

“RAIN WATER DETECTION AND AUTOMATIC CLOTH RETRIEVAL MACHINE”

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Abstract: Rain water Detection Automatic Cloth Retrieval Machine is a system designed to be helpful in household uses where wet cloths can be hang on system hangers so that whenever rain comes the system retrieves in the cloths to a shaded area and wetting of cloth are been avoided. Likewise, when rain stops the machine retrieves back the cloth to open atmosphere to continue drying. This includes conversion of electrical energy into mechanical energy. It is hard to keep the clothes out for drying when the weather changes from sunny to a rainy day. People often forget to lift the suspension of clothing during the day rain. For people who working, they don't have to worry about their clothes that have been dried outside. People often don't have time to manage their routine. This project develop for working couple, it is hard to find time to have laundry day where the cloth is dried through the whole day because the weather can change from sunny to rainy days. This project will automatically retrieve out the clothes when it is the sunny day and oppositely retrieve in the clothes when it is a rainy day.

This part needs DC motor to convert electrical power into mechanical power for retrieve-out and retrieve-in all the clothes.

LDR (Light Dependent Resistor) sensors will be use to detect light. Rain detector also will be use to sense when it begins to rain outside by detecting rain water from sensor locate at the rod. The dry time of the clothes will be setup using rotary knob switch and it will automatically retrieve-in the clothes using DC motor when the dried time is finished.

KEYWORDS: Cloth retrieval machine, LDR,

I. INTRODUCTION

The life of human race has greatly changed with number of inventions. There are many inventions that satisfy people needs. Though these modern discoveries of technology and with their increasing power and versatility, people have become dependent on this machine in their day to day endeavor of their business and lifestyle. In this age invention is given a great impact in everything that we do. It makes peoples work and satisfies human needs. With this premise our group thought of something that could help ease the burden of all people when it comes to their laundry because there are some that still rely on manual base system. In this research we will able to look for a possible solution in protecting clothes lie to decreased stressful lifestyle.

For a working couple, it is hard to find time to have laundry day where the cloth is dried through the whole day because the weather can change from sunny to rainy days. This projects use Microcontroller 8081-AT89S52 to install all program that will give instructions to conduct this system properly. This project will automatically retrieve-out the clothes when it is the sunny day and oppositely retrieve-in the clothes when it is a rainy day. This part needs DC motor to convert electrical power into mechanical power for retrieve-out and retrieve-in all the clothes. LDR (Light Dependent Resistor) sensors will be use to detect light. Rain detector also will be use to sense when it begins to rain outside by detecting rain water drops which falls on the sensor which is placed on the rod. This will automatically retrieve-in the clothes using DC motor when the sensor is actuated. This project will be display the day condition using LCD (Liquid Crystal Display) or indicator light such as LED (Light Emitting Diode).

II. LITERATURE REVIEW

Outdoor Retractable Laundry Hanger

This system in figure below could work perfectly solved problem drying our laundry and make the clothes dry under the sun or indoor when it rains. We no longer need to carry heavy bamboo poles out of our windows again. Outdoor laundry system equipped with German technology and parts are simple to use by our own or family members. This system is highly suitable for residents staying in high rise flats and apartments due to limited space constraint.



Fig 1 Outdoor retractable laundry hanger

Roll Out Awnings

Rollout awning is made up of all heavy American made stock components, thick, white epoxy/PVC coated/full bath dipped over heavy aluminum alloy frames. Alloy is stronger than plain aluminum and has an elastic quality under stress to return to shape. Other companies may import German, Italian, French, or Chinese awnings & components that are lightweight, thin models for light wind and no rain only but this rollout awning will never use these inferior systems.

The steel tubes can corrode due to the galvanic Electrical Charge that never shuts off, once place outside on a wall in High Humidity and windy areas. All of the steel main frame and its components attached to it, such as the arms, shoulders, elbows and wrist connection points, stay charged up and sizzling, and can freeze up, require constant lubricant, or will just become weakened and corroded over a few years. This awning arms have Triple-Angled- Elbows with Triple-Springs sealed inside for water tightness providing Triple Strength and added stiffness for maximum use on windy beach fronts . These brackets are heavy, thick aluminum alloy with thick epoxy / PVC coating to ensure complete protection from the elements.



