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Design and Experimental Study on Automatic Cloth Retrieval and Drying System

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Abstract**: 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 PIC 16F877 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. Temperature sensors that will be use in this project can measure temperature and day condition whether it is sunny or rainy day more accurately. LDR (Light Dependent Resistor) sensors will be used to detect light. Rain detector also will be use to sense when it begins to rain outside by detecting rain water from moisture impedance 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. This project will be display the day condition, temperature and dry-timer using LCD (Liquid Crystal Display) or indicator light such as LED (Light Emitting Diode).

Keywords: Rain detection, Rain sensing, solar powered, Automatic retrieval.

I. INTRODUCTION

People are now-a-days working in corporate companies they go for work in morning and come only at night they wash clothes in machines and they suspend it in open terrace and they are unable 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 is developed 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 projects use Microcontroller PIC 16F877 to install all program that will give instructions to conduct this system properly and 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. Temperature sensors that use in this project can measure temperature and day condition whether it is sunny or rainy day more accurately. LDR (Light Dependent Resistor) sensors use to detect light. Rain detector use to sense whether it rain or not at outside by detecting rain water from impedance sensor locate at the rod. The dry-time of the clothes will be setup using push button and it will automatically retrieve-in the clothes using DC motor when the dried-time is finished. For status display, this project will be display the day condition, temperature and dry-timer using LCD (Liquid Crystal Display) or indicator lights such as LED (Light Emitting Diode)

Project Objective

The main objective of done this project is to develop an automatic system for cloth retriever within required range and specific objectives of this project are listed as followed:

i. It 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 project is done by developing the circuit of Light Dependent Resistor which is could detect the sunny day

and rain detector circuit to detect whether it is rainy day and programming the controller to control the motor to retrieve-out the clothes when it is sunny day and retrieve-in the cloth when it is rainy day.

ii. The dry-time of the clothes will be counted and it will automatically retrieve-in the clothes when the dried-time is finished. The dry-timer was set by user whether 3 hours, 4 hours or 5 hours.

iii. This project will be display the day condition, temperature and dry-timer. Day conditions will display sunny, cloud or rainy. It depends on the current

iv. Temperature range that has been set by programming.
Also, could display dry timer that has been set by user.

II. LITERATURE REVIEW

This literature review explains about relevant past research and project development which is used the almost similar system for this project.

A. Outdoor Retractable Laundry Hanger

This system in figure.1below 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 owner family members. This system is highly suitable for residents staying in high rise flats and apartments due to limited space constraints. This system work simply on a German gas spring and roller bearing from Japan, this system sit flat to the ceiling when not in use, and it makes maximum use of the air space in our home, kitchen or in your utility yards. It makes your home look neater thus giving you more space to move around.

The gas spring act to let the system move up and down using a pull and push stainless steel rod handle and it will lock at upward and downward position. The laundry hangers it on the roller bearing on the bottom part of the system, and it allows the laundry system to move in and out of the window for the sun and wind to dry your ready washed clothes. This system features were suitable for bed sheet and blanket drying and for heavy weight load upto25kg

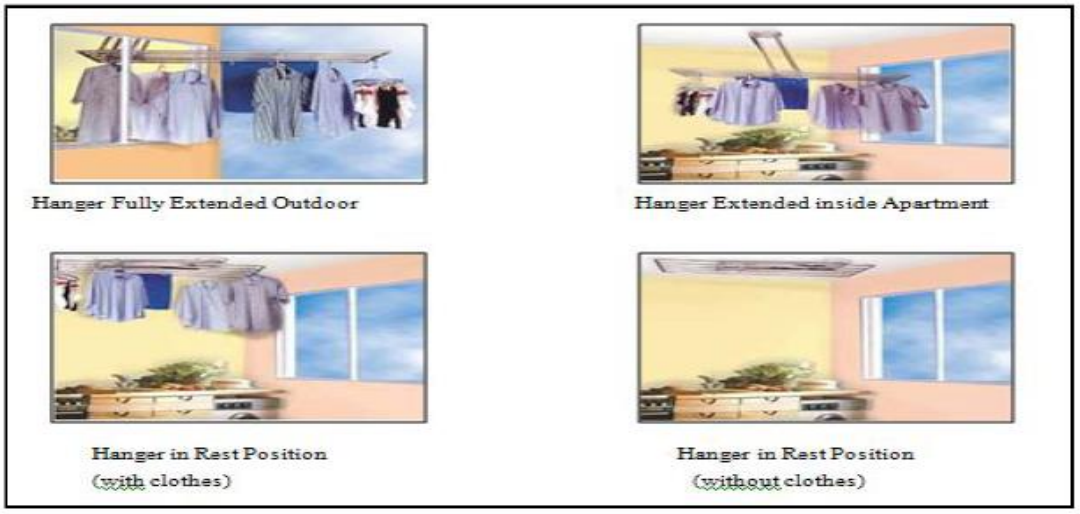

Figure 1Outdoor Retractable Hanger Operation.

