



Faculty of Computer Science and Information Technology

**WEATHER DETECTION (SUNNY/RAINY DAY)
AUTOMATED GARMENT DRYING RACK**

Asylvester Anak John Juan

**Bachelor of Computer Science with Honours
(Multimedia Computing)
2015**

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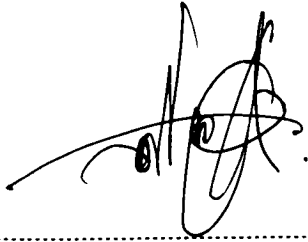
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Faculty Computer Science and Information Technology
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ABSTRACT

Automated concepts are now growing rapidly in many industries, as it great potential in improving modern lifestyle especially in smart home development. Furthermore, many levels of industries are highly recommended to inject high level of environmental-friendly, energy efficient and sustainable practice. Based on the guidelines of these features, taking advantages of the nature energy source and results in zero pollution is the ultimate goal. Besides than that, less human efforts for the practicalities, cost efficient for operations is likely to favor targeted market.

The Automated Garment Drying Rack took these initiatives by proposing the ease of use to modern households especially the working women. They can do so many activities in their daily life and the laundries are drying under the sunlight at the same time, even without getting themselves busy looking after their laundries. Plus, they can save a lot with their electricity bills even by using this automated system.

ABSTRAK

Konsep automasi kini semakin berkembang dalam kebanyakan bidang industri, berpotensi tinggi dalam meningkatkan kualiti kehidupan moden terutamanya bidang pemajuan rumah pintar. Tambahan lagi, pelbagai peringkat industri digalakkan untuk menerapkan aspek mesra alam, penggunaan tenaga yang cekap lagi mampan di peringkat yang lebih tinggi. Berlandaskan ciri-ciri ini, menggunakan peluang daripada sumber tenaga alam lantas sifar pencemaran alam adalah pencapaian terunggul. Selain daripada itu, praktikal dalam mengurangkan usaha manusia, kos operasi yang cekap adalah ciri-ciri yang diingini ramai.

Rak Penyidai Pakaian Automatik (Automated Garment Drying Rack) mengambil inisiatif tersebut dengan mengetengahkan sifat senang diguna kepada isirumah moden terutamanya wanita bekerjaya. Mereka mampu melakukan pelbagai aktiviti harian di samping menjemur pakaian di bawah sinaran matahari pada masa yang sama, walhal tanpa menjaga pakaian yang dijemur tersebut. Tambahan lagi mereka mampu untuk berjimat bil elektrik walaupun menggunakan sistem automasi ini.

TABLE OF CONTENTS

Declaration	ii
Acknowledgement.....	iii
Abstract	iv
Abstrak	v
Table of Contents	vi - viii
List of Tables.....	ix
List of Figures	x - xii
Abbreviation.....	xiii - xiv
Chapter 1: Introduction	1 - 9
1.1 Background.....	1
1.2 Problem Statement.....	2
1.3 Objectives	2
1.4 Methodology.....	3
1.4.1 Preliminary Consideration.....	4
1.4.2 Selection of Implementation Platform	4
1.4.3 Selection of Hardware Components.....	5
1.4.4 System Design.....	5
1.5 Project Scope and Limitation	8
1.6 Significant of the Project	8
Chapter 2: Literature Review	10 - 28
2.1 Introduction	10
2.2 Analysis of Women Labour Force in Malaysia, 2013	10
2.3 Malaysia's General Climate	11
2.3.1 Wind Flow.....	12
2.3.2 Rainfall Distribution.....	12
2.3.3 Sunshine	16
2.3.4 Evaporation	17
2.4 Methods and Technology Used in Garment Drying.....	17
2.4.1 Primitives Garment Drying Techniques.....	18
2.4.2 Mrs. Pegg's Handy Line.....	19