Fig 2 Rollout awnings

III. EXPERIMENTAL SETUP DESIGN AND COMPONENTS

D C Motor

This motor follows linear laws of operation and because of this it is easier to fully exploit its characteristics compared to synchronous or asynchronous motors.

Why Choose a D.C Motor

Many application call for a higher start-up torque. The D.C motor by its very nature, has a high torque vs falling speed characteristics and this enable it to deal with high starting torque and to absorb sudden rises in load easily. The speed of the motor adjusts to the load. Furthermore, the D.C motor is an ideal way of achieving the miniaturisation designers are constantly seeking because the efficiency it gives is high compared with other design.

Types Of Dc Motor

- Brushed DC Motors
- Brushed DC Electric Motor

The classic DC Motor design generates an oscillating current in a wound rotor with a split ring commutator, and either a wound or permanent stator. Many of the limitations of the classic commutator DC motor are due to the need for brushes to press against the commutator. This creates friction. At higher speeds, brushes have increasing difficulty in maintaining contacts. Brushes may bounce off the irregularities in the commutator surface, creating sparks. This limits the maximum speed of the machine. The current density per unit area of the brushes limits the output of the motor. The imperfect electronic contact also causes electrical noise. Brushes eventually wear out and require replacement, and the commutator itself is subjected to wear and maintenance.

Volt Dc Wiper Motor

The motor used here is 12-volt electric motor. The motor is a permanent magnet motor operating on 12-volt battery, which gives the motor enough power to pull the rope drive mechanism.

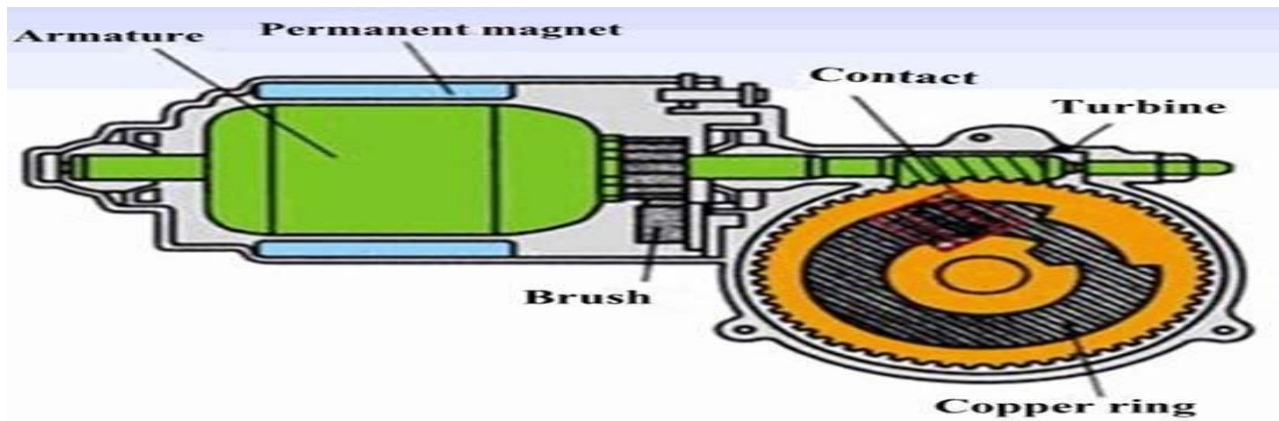


Fig 3 D.C Wiper Motor

Microcontroller

8051 is the name of a big family of Microcontrollers. The device which we use in our project is 'AT89S52' which is a typical 8051 Microcontroller manufactured by Atmel. A simpler architecture can be represented as below.

The 89S52 has 4 different ports, each one having 8 Input/output lines providing a total of 32 I/O lines. Those ports can be used to output DATA and orders to other devices, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have 'dual function' meaning that they can be used for two different functions.

The first one is to perform input/output operations and the second one is used to implement special features of the Microcontroller like counting external pulses, interrupting the execution of the program according to external events, performing serial data transfer or connecting the chip to a computer to update the software. Each port has 8 pins, and will be treated from the software point of view as an 8-bit variable called 'register', each bit being connected to a different Input/output pin. There are two different memory types: **RAM** and **EEPROM**. Shortly, RAM is used to store variable during program execution, while the EEPROM memory is used to store the program itself, that's why it is often referred to as the 'program memory'. It is clear that the CPU (Central Processing Unit) is the heart of the micro controllers. It is the CPU that will Read the program from the FLASH memory and Execute it by interacting with the different peripherals.