B. Rain Tracker Rain Gauge – Model RG-10

The Rain Gage RG-10 senses using beams infrared light. The RG-10 uses the same underlying principle used in millions of automotive rain sensing wind shield wiper controls, most of which employ technology originally developed in our labs. The technology that was designed to sense tiny amounts of water in the harsh automotive environment, made it a bit more rugged yet, and applied it to the RG-10. The result is a general-purpose rain sensor that maybe configured for many applications. Include with a DIP switch that allows it to be setup for the mode of operation that best matches the application. The DIP switch sets the mode, the nature of the output, and the function of the auxiliary output. The RG-10 is suitable for almost any application that requires reliable and sensitive rain sensing, including automatic retraction of awnings, boat and ship window wiper control, and wiper control for specialized vehicles and equipment.

The RG-10 over comes many of the shortcomings of conventional tipping bucket rain gauges. Tipping buckets remain the standard for accuracy and simplicity; indeed, we used such a rain gauge to calibrate the RG-10. But, a lot of water collects on a rain gauge collecting funnel before the first drop ever reaches the tipping bucket. The RG-10 senses the drops directly, and is thus able to detect a much smaller amount of water. It has a clear compound lens that makes up the sensing surface. Beams of

invisible, infrared light bounce around inside the lens and off the outside surface. Electronic circuits pulse infrared emitters to generate the beams, and amplify the received beams. Digital Signal Processing techniques extract small signals and help get rid of the effects of ambient light disturbances. The RG-10 was developed over many years for automotive rain sensing wind shield wiper controls. The RG-10 also provided drop detection. Use this mode if want to do own external data interpretation. The output will pulse once with each detected drop.

C. Temperature Control System

This project about temperature control system which is a particular system for server room. This system consists of temperature sensor, PIC, LCD (Liquid Crystal Display), driver circuits, AC air heater and AC motor. To switch on the AC heater three drivers are used for triggered process and another two used for triggered levels of the motor. This motor operated based on two levels of speed and functioning for controlling the temperature value inside of a regular room automatically. This system would operate based on values or ranges of the temperature inside the room that would be detected by using the temperature sensor. If the temperature in the first ranges (0˚C to 15˚C) the air heater will be operated to heat the very cold server room. Second range between (16˚C to 25˚C) made this system not been able because it is achieving normal range of temperature.

Motor will be triggered for level 1 when temperature ranges between 26˚C to 40˚C to decrease the temperature value. If the temperature become more than 40˚C, the motor will be triggered for level 2 and become faster for this level. Both output devices are important to maintain the temperature value in the room. This system can solve be categorized into automatic system class. Problem always happened if air- influenced by weather from outside of the server room. To keep maintaining the server room in suitable temperature range the motor and air heater are most important. The surrounding temperature and conditioner broke down and made room becomes hotter or high temperature. Temperature become too cold and the outputs are operated based on the temperature ranges that may detected by temperature sensor. Programming for PIC is very important to read data and accept the signal from the sensor. At the same time, it will be maintaining the temperature inside of the room and make it suitable for user.

D. Rollout Awnings

Rollout awning is made up of all heavy American made stock components, thick, white epoxy /PVC coated/ full bath dipped over heavy aluminium alloy frames. Alloy is stronger than plain aluminium and has an elastic quality under stress to return to shape. Other companies may import German, Italian, French, or Chinese awnings &components that are light weight, 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 aluminium alloy with thick epoxy/PVC coating to ensure complete protection from the elements.

They can be rolled up even when wet without forming mildew and provide the highest longevity for awning material used in rollout awnings. Electric motors are completely sealed and then inserted inside the fabric roller tube of the awning, never being exposed to the elements. For motor, the torque required to roll the awning in and out is always constant, allowing the motor to run almost indefinitely without breaking down.

