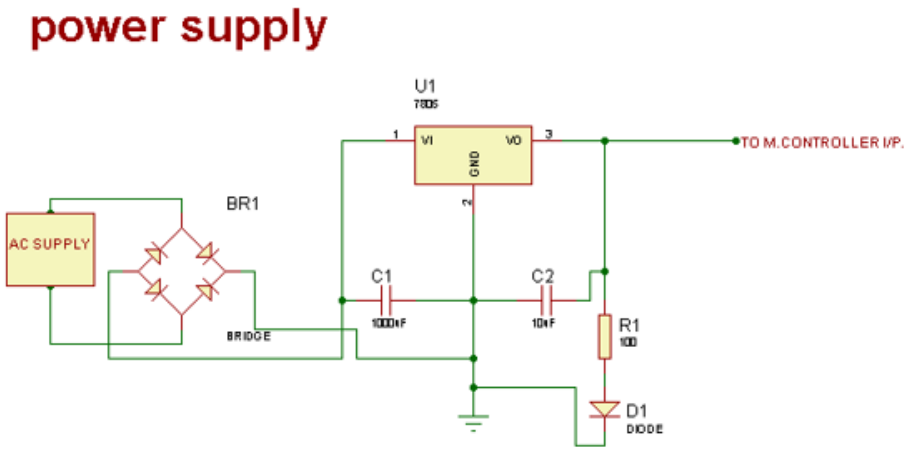

Figure 4.2 Circuit Diagram

4.3 Transformer Working

A transformer consists of two coils (often called 'windings') linked by an iron core, as shown in figure below. There is no electrical connection between the coils, instead they are linked by a magnetic field created in the core.

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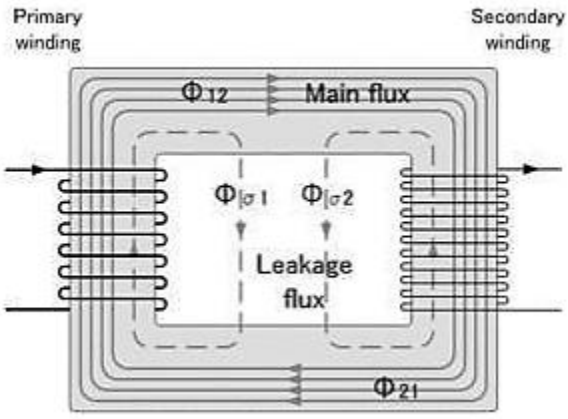

Figure 4.3 Basic Transformer

Transformers are used to convert electricity from one voltage to another with minimal loss of power. They only work with AC (alternating current) because they require a changing magnetic field to be created in their core. Transformers can increase voltage (step-up) as well as reduce voltage (step-down).

4.4 Rectifier

The purpose of a rectifier is to convert an AC waveform into a DC waveform (OR) Rectifier converts AC current or voltages into DC current or voltage. There are two different rectification circuits, known as 'half-wave' and 'full-wave' rectifiers. Both use components called diodes to convert AC into DC.

The Half-wave Rectifier

The half-wave rectifier is the simplest type of rectifier since it only uses one diode, as shown in figure.

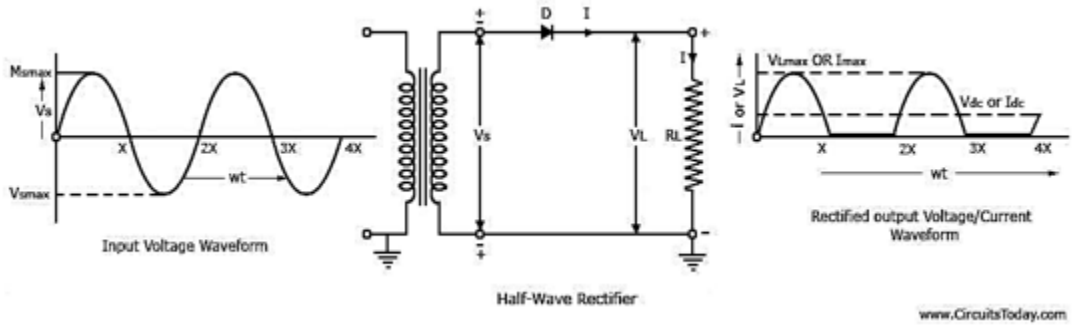

Figure 4.4 Half Wave Rectifier

Figure 4.4 shows the AC input waveform to this circuit and the resulting output. As you can see, when the AC input is positive, the diode is forward-biased and lets the current through. When the AC input is negative, the diode is reverse-biased and the diode does not let any current through,

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meaning the output is 0V. Because there is a 0.7V voltage loss across the diode, the peak output voltage will be 0.7V less than Vs.