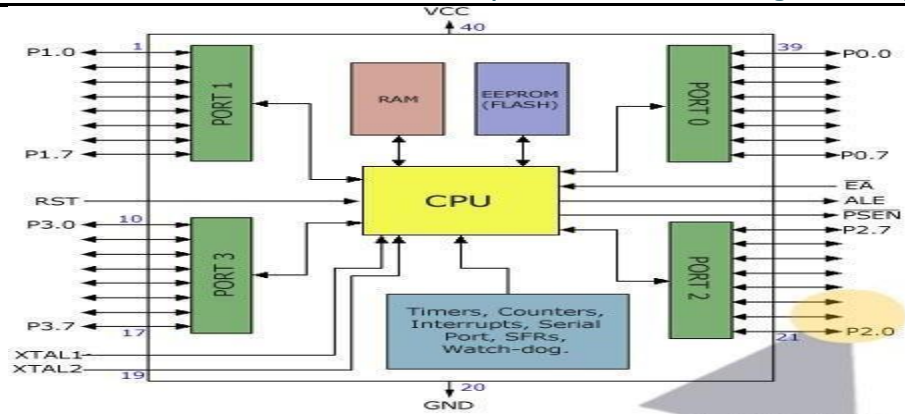


Fig 4 Schematic Diagram of Microcontroller

Diagram below shows the pin configuration of the 89S52, where the function of each pin is written next to it, and, if it exists, the dual function is mention. Note that the pins that havedual functions can still be used normally as an input/output pin. Unless the program uses their dual functions, all the 32 I/O pins of the microcontroller are configured as input/output pins. Below Diagram also shows the Reset and Crystal circuit required for the Microcontroller.