E. Equilibrium of a Suspended Clothesline

A clothesline is a rope or wire on which washed clothes are hung to dry. It is usually stretched between two points (e.g. two rods), whether outside or indoors, above the level of the ground. The principles in engineering mechanics about force systems in equilibrium can be demonstrated by analysing the equilibrium of a suspended clothesline. The suspended clothesline is an example of a parallel force system. A parallel force system is a type of force system where in all forces are oriented along one axis. In this case, all forces acting on the steel pipe are vertical since only gravity loads due to the weights of the hanging objects act. The suspended clothesline is actually a parallel force system in space or three dimensional (3D). However, it can be reduced into a two-dimensional system (2D).

The free body diagram of the suspended clothesline with the hangers with shirts on it is shown below in Figure 8. The hangers with shirts are represented in the free body diagram (FBD) as W and the tensile forces in the angel bars are represented by T. Neglect the weight of the steel pipe and assume to be rigid in the analysis.

The shirts were drenched and the hangers were put to each of the shirts. The masses and weights of each are as follow:

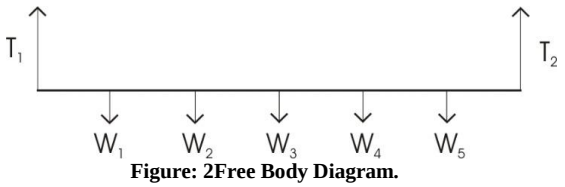

Figure: 2Free Body Diagram.

Table 1Mass and Weight of Shirts.

Shirt	Mass (kg)	Weight (N)
1	0.5	4.91
2	0.36	3.53
3	0.41	4.02
4	0.45	4.41
5	0.5	4.91

To compute the force acting on T_1, the equilibrium equation of summation of forces with respect to the vertical axis is applied.

$$\Sigma F_y = 0$$
$$T_1 + T_2 - W_1 - W_2 - W_3 - W_4 - W_5 = 0$$
$$T_1 + T_2 - 4.91 - 3.53 - 4.02 - 4.41 - 4.91 = 0$$
$$T_1 + T_2 - 21.78 = 0$$
$$T_1 = 21.78 + T_2$$

Since there are two unknowns in the equation, the equilibrium equation of summation of moments about point A is applied to cancel T_1 to have only one unknown, which is T_2.

$$\Sigma M_A = 0$$
$$-W_1(20.58) - W_2(41.16) - W_3(61.74) - W_4(82.32) - W_5(102.9) + T_2(123.48) = 0$$
$$-4.91(20.58) - 3.53(41.16) - 4.02(61.74) - 4.41(82.32) - 4.91(102.9) + T_2(123.48) = 0$$
$$-101.05 - 145.29 - 248.19 - 363.03 - 505.24 + T_2(123.48) = 0$$
$$T_2(123.48) = 1362.8$$
$$T_2 = 11.04N$$

Since T_2 is already known, it can now be substituted to the equilibrium equation of summation of forces with respect to the vertical axis to get T_1.

$$T_1 = 21.78 + T_2$$
$$T_1 = 21.78 + 11.04$$
$$T_1 = 32.79N$$

So, the forces acting at the two angle bars are as follow.

$$T_1 = 32.79N$$
$$T_2 = 11.04N$$

The arrangement of the clothes (wet and dry) that are hung on the clothesline will affect the magnitude of the forces acting on the steel. In the design of the clothesline, the following factors should be considered:

a. Mass of each hanging object
b. Whether the clothes hung are wet or dry
c. Location of the clothesline — if it is screwed to the wall, or two sticks pinned on the ground that is connected by a wire, etc.

The location of the angle bar on the steel pipe depends on the weights supported by the steel pipe. If the weights are hanged symmetrically, then the angle bar is placed at the mid span of the steel pipe to satisfy equilibrium. However, for unsymmetrical loading where the weight at the left is not equal to the weight at the right, the location can be obtained by applying the equation of equilibrium for moments.

F. Studies Related to Drying Laundry

Laundry may be dried indoors rather than outdoors for a variety of reasons including:

- Inclement Weather

- Physical Disability
- Lack of space for a line
- Reduce the damage to fabrics from sun's UV rays.
- Legal restrictions
- To raise the humidity level indoors, and lower the air temperature indoors
- Convenience
- To preserve privacy

Several types of devices are available for indoor drying. A drying rack or clotheshorse can help save space in an apartment, or clothes lines can be strung in the basement during the winter. Small loads can simply be draped over furniture or a shower curtain pole. The drying time indoors will typically be longer than outdoor drying because of the lack of direct solar radiation and the convective assistance of the wind.