2.4.3	Clever Closeline	21
2.4.4	TRENDY Clothesline	22
2.5	Comparison.....	24
2.5.1	Strengths Discovered.....	25
2.5.2	Weaknesses Discovered	26
2.6	Proposed System.....	27
2.7	Summary.....	28
Chapter 3:	System Designs and Requirements	29 - 54
3.1	Introduction	29
3.2	Project's Work Flow.....	29
3.2.1	Phase 1: Planning / Proposing.....	29
3.2.2	Phase 2: Problems Analyzing.....	30
3.2.3	Phase 3: System Designs and Requirements.....	30
3.2.4	Phase 4: Development and Testing	31
3.2.5	Phase 5: Evaluation	31
3.3	System Architectures and Requirements.....	32
3.3.1	Hardware Components.....	37
3.3.2	Software Program.....	51
3.4	Summary.....	53
Chapter 4:	Development and Implementation	55 - 73
4.1	Introduction	55
4.2	Parameter for sensors.....	55
4.2.1	Rain Detection.....	56
4.2.2	Sunlight luminosity	57
4.2.3	Temperature	58
4.3	Prototype development.....	59
4.3.1	Hardware components.....	60
4.3.2	Software program	62
4.3.3	Integration of Automated system and physical rack	68
4.4	Prototype testing	71
4.4.1	Unit testing	72
4.4.2	System testing	73
4.5	Summary.....	73

Chapter 5: Evaluation and Conclusion.....	74 - 79
5.1 Introduction	74
5.2 Project's evaluation	74
5.3 Project's limitation	75
5.4 Project's future work	77
5.5 Project's Cost.....	78
5.6 Summary.....	79
References	80 - 82
Appendices	83 - 100
<i>Appendix A. Weight limit experiment</i>	<i>83</i>
<i>Appendix B. System testing.....</i>	<i>84 - 87</i>
<i>Appendix C. User's Manual</i>	<i>88</i>
<i>Appendix D. Source Code</i>	<i>89 - 98</i>
<i>Appendix E. Temperature and light sensor data logging.....</i>	<i>99 - 100</i>

LIST OF TABLES

<i>Table 2.1: Summary of climate statistics in Malaysia, 2012</i> ^[15]	11
<i>Table 2.2: Comparison summary over products and methods.</i>	24
<i>Table 2.3: Proposed system of Automated Garment Drying Rack.</i>	27
<i>Table 3.1: The Arduino UNO R3's specifications summary.</i> ^[19]	38
<i>Table 3.2: Pin allocations for the Arduino UNO R3.</i>	40
<i>Table 3.3: Environment condition and luminous flux value estimation.</i> ^[14]	41
<i>Table 3.4: Specification's summary of Grove Water Sensor.</i> ^[20]	43
<i>Table 3.5: Specification's summary of Bipolar Stepper Motor.</i> ^[21]	44
<i>Table 3.6: Feature's summary of Spark Fun EasyDriver v4.5.</i> ^[22]	46
<i>Table 3.7: Specifications of Solar Panel (5.5v 450m)</i> ^[26]	48
<i>Table 3.8: Specifications of Solar Lipo Charger (3.7V)</i> ^[27]	49
<i>Table 3.9: Features of LiPower Boost Converter</i> ^[28]	50
<i>Table 3.10: Specifications of 3.7V Polymer Lithium Ion Battery - 1000mAh</i> ^[29]	51
<i>Table 4.1: Environment condition and its luminous flux value estimation.</i> ^[33]	57
<i>Table 4.2: Categories of Hardware Components.</i>	60
<i>Table 4.3: Libraries included.</i>	62
<i>Table 4.4: Define components data pin.</i>	63
<i>Table 4.5: Variables and description.</i>	63
<i>Table 4.6: Function block and description.</i>	64
<i>Table 4.7: System's binary state.</i>	65
<i>Table 4.8: Prototype's unit testing.</i>	72
<i>Table 5.1: Project's Cost</i>	78