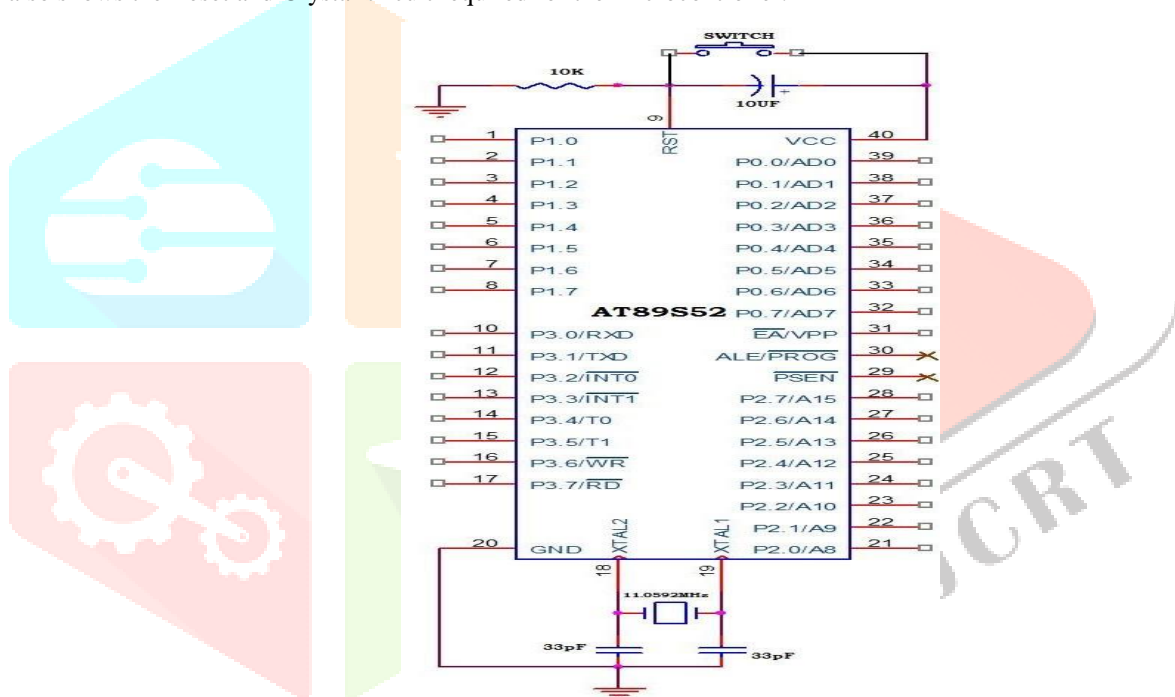


Fig 5 Pin Diagram of Microcontroller

LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

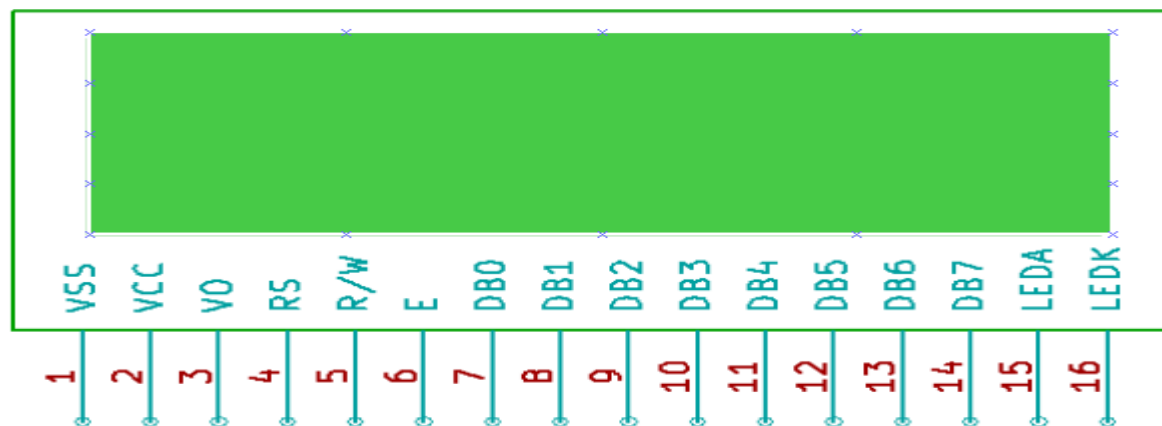


Fig 6: LCD Diagram

Pin Description

Table LCD Pin Description

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	VEE
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V _{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

Regulated Power Supply

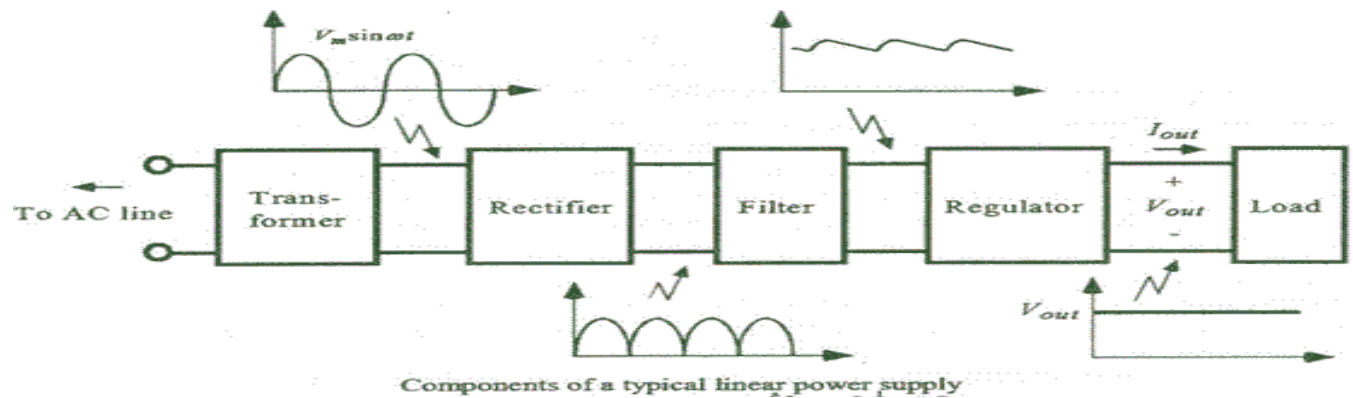


Fig 7 Block Diagram of Power Supply

The Basic Blocks of a Regulated Dc Power Supply are as Follows

1. A STEP DOWN TRANSFORMER
2. A RECTIFIER
3. A DC FILTER
4. A REGULATOR

Operation of Regulated Power Supply

1. Step Down Transformer

A step down transformer will step down the voltage from the ac mains to the required voltage level. The turn's ratio of the transformer is so adjusted such as to obtain the required voltage value. The output of the transformer is given as an input to the rectifier circuit.