The evaporation of the moisture from the clothes will cool the indoor air and increase the humidity level, which may or may not be desirable. In cold, dry weather, moderate increases in humidity make most people feel more comfortable. In warm weather, increased humidity makes most people feel even hotter. Increased humidity can also increase the growth of fungi, which can cause health problems.

An average-sized wash load will convert approximately 4965 kilojoules of ambient heat into latent heat that is stored in the evaporated water, as follows. A typical 4 kg load of laundry can contain 2.2 kg of water, after being spun in a laundry machine. To determine how much heat has been converted in drying a load of laundry, weigh the clothes when they are wet and then again after the clothes have dried. The difference is the weight of the water that was evaporated from them. Multiply that weight in kg by 2,257 kJ/kg, which is the heat of vaporization per kilogram, to obtain the number of kilojoules that went into evaporating the water, or multiply by 0.6250 kWh/kg to get kilowatt-hours. (Note: If the moisture later condenses inside the house, the latent heat will be converted back into ambient heat which could increase the temperature of the air in the room slightly.) To obtain a good approximation of the effect this would have in a particular situation, the process can be traced on a psychometric chart.

Various factors determine the duration of drying and can help to decide rather use a drier or a clothes line

- The environmental temperature - increase of temperature decreases the drying duration
- The environmental humidity - decrease of humidity will decrease the drying duration
- Wind velocity - Sometimes people put a fan near the clothes when drying them indoors
- Direct sun - usually only the external line will be exposed to direct sun, so usually, people put the thickest clothes on the most external line.
- Cloth thickness

Laundry may be dried outdoors when the temperature is well below the freezing point. First, the moisture in the laundry items will freeze and the clothing will become stiff. Then the frost on the clothes will sublimate into the air, leaving the items dry. It takes a long time and it is usually much quicker to dry them indoors; however, indoor drying removes heat from the air so it is a trade-off between speed and energy efficiency.

III. FACTORS DETERMINING THE CHOICE OF MATERIALS

The various factors which determine the choice of material are discussed below.

A. Properties

The material selected must possess the necessary properties for the proposed application. The various requirements to be satisfied can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

a. Physical
b. Mechanical
c. From manufacturing point of view
d. Chemical

The various physical properties concerned are melting point, thermal Conductivity, specific heat, the coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc.

The various Mechanical Properties Concerned are strength in tensile, Compressive shear, bending, torsion and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

The various properties concerned from the manufacturing point of view are,

- Cast ability
- Weld ability
- Surface properties
- Shrinkage

- Deep drawing etc.

B. Manufacturing Case

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

C. Quality Required

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

D. Availability of Material

Some materials may be scarce or in short supply, it then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. The delivery of materials and the delivery date of the product should also be kept in mind.

E. Space Consideration

Sometimes high strength materials have to be selected because the forces involved are high and space limitations are there.

F. Cost

As in any other problem, in the selection of material, the cost of material plays an important part and should not be ignored.

Sometimes factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

IV. COMPONENTS

A. Sheet Metal

Sheet metal is metal formed by an industrial process into thin, flat pieces. It is one of the fundamental forms used in metalworking and it can be cut and bent into a variety of shapes. Countless everyday objects are fabricated from sheet metal. Thicknesses can vary significantly; extremely thin thicknesses are considered foil or leaf and pieces thicker than 6 mm (0.25 in) are considered plate.

Sheet metal is available in flat pieces or coiled strips. The coils are formed by running a continuous sheet of metal through a roll slitter.

The thickness of sheet metal is in the USA commonly specified by a traditional, non-linear measure known as its gauge. The larger the gauge number, the thinner the metal. Commonly used steel sheet metal ranges from 30 gauge to about 7 gauge. Gauge differs between ferrous (iron based) metals and nonferrous metals such as aluminum or copper; copper thickness, for example, is measured in ounces, which represents the thickness of one ounce of copper rolled out to an area of one square foot. In the rest of the world, the sheet metal thickness is given in millimeters.

B. Electric Motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this is the conversion of mechanical energy into electrical energy and is done by an electric generator.

In normal motoring mode, most electric motors operate through the interaction between an electric motor's magnetic field and winding currents to generate force within the motor. In certain applications, such as in the transportation industry with traction motors, electric motors can operate in both motoring and generate or braking modes to also produce electrical energy from mechanical energy.