LIST OF FIGURES

<i>Figure 1.1: Sunny day (high temperature, no rain detected), the Automated Garment Drying Rack will automatically slides out from shades to receive optimum direct sunlight.</i>	6
<i>Figure 1.2: Cloudy day (low temperature, no rain detected), the Automated Garment Drying Rack will remain outdoors.</i>	6
<i>Figure 1.3: Rainy day (rain droplets detected), the Automated Garment Drying Rack will automatically slides back under the shades to prevent laundry getting wet.</i>	7
<i>Figure 1.4: Night (low temperature, no light detected), the Automated Garment Drying Rack will automatically slides back under the shades.</i>	7
<i>Figure 2.1: Total rainfall in Malaysia, 2008-2013. ^[5]</i>	14
<i>Figure 2.2: Total number of rainy days in Peninsular Malaysia, 2011 and 2012. ^[5]</i>	15
<i>Figure 2.3: Total number of rainy days in Sarawak, 2011 and 2012. ^[5]</i>	15
<i>Figure 2.4: Total number of rainy days in Sabah, 2011 and 2012. ^[5]</i>	16
<i>Figure 2.5: Laundries hanged on the primitive clothesline under the bright sunlight.</i>	18
<i>Figure 2.6: Laundry on the primitive clothesline soaked in rain.</i>	19
<i>Figure 2.7: Mrs. Pegg's Handy Line is ready to hang clothes. ^[6]</i>	20
<i>Figure 2.8: Mrs. Pegg's Handy Line is foldable for easy storage and saves space. ^[6]</i>	20
<i>Figure 2.9: Clever Closeline with hanged laundries. ^[7]</i>	21
<i>Figure 2.10: Cover the laundries within its parameter. ^[7]</i>	21
<i>Figure 2.11: Draw-out its roof cover when rain droplets detected. ^[7]</i>	21
<i>Figure 2.12: A ceiling-mounted TRENDY Clothesline. ^[8]</i>	23
<i>Figure 3.1: The Automated Garment Drying Rack's system architecture and its components.</i>	32
<i>Figure 3.2: The Automated Garment Drying Rack's process workflow.</i>	34
<i>Figure 3.3: Function sleep mode enable (left) and sleep mode disable (right).</i>	35
<i>Figure 3.4: Function slide out rack (left) and slide in rack (right).</i>	35
<i>Figure 3.5: An Arduino UNO R3. ^[9]</i>	39
<i>Figure 3.6: Arduino UNO R3 pin-out diagram. ^[10]</i>	39
<i>Figure 3.7: Photo-Conductive Cells Light Sensor. ^[14]</i>	40
<i>Figure 3.8: Photo-Conductive Cells Light Sensor Characteristic. ^[16]</i>	41

<i>Figure 3.9: TMP36 Temperature</i>	42
<i>Figure 3.10: TMP36 block diagram.</i> ^[18]	42
<i>Figure 3.11: A Grove Water Sensor module.</i> ^[20]	43
<i>Figure 3.12: A bipolar stepper motor.</i> ^[21]	44
<i>Figure 3.13: A Spark Fun EasyDriver v4.5.</i> ^[22]	45
<i>Figure 3.14: The wiring diagram of stepper motor and Spark Fun EasyDriver v4.5</i> ^[23]	46
<i>Figure 3.15: A 16 x 2 Character LCD Display</i> ^[24]	47
<i>Figure 3.16: The connection diagram of Arduino UNO R3, LCD and potentiometer.</i> ^[25]	47
<i>Figure 3.17: Solar Panel (5.5v 450m)</i> ^[26]	48
<i>Figure 3.18: Solar Lipo Charger (3.7V)</i> ^[27]	49
<i>Figure 3.19: LiPower Boost Converter.</i> ^[28]	50
<i>Figure 3.20: 3.7V Polymer Lithium Ion Battery - 1000mAh</i> ^[29]	51
<i>Figure 3.21: A screenshot of Arduino IDE programming.</i> ^[30]	53
<i>Figure 4.1: The daily number of hourly observed precipitation reports during the last 12 months, color coded according to precipitation type, the categories are thunderstorms (orange); heavy, moderate, and light rain (dark to light green); and drizzle (lightest green). The bar at the top of the graph is green if any precipitation was observed that day and white otherwise.</i> ^[31]	56
<i>Figure 4.2: The full year of hourly present weather reports with the days of the year on the horizontal and the hours of the day on the vertical. The color-coded categories are thunderstorms (orange); heavy, moderate, and light rain (dark to light green); drizzle (lightest green); fog (gray); and haze (brownish gray).</i> ^[31]	56
<i>Figure 4.3: The solar day over the course of the year 2012. From bottom to top, the black lines are the previous solar midnight, sunrise, solar noon, sunset, and the next solar midnight. The day, twilights (solar, civil, nautical, and astronomical), and night are indicated by the color bands from yellow to gray.</i> ^[31]	57
<i>Figure 4.4: The daily low (blue) and high (red) temperature during the last 12 months, November 2014-October 2015.</i> ^[31]	58
<i>Figure 4.5: The last 12 months of hourly temperature. The hourly temperature measurement is color coded temperature bands: comfortable is yellow (65°F to 75°F), warm is light red (75°F to 85°F), hot is medium red (85°F to 100°F), sweltering is dark red (above 100°F).</i> ^[31]	59
<i>Figure 4.6: The prototype's component assembly</i>	61
<i>Figure 4.7: The logical state change</i>	66
<i>Figure 4.8: Small scale model of the Automated Garment Drying Rack.</i>	69