2. Rectification

Rectifier is an electronic circuit consisting of diodes which carries out the rectification process. Rectification is the process of converting an alternating voltage or current into corresponding direct (dc) quantity. The input to a rectifier is ac whereas its output is unidirectional pulsating dc. Usually a full wave rectifier or a bridge rectifier is used to rectify both the half cycles of the ac supply (full wave rectification). Figure below shows a full wave bridge rectifier.

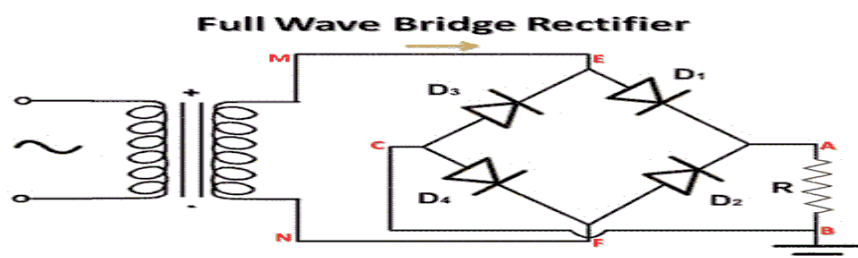


Fig 8 Full Wave Rectifier

A bridge rectifier consists of four p-n junction diodes connected in the above shown manner. In the positive half cycle of the supply the voltage induced across the secondary of the electrical transformer i.e. VMN is positive. Therefore point E is positive with respect to F. Hence, diodes D₃ and D₂ are reversed biased and diodes D₁ and D₄ are forward biased. The diode D₃ and D₂ will act as open switches (practically there is some voltage drop) and diodes D₁ and D₄ will act as closed switches and will start conducting. Hence a rectified waveform appears at the output of the rectifier as shown in the first figure. When voltage induced in secondary i.e. VMN is negative than D₃ and D₂ are forward biased with the other two reversed biased and a positive

voltage appears at the input of the filter.

3. D C Filtration

The rectified voltage from the rectifier is a pulsating dc voltage having very high ripple content. But this is not we want, we want a pure ripple free dc waveform. Hence a filter is used. Different types of filters are used such as capacitor filter, LC filter, Choke input filter, π type filter.

As the instantaneous voltage starts increasing the capacitor charges, it charges till the waveform reaches its peak value. When the instantaneous value starts reducing the capacitor starts discharging exponentially and slowly through the load (input of the regulator in this case). Hence, an almost constant dc value having very less ripple content is obtained.

4. Regulation

This is the last block in a regulated DC power supply. The output voltage or current will change or fluctuate when there is change in the input from ac mains or due to change in load current at the output of the regulated power supply or due to other factors like temperature changes. This problem can be eliminated by using a regulator. A regulator will maintain the output constant even when changes at the input or any other changes occur. Transistor series regulator, Fixed and variable IC regulators or a zener diode operated in the zener region can be used depending on their applications. IC's like 78XX and 79XX are used to obtained fixed values of voltages at the output. With IC's like LM 317 and 723 etc we can adjust the output voltage to a required constant value.

There are some LDRs that work in the opposite way i.e. their resistance increases with light (called positive co-efficient LDR).

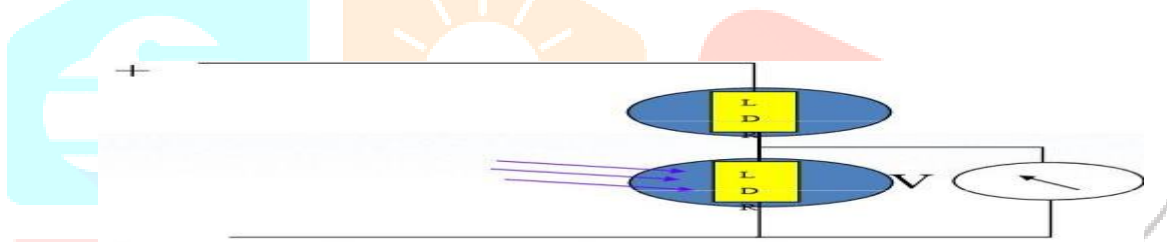


Fig 9 Measuring Change of Light by using LDR

The figure above shows how to measure the change of light by using LDR -

This needs two resistors in series. You need to measure the voltage across the LDR that is subjected to light. The whole system works like a potential divider, and the voltage across the LDR is proportional to the current.