C. Solar Panel

A solar panel is a device that collects and converts solar energy into electricity or heat. It known as Photovoltaic panels, used to generate electricity directly from sunlight Solar thermal energy collection systems, used to generate electricity through a system of mirrors and fluid-filled tubes solar thermal collector, used to generate heat solar hot water panel, used to heat water. It is energy portal. A solar power technology uses solar cells or solar photovoltaic arrays to convert light from the sun directly into electricity.

Photo voltaics is in which light is converted into electrical power. It is best known as a method for generating solar power by using solar cells packaged in photovoltaic modules, often electrically connected in multiples as solar photovoltaic arrays to convert energy from the sun into electricity. The photovoltaic solar panel is photons from sunlight knock electrons into a higher state of energy, creating electricity.

Solar cells produce direct current electricity from light, which can be used to power equipment or to recharge a battery. A less common form of the technologies is thermos photo voltaic, in which the thermal radiation from some hot body other than the sun is utilized. Photovoltaic devices are also used to produce electricity in optical wireless power transmission.

D. Rain Detector

Rain is a form of precipitation which forms when separate drops of water fall to the Earth's surface from clouds. Not all rain reaches the surface, however; some evaporates while falling through dry air. When none of it reaches the ground, it is called virga, a phenomenon is often seen in hot, dry desert regions. The scientific explanation of how rain forms and falls are called the Bergeron process.

Rain plays a role in the hydrologic cycle in which moisture from the oceans evaporates, condenses into clouds, precipitates back to earth, and eventually returns to the ocean via streams and rivers to repeat the cycle again. There is also a small amount of water vapor that respires from plants and evaporates to join other water molecules in condensing into clouds.

The amount of rainfall is measured using a rain gauge. It is expressed as the depth of water that collects on a flat surface and is routinely measured with accuracy up to 0.1 mm or 0.01 in. It is sometimes expressed in liters per square meter (1 liter/m^2 = 1 mm).

This circuit is designed with two lines are tracked with very short distance. When rain drops fall on this circuit, the track may become a short circuit. It gives the corresponding signal to the related circuit in order to find the rainfall.

E. Blower

A fan heater is a heater that works by using a fan to pass air over a heat source (e.g. a heating element).These heats up the air, which then leaves the heater, warming up the surrounding room. They can heat an enclosed space such as a room faster than a heater without a fan, but, like any fan, create audible noise.

F. Proximity Sensor

A Proximity sensor can detect objects without physical contact. A proximity sensor often emits an electromagnetic field or beam and look for changes in the field. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor requires a metal target.

In capacitive proximity sensors, the sensed object changes the dielectric constant between two plates. A proximity sensor has a range, which is usually quoted relative to water. Because changes in capacitance take a relatively long time to detect, the upper switching range of a proximity sensor is about 50 Hz. The proximity sensor is often found in bulk-handling machines, level detectors, and package detection. One advantage of capacitive proximity sensors is that they are unaffected by dust or opaque containers, allowing them to replace optical devices.

A typical capacitive proximity sensor has a 10-mm sensing range and is 30 mm in diameter. The proximity sensor incorporates a potentiometer to allow fine tuning of the sensing range and can repetitively detect objects within 0.01 mm of the set point. Switching frequency is 10 Hz, and operating temperature range is -14 to 158°F.Conditioning the output of a proximity sensor has always been difficult. Proximity sensor designers must confront linearity, hysteresis, excitation voltage instability, and voltage offset. A proximity sensor that measures current flow between the sensing electrode and the target provides readouts in appropriate engineering units. Usually, one side of the voltage source or oscillator connects to the sensing electrode, and the other side connects to a current-measuring circuit to the target, which generally is a metal part at earth or ground potential.

Probes used with a capacitive proximity sensor have either a flat disc or rectangular sensing element surrounded by a guard electrode that provides electrical isolation between the proximity sensor and its housing. The guard also ensures that the lines of electrostatic field emanating from the probe are parallel and perpendicular to the surface of the proximity sensor.

Capacitance proximity sensor systems can make measurements in 100 µsec with resolutions to 10^{-7} in. (0.001 microns). Probe diameters range from a few thousandths of an inch to several feet for corresponding measurements ranging from thousandths of an inch to several feet.