Figure 4.9: Over-head wall-mount rails for better ground clearance. Trolley wheels roll above rails & the rack is underneath the rails. These two components are attached together with a bracket. Limit-in (right) and limit-out (left) switch will stop rack from sliding at end of rail. 69

Figure 4.10: Microcontroller and other components are packed in a console box. LCD display, push buttons, auto mode LED indicator as the user input/output interface, temperature sensor and light sensor as the system input are placed at the console's front cover. 70

Figure 4.11: Limit-out switch (left) and limit-in switch (right) placed at the end of each rails. 70

Figure 4.12: Solar panel and water sensor are placed at the top of the shades (roof). 71

Figure 4.13: Bipolar stepper motor rotates the sprocket at inner end (left) and another dummy sprocket at the outer end (right). This pulley system will pull the chain that was attached together with the moving rack. 71

Figure 5.1: Household room temperature reader 76

ABBREVIATION

FYP	:	Final Year Project
DIY	:	Do-it-yourself
UV	:	Ultraviolet
LED	:	Light Emitting Diode
LCD	:	Liquid Crystal Display
SRAM	:	Static Random Access Memory
EEPROM	:	Electrically Erasable Programmable Read Only Memory
AVR	:	Alf (Egil Bogen) and Vegard (Wollan)'s RISC (aka Advanced Virtual RISC)
AC	:	Accumulate Current
DC	:	Direct Current
ADC	:	Analog Digital Converter
LDR	:	Light Dependent Resistor
V	:	Volt
mV	:	millivolt
W	:	Watt
°C	:	Degrees Celsius
°F	:	Degrees Fahrenheit
Lx	:	Lux
PWM	:	Pulse Width Modulator
MHz	:	Megahertz
I/O	:	Input/Output
A	:	Amp
mA	:	milliamp
KB	:	kilobyte
Ω	:	Ohm

kΩ	:	kilo Ohm
kg	:	kilogram
g	:	gram
N	:	Newton
in	:	inch
mm	:	millimeter
cm	:	centimeter
oz	:	ounce
kg.cm	:	kilogram per centimeter
UVLO	:	Undervoltage Lockout
VIN	:	Voltage In
GND	:	Ground
MS	:	Micro Stepping
JST	:	Japan Solderless Terminal
IDE	:	Integrated Development Environment
mAh	:	Milliamp hours
M-M	:	Male-Male wire jumper pin
F-M	:	Female-Male wire jumper
F-F	:	Female-Female wire jumper

CHAPTER 1: INTRODUCTION

1.1 Background

In pursuing eco-friendly lifestyle and easing the households in the effort of drying their daily laundry, an automated garment drying rack and nature sunlight is the major idea for this Final Year Project. This simple automated system is believed to be revolutionized the way of the household doing their daily laundry. This system will sense the sunny day and the rainy day, then response automatically to the weather directly. Go out from the shades when it is sunny day. Go back under the shades when it is raining or night. Furthermore, solar powered electrical appliances are as energy efficient and sustainable as it harnesses the nature sunlight as its power source.

The drying rack will be under the house's shades at the initial state. It will sense its environment weather continuously. When sunlight detected, the rack will automatically come out from the shades and remain outdoor as long as sunlight was detected. It will return to the shades when no sunlight was detected and remain as long as no sunlight was detected.

When it is raining (rain droplets detected), and the drying rack are away from the shades at the state, it will return to the shades and remain as long as the rain droplets detected. When the rain has stop, and the sun come out (sunlight detected), the drying rack will come out from the shades again otherwise the rain has stop and there is no sunlight (cloudy), the drying rack will remain its state under the shades because there is no enough heat. This is because there is no point for the drying rack to be outdoors when there is no sunlight to dry the laundry.