Photo emitters

- Photoemissive cells - dominant type of sensors - used in sound tracking of films
- It is a vacuum device - with Cesium as cathode, Nickel as anode
- Current flow between the electrodes is proportional to the energy carried
- Current flow between the electrodes is proportional to the energy carried by the light
- A threshold frequency exists
- Limited range of response - UV easy to sense, Infra difficult most
- Used in series with a resistor, supply voltage 25-100v
- The LED colors most commonly used in sensing are visible red and infrared. In applications which sense color contrasts, the choice of LED color can be important. Because LEDs are solid-state, they will last for the entire useful life of sensor.

The figure below shows different colored LEDs that can be used in a photoelectric system.



Fig 10 Different Colored LEDs

The figure below is showing how a photometer and receiver combination could be used for sensing an object. This is a very common sensor used in automated plants. Photoelectric receivers typically use one of three light-sensitive electronic elements.

The phototransistor is the most widely used receiver in industrial photoelectric sensor design, because they offer the best tradeoff between light sensitivity and response speed.

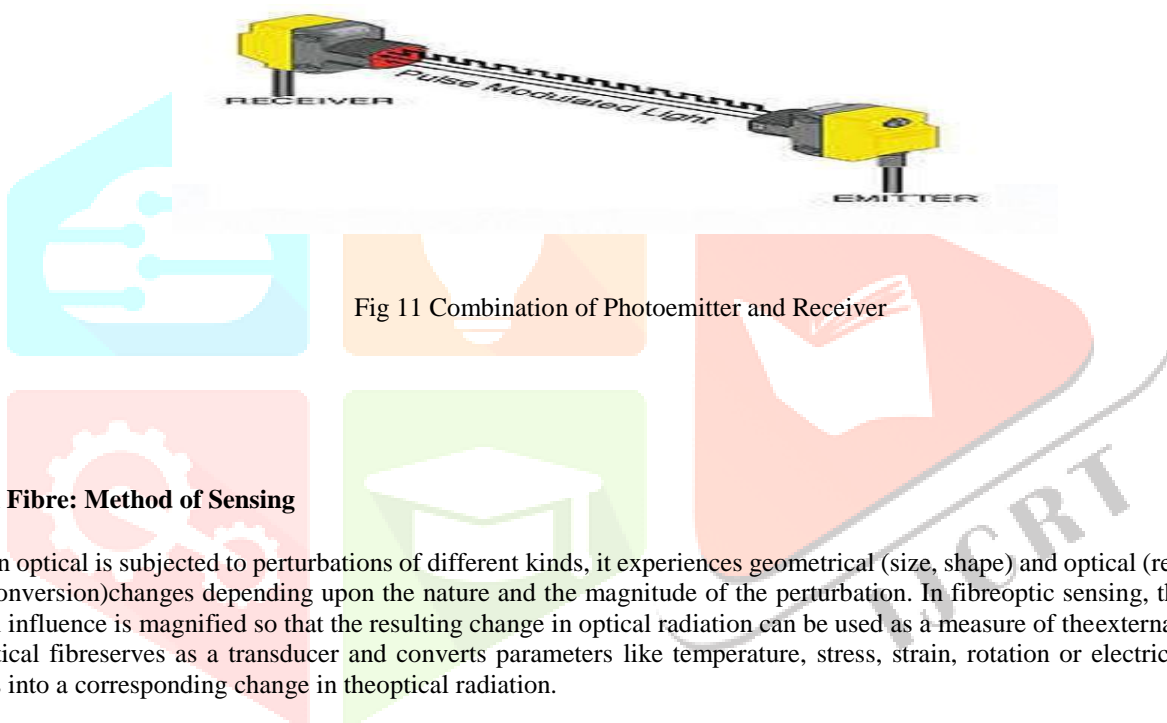


Fig 11 Combination of Photoemitter and Receiver

Optical Fibre: Method of Sensing

When an optical is subjected to perturbations of different kinds, it experiences geometrical (size, shape) and optical (refractive index, mode conversion) changes depending upon the nature and the magnitude of the perturbation. In fibreoptic sensing, this response to external influence is magnified so that the resulting change in optical radiation can be used as a measure of the external perturbation. The optical fibreserves as a transducer and converts parameters like temperature, stress, strain, rotation or electric and magnetic currents into a corresponding change in the optical radiation.