G. Battery

In our project, we are using secondary type battery. It is the rechargeable type. A battery is one or more electrochemical cells, which store chemical energy and make it available as electric current. There are two types of batteries, primary (disposable) and secondary (rechargeable), both of which convert chemical energy to electrical energy. Primary batteries can only be used once because they use up their chemicals in an irreversible reaction. Secondary batteries can be recharged because the chemical reactions they use are reversible; they are recharged by running a charging current through the battery but in the opposite direction of the discharge current. Secondary, also called rechargeable batteries can be charged and discharged many times before wearing out. After wearing out some batteries can be recycled.

Batteries have gained popularity as they became portable and useful for many purposes. The use of batteries has created many environmental concerns, such as toxic metal pollution. A battery is a device that converts chemical energy directly to electrical energy it consists of one or more voltaic cells. Each voltaic cell consists of two half cells connected in series by a conductive electrolyte.

One half-cell is the positive electrode, and the other is the negative electrode. The electrodes do not touch each other but are electrically connected by the electrolyte, which can be either solid or liquid. A battery can be simply modeled as a perfect voltage source which has its own resistance, the resulting voltage across the load depends on the ratio of the battery's internal resistance to the resistance of the load.

When the battery is fresh, its internal resistance is low, so the voltage across the load is almost equal to that of the battery's internal voltage source. As the battery runs down and its internal resistance increases, the voltage drop across its internal resistance increases, so the voltage at its terminals decreases, and the battery's ability to deliver power to the load decreases.

H. Control Unit

In this, the control unit is used for control the whole assembly. It is an electronic device; the program of the unit is donning by using embedded lab.

Microcontrollers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life more strongly than one can imagine.

Since its emergence in the early 1980's the microcontroller has been recognized as a general-purpose building block for intelligent digital systems. It is finding using diverse area, starting from simple children's toys to highly complex spacecraft.

Because of its versatility and many advantages, the application domain has spread in all conceivable directions, making it ubiquitous. The microprocessor system is implemented with a single chip microcontroller. This could be called microcomputer, as all the major parts are in the IC. Most frequently they are called microcontroller because they are used they are used to perform control functions.

The microcontroller contains a full implementation of a standard MICROPROCESSOR, ROM, RAM, I/0, CLOCK, TIMERS, and also SERIAL PORTS. The microcontroller also called "system on a chip" or "single chip microprocessor system" or "computer on a chip".

A microcontroller is a Computer-On-A-Chip, or if you prefer, a single-chip computer. Micro suggests that the device is small, and controller tells you that the device might be used to control objects, processes, or events. Another term to describe a microcontroller is embedded controller, because the microcontroller and its support circuits are often built into, or embedded in, the devices they control.

I. Working

Our project uses a combination of the Rain sensor, Light sensor and Temperature sensor. We feed the output values to the above said microprocessor unit (PIC 16F877) which is interfaced to a Arduino kit which contains all the three sensors and after collecting the necessary information from them it is then sent back to the PIC kit and from the results after determining that the weather is raining for sure the microprocessor send signals to a control unit which is a slave unit to the main master microprocessor which in turn actuates the DC motor.