1.2 Problem Statement

Everyday households need to do their laundry. This is no exception for bachelor because we wear our cloths all the time. Thus, households need to do the laundry cleaning either at home or the laundry shop. After the laundry washed, we need to dry the laundry before to be used. How did we dry our laundry? Normally, we prefer to dry our laundry outdoor, under the bright sunny day. Why we need to dry our laundry under the sunlight? By instinct, we know it will takes shorter time for the laundry to dry under the sun because of the heat. In fact, science proves that heat will turn the liquid water on the wet laundry into the vapor and disappears into the air. Secondly, we felt that our dried laundry under the sunlight to be more fresh and clean compare with dries slowly indoor which tend to dry improperly and with undesirable smells like odor as well.

Today, most of the household are too busy with their daily routine. Even both husband and wife are working and their reliable children to watch over the laundry were at school and other family members may be busy with their own activity. This situation caused the household do not have the opportunity to dry their laundry under the sunlight.

On the other hand, most of electrical appliances require electricity to operate and this will cost the user electricity bills. In the long term operations, the user will feel the burden of using the appliances from paying the costly electricity bills.

1.3 Objectives

In the tandem of improving modern lifestyle and practicing environmental-friendly awareness, an Automated Garment Drying Rack is the main objectives of this Final Year Project. It is one of the home automation inspirations. It will constantly sense the surrounding

weather changes (sunny/rainy day) and respond accordingly to it. Let the laundry out from the shades when it is sunny day and get back to the shades when it is rainy day. At the same time, harness the sunlight energy and store it into a battery pack as the system power source.

By improving modern lifestyle, this system will ease the user by saving their efforts, time and money. Hence, it will bring them peace in mind about their drying laundry and electricity bills. This will also let the user have more quality time for other activities other than worry about the weather and their laundry outdoor.

This automated garment drying rack is taking steps in approaching the environmental-friendly awareness by taking advantage of the nature sunlight, heat from the sunlight to dry the laundry naturally as well as a solar powered innovation. Dries the wet laundry dries naturally and recharged the battery at the same time.

To make it in simple words, this Automated Garment Drying Rack gain triple benefits by taking advantages of the natural sunlight for drying the laundries, solar powered system and furthermore, put the user in ease by bringing their drying laundry back to the shades in the event of raining. Thus, improving modern lifestyle, practicing eco-friendly, sustainable and energy efficient at the same time is very much promising.

1.4 Methodology

In the work of concept, designing and developing this garment drying automation system, more than one platform is used to create a usable and reliable system. It is also crucial to take into account that this system is installable and adaptable to most of the house compound. For this reason, it is necessary to make pre-cautions decision in the selection of

platforms, hardware components and mode of operations of the automated garment drying rack as well as the design of the garment rack itself.

1.4.1 Preliminary Consideration

Prior to the actual design of the prototype started, selection of the appropriate implementation of the specific platforms and hardware are vital. Cost affordability, components availability, reliability, flexibility, practicality, simplicity and programmability are criteria that given the priority. Proper selections of these components are crucial to avoid wastage in cost and time of development.

On the other hand, it will increase the prototype's practicality in daily usage, promoting eco-friendly, sustainable and energy efficient at the same time. This eventually will result an effective and efficient modern lifestyle, and of course save user's electricity bills for long term operations.

1.4.2 Selection of Implementation Platform

For this automated prototype, a microcontroller is used as the most suitable platform. Microcontroller is used due to its programmable criteria and it can be bought at an affordable price. It is also become a platform to integrate all the sensors needed and a motor to move the rack in and out.

1.4.3 Selection of Hardware Components

There are quite a number of microcontrollers available in today market such as Arduino, Raspberry PI, Nanode, BeagleBone and others. For this Automated Garment Drying Rack project, Arduino is selected as it microcontroller. The main reason of this selection is because of its availability in Malaysia's microcontroller market with reasonable price. In addition, its sources are easily available and this will contribute to development progress.

1.4.4 System Design

The Automated Garment Drying Rack basically require Arduino UNO R3 as the microcontroller, light sensor to detect sunlight existence, temperature sensor to measure heat of the sunlight, a water sensors to detect any rain droplets and a bipolar stepper motor to move the garment drying rack. Solar panel will harness the sunlight energy. A connected charger will then store the harnessed energy into a battery pack to power the Arduino UNO R3. Switches are used as input controllers for user's option for auto or manual mode.