Since light is characterized by intensity, phase, frequency and polarization, any of these parameters may undergo a change during the motion of a dynamic system.

Extrinsic Vs. Intrinsic Sensors

Extrinsic sensors are those which use fiber to supply light to a sensing device and returnsignal light to a detection system, intrinsic sensors use the fiber itself as the transducer.

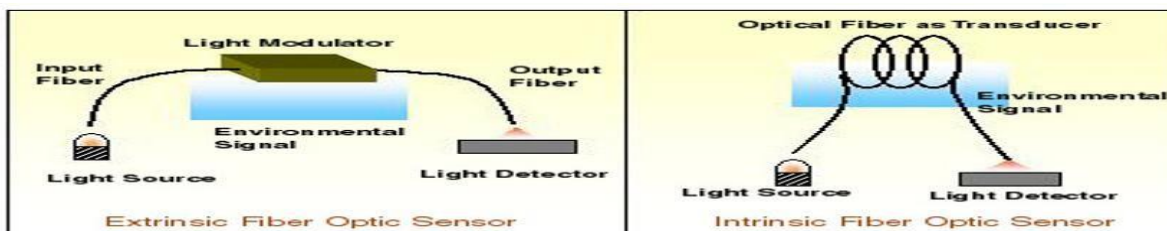


Fig 12 Extrinsic vs. Intrinsic Sensors

Rain Sensor

This sensor shown in Figure works by having a series of exposed traces connected to ground and interlaced between the grounded traces are the sense traces. The sensor traces have a weak pull-up resistor of 1 M Ω . The resistor will pull the sensor trace value high until a drop of water shorts the sensor trace to the grounded trace. Other than that, this circuit also will work with the digital I/O pins of Arduino or it also can be use it with the analog pins to detect the amount of water induced contact between the grounded and sensor traces. It is suitable to detect rainfall, tank overflow or water leakage.



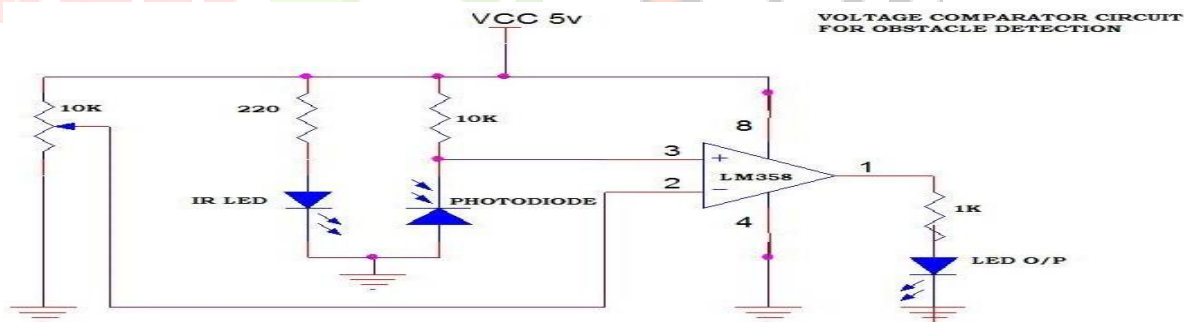
Fig 13 Rain Sensor

voltage Comparator

A comparator is a device that compares two voltage or currents and outputs a digital signal indicating which is larger. The voltage comparator used here is LM358.

The LM358 consists of two independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. Application areas include transducer amplifiers, dc gain blocks and all the conventional op amp circuits which now can be more easily implemented in single power supply systems. For example, the LM358 series can be directly operated off of the standard +5V power supply voltage which is used in digital systems and will easily provide the required interface electronics without requiring the additional $\pm 15V$ power supplies. The LM358 are available in a chip sized package (8-Bump micro SMD) using National's micro SMD package technology.

