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Settlement of Lands System Using Laser Technology

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Abstract: ***The theme of this paper is to redesigning the settlement and flattening farmland using electromechanical system depend on Laser technology. This project aims to flattening the target farmland with specific inclination and high accuracy contain of four units (Control Box – Receiver Unit – Transmitter Unit – Hydraulic system Unit) .In this paper we will focus on two units (Control Box Unit and Receiver Unit) because the most failures occurs in this two units, so we offer to design a new efficient system suitable with our environment to providing maintenance centers for all locations where the system is required.***
Keywords: ATMEGA32, LED, Relay 12V DC, REGULATER LM7805, ULN2003A DRIVER, PHOTOTRANSSTOR, Control Box Unit, Receiver Unit.

I. INTRODUCTION

It is an integrated electronic mechanical system designed to make the settlement and flattening of the target farmland with high accuracy processing in addition to providing the ability to specify the desired inclination of the land.
System components:

A. Transmitter Unit

This unit is concerned with sending a laser beam with a certain power and distance, laser transmitter installed on a rotary DC Motor which can rotate 360 degree with adjustable inclination and speed.

B. Receiver Unit

This unit is concerned with receiving the laser beam by matrix of the PHOTOTRANSISTER sensors to determine the height or low the ground comparing with the reference point then sending the digital signals to the control unit.

C. Control Box Unit

This unit is concerned with receiving the digital signals