These electronic components are integrated to the physical garment rack itself to become a complete system especially the motor which is attached to the rack itself is to moves the rack in bidirectional ways. The trolley wheels are spinning along the rails which are over-head mounted. This is to provide spacious ground clearance below the rack as well as to prevent the motor from getting wet because of the dripping wet laundry.

The basic illustration of a complete prototype is as follows:

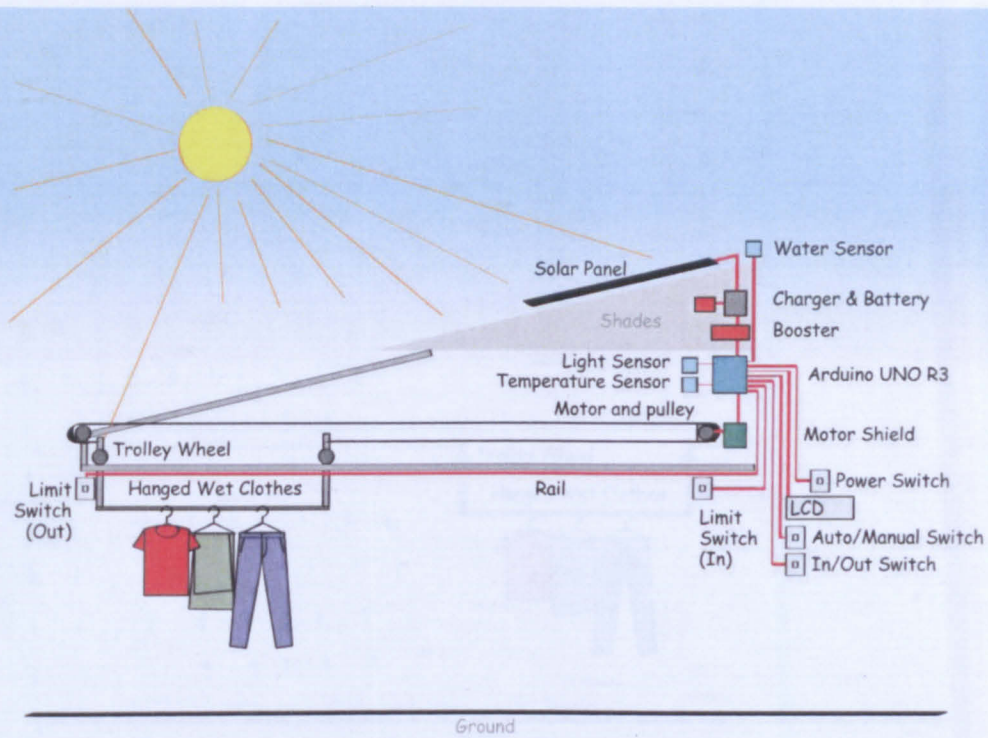


Figure 1.1: Sunny day (high temperature, no rain detected), the Automated Garment Drying Rack will automatically slides out from shades to receive optimum direct sunlight.