Fig 14 Voltage Comparator



Characteristics

- In the linear mode the input common-mode voltage range includes ground and the output voltage can also swing to ground, even though operated from only a single power supply voltage.
- The unity gain cross frequency is temperature compensated.
- The input bias current is also temperature compensated.

IV.Results and Discussions:

Rain Detection Automatic Cloth Retrieval Machine is a system designed to be helpful in household uses where wet cloths can be hung on system hangers so that whenever it rains, the system retrieves in the cloths to a shaded area and wetting of cloth are been avoided. Like wise when rain stops the machine retrieves back the cloth to open atmosphere to continue drying. This includes conversion of electrical energy into mechanical energy.

In this project sensors like rain sensor, light sensor are used .A Microcontroller is used to convert signals into required form. Limit switches are used to limit the over rotation of the rope drive and a 12 volt dc motor is used to convert electrical signal into mechanical work.

When it starts raining, the rain drops fall on the rain sensor which consists of electrodes which are kept at certain small distance. When rain drops fall on these electrodes ,the electrode gets connected and circuits gets completed, because of this action, signal is sent to the microcontroller which actuates the system and sends signal to the motor present in it and clothes will be retrieved into the shades. Limit switches are provided to avoid over rotation of rope drive.

Once the rain stops, the rain sensor gets dried up and circuit breaks then the microcontroller will check the light sensor for sunlight and if the conditions satisfy then the clothes are retrieved out to the open atmosphere and drying of clothes is continued.

At night, where there is no sunlight, there is no use of clothes being in open air, so the light sensor is used here. Whenever it is dark, it senses the intensity of light and if it is too low it sends signal to the microcontroller and microcontroller further sends signal to the driver and driver to the motor and thus clothes will be retrieved back to the shaded area.

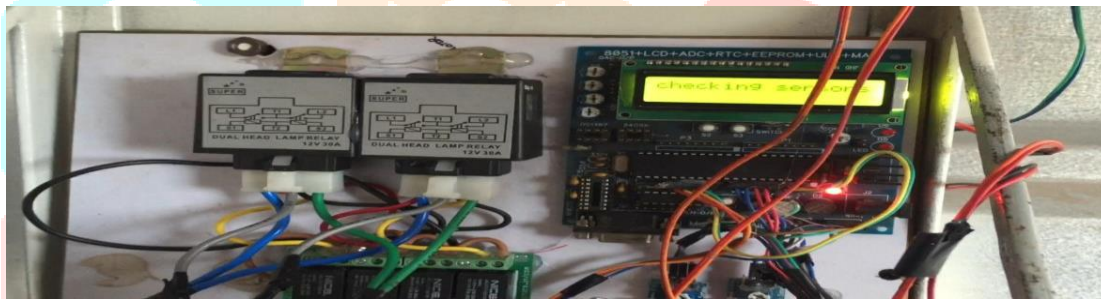


Fig 15 Relays and microcontroller circuit



Fig 16 Wiper motor



Fig 17 Fabricated model

ADVANTAGES

- 1.The laundry can be safely hung up in the morning and caught up in the evening. It is no longer wet. Experiments have shown that the laundry even 2-3 days stay dry in strong rain.
- 2.The laundry lines are not dirty.
- 3.Energy saving by eliminating repeated washings.
- 4.Environmental protection by eliminating repeated washings.
- 5.Time saving.
- 6.Easily operated, Skilled people are not require.

FUTURE SCOPE

- Solar pannel can be used .
- Heater can be used and mounted inside the setup so than during raining it can dry thecloth inside.
- By altering the program dry timer can be set which sets the time of drying.

V. CONCLUSION

It is hard to keep the clothes out for drying when the weather changes from sunny to a rainy day. This project will automatically retrieve out the clothes when it is the sunny day and oppositely retrieve in the clothes when it is a rainy day and also when the light intensity is not enough to dry the clothes or at night when the clothes wont dry, the light sensor checks the intensity of light and retrives the cloth in and when there is sufficient light, it retrives the cloth outside. This project will be very usefull for a working couple who do not get time to spend on their household works.

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