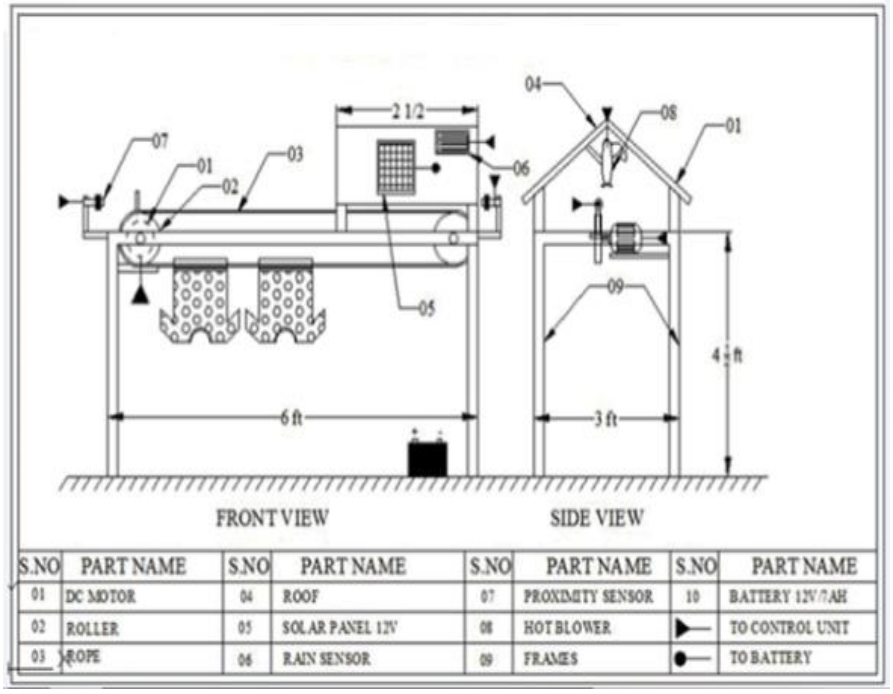

Figure 3 Block Diagram

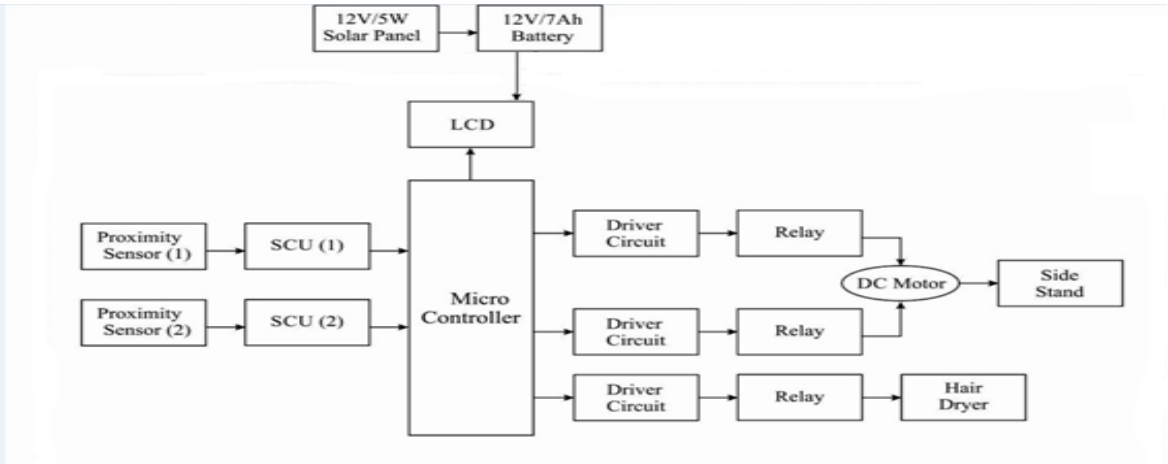

Figure 4 Assembly Drawing

One very common thing in electronics is the need for two intelligent devices to communicate with each other. When you first see a PIC and Arduino you might think that they are two different systems and don't share much in common. In fact, the AVR and the PIC microcontrollers have many of the same types of hardware modules and some they follow the exact same protocols for communication. The communication between PIC 16F877 will be handled by a serial communication transmitter and receiver. The transmitter will always transmit a specific 'idle' command until a button is pressed, which will tell the transmitter to transmit an 'active' command to the receiver.

The DC motor which is powered by either powered by AC power source which is rectified to DC after using a diode circuit or a Battery which will be provided with the whole project kit. Being a battery which is basically available only in 12V we have to increase the voltage to an upper value which is closer to the working voltage of the provided motor for proper operation using an electrical step-up transformer circuit board. Another advantage of this project is that the provided battery is continuously charged by solar panels which are placed above the roof.

CONCLUSION

Scientifically the solar panel converts sunlight into electricity to charge the battery. Thus, one advantage is that the battery life is continuous and replenish able as long as the solar panel is working. The photocell, however, detects sunlight causing what is called the photoelectric effect and its resistance is varied depending on its exposure to sunlight. This determines the flow of electric current in the circuit.

When the battery is charged by the solar panel through the solar controller, it provides power to the motor which will operate the pulley and reel the clothes in. In another condition where the photocell is exposed to sunlight, the resistance is approximately and currently is able to flow to the relay to move the electromagnet. This is why under hot sunlight; the clothes will remain under the sun to dry until the sun is gone

This project is advantageous towards the environment and also for us. It is good for the environment because of its solar energy source. We, on the other hand, are able to go out and leave our clothes out in the open without the constant worrying that our clothes might get drenched or so on. For example, even if it starts to rain, we no longer need to rush home for our clothes will be in safe hands.

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