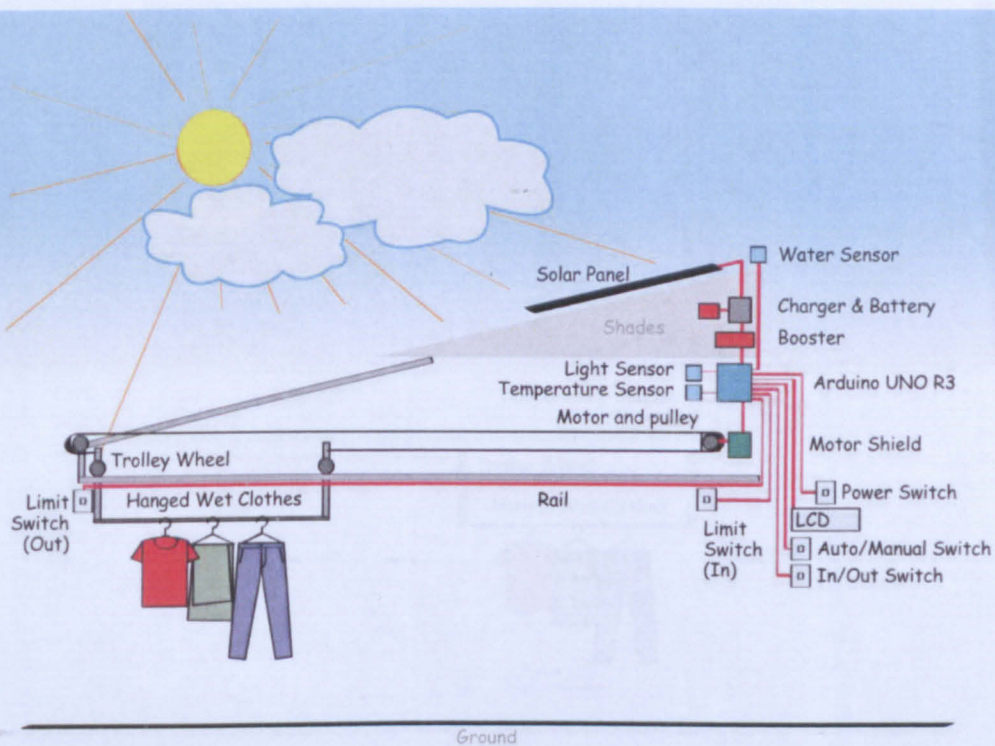


Figure 1.2: Cloudy day (low temperature, no rain detected), the Automated Garment Drying Rack will remain outdoors.

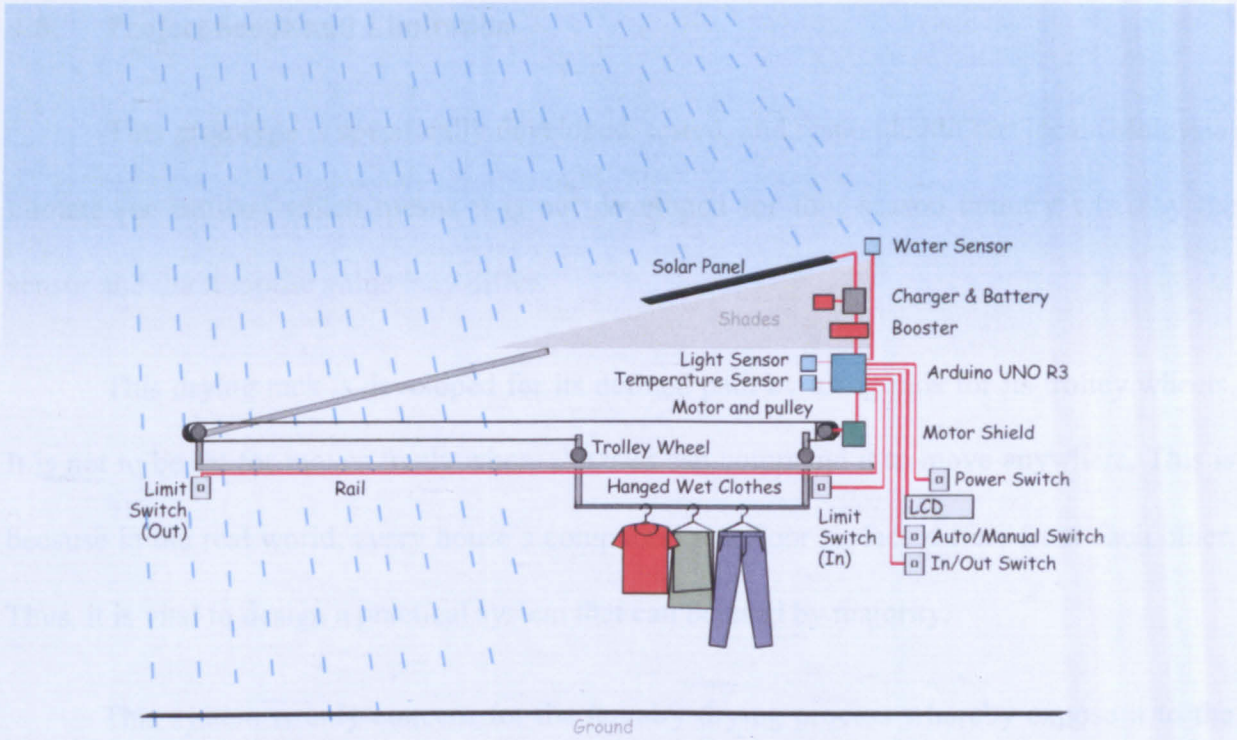


Figure 1.3: Rainy day (rain droplets detected), the Automated Garment Drying Rack will automatically slides back under the shades to prevent laundry getting wet.