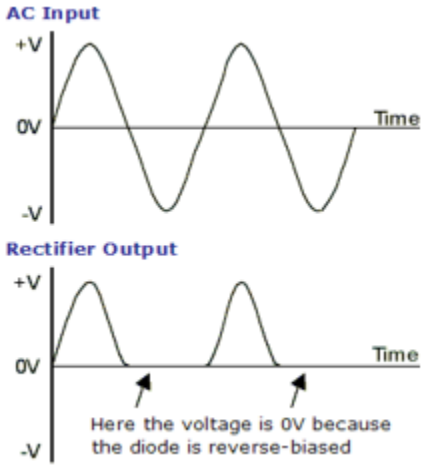

Figure 4.5 Half-Wave Rectification

While the output of the half-wave rectifier is DC (it is all positive), it would not be suitable as a power supply for a circuit. Firstly, the output voltage continually varies between 0V and Vs-0.7V, and secondly, for half the time there is no output at all.

The Full-wave Rectifier

The circuit in figure 3 addresses the second of these problems since at no time is the output voltage 0V. This time four diodes are arranged so that both the positive and negative parts of the AC waveform are converted to DC. The resulting waveform is shown in figure 4.6

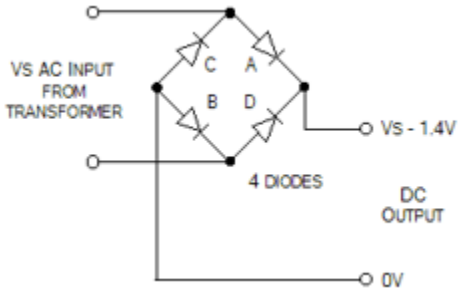

Figure 4.6 Full-Wave Rectifier

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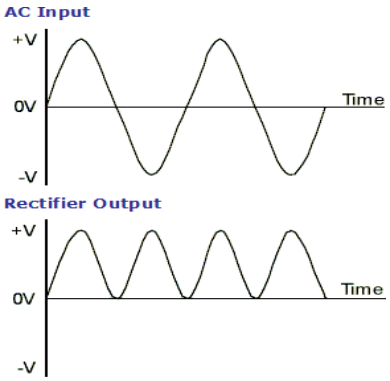

Figure 4.7 Full-Wave Rectification

When the AC input is positive, diodes A and B are forward-biased, while diodes C and D are reverse-biased. When the AC input is negative, the opposite is true - diodes C and D are forward-biased, while diodes A and B are reverse-biased.

While the full-wave rectifier is an improvement on the half-wave rectifier, its output still isn't suitable as a power supply for most circuits since the output voltage still varies between 0V and Vs-1.4V. So, if you put 12V AC in, you will 10.6V DC out.

4.5 Capacitor Filter

The capacitor-input filter, also called "Pi" filter due to its shape that looks like the Greek letter pi, is a type of electronic filter. Filter circuits are used to remove unwanted or undesired frequencies from a signal.

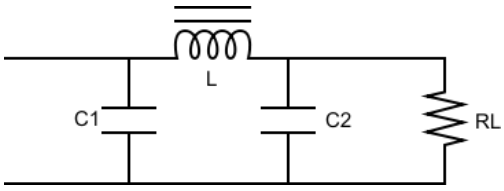

Figure 4.8 Capacitor Filter

A typical capacitor input filter consists of a filter capacitor C1, connected across the rectifier output, an inductor L, in series and another filter capacitor connected across the load.

1. The capacitor C1 offers low reactance to the AC component of the rectifier output while it offers infinite reactance to the DC component. As a result the capacitor shunts an appreciable amount of the AC component while the DC component continues its journey to the inductor L
2. The inductor L offers high reactance to the AC component but it offers almost zero reactance to the DC component. As a result the DC component flows through the inductor while the AC component is blocked.
3. The capacitor C2 bypasses the AC component which the inductor had failed to block. As a result only the DC component appears across the load RL.

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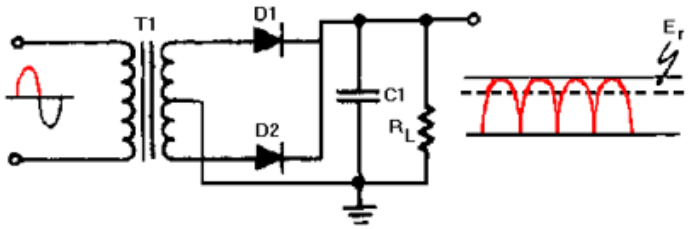

Figure 4.9 Centered Tapped Full-Wave Rectifier with a Capacitor Filter

4.6 PIN DESCRIPTION:

Most LCDs with 1 controller has 14 Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for back-light LED connections).

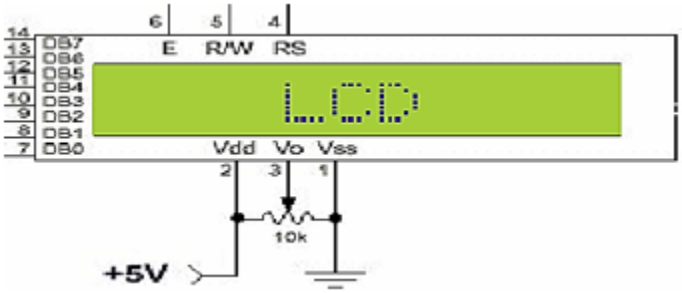

Figure 4.10 (a) Pin diagram of 1x16 lines LCD

PIN	SYMBOL	FUNCTION
1	Vss	Power Supply(GND)
2	Vdd	Power Supply(+5V)
3	Vo	Contrast Adjust
4	RS	Instruction/Data Register Select
5	R/W	Data Bus Line
6	E	Enable Signal
7-14	DB0-DB7	Data Bus Line
15	A	Power Supply for LED B/L(+)
16	K	Power Supply for LED B/L(-)

Figure 4.10 (b) Pin specifications

5. RESULT & OUTPUTS

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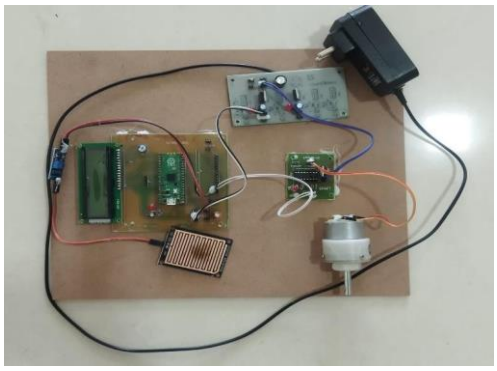

Figure 5.1 Complete circuit

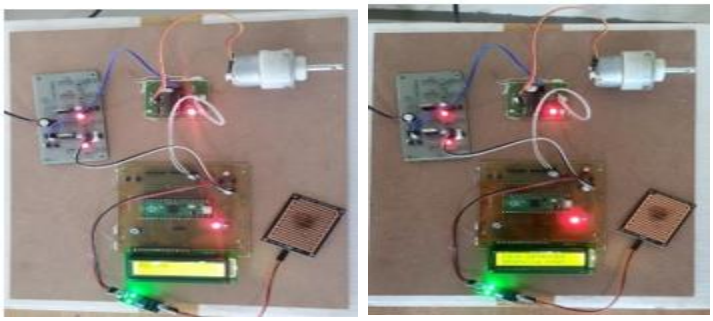

Figure 5.2 Output 1 (Rain detected)

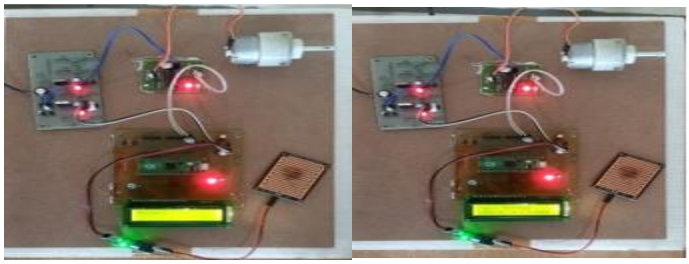

Figure 5.3 Output 2 (Normal)

CONCLUSION

After completing the present work with all the process involved in designing the automated umbrella which can be of reasonable cost analysis and effective way to providing the shelter and safety to the object and goods with high intensity of power and this type of umbrella should be used in the various place in village to protect crops and the vehicles, etc. It can be applying at large scale area for reduced human work. It included the rack and pinion gear which changes the motion rotation into reciprocating.

It also used in future after some of modification algorithm can be developed to coordinate Working system of rain to identify weather condition based on set value. The designed system prototype can be used along with the renewable source of energy. The designed model is not only smart but also intelligent as it will take decision about folding and unfolding of umbrella. The system can be control by Arduino and dc motor used for folding the roof with two or more switch fix along with the knowledge of next future direction.

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