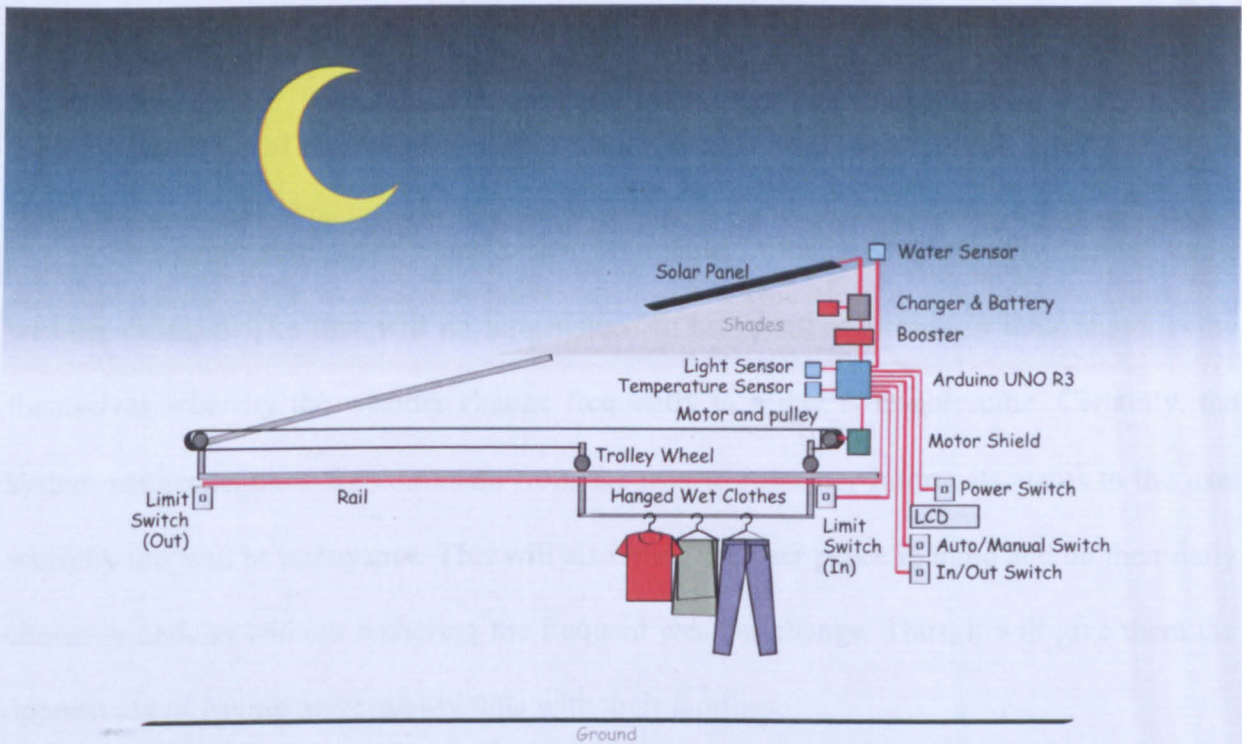


Figure 1.4: Night (low temperature, no light detected), the Automated Garment Drying Rack will automatically slides back under the shades.

1.5 Project Scope and Limitation

This prototype is specifically developed, tested, and responded to our local (Malaysia) climate (or similar) which means it is not developed for four season country whereby the sensor and the response value may differ.

This drying rack is developed for its defined path by using rails for its trolley wheels. It is not to be set for moves freely where the user can command it to move anywhere. This is because in the real world, every house's compound and floor surface differs from each other. Thus, it is vital to design a practical system that can be used by majority.

This system is only concern for the laundry drying process whereby expose it to the direct sunlight and get it way from the rain. It is not developed for taking in charge of the whole process of the laundry cleaning such as wash, hang to the rack and remove from rack when it is dry.

1.6 Significant of the Project

This automated system helps to save households' time by automatically respond to the weather changes. The user will no longer need to bring out and bring in their laundries by themselves whereby the weather change frequently in a day is troublesome. Certainly, the system neither requires the command from the user to react nor inform its status to the user whereby this will be annoyance. This will also bring the user peace in mind and do their daily chores or activity without bothering the frequent weather change. Thus, it will give them the opportunity of having more quality time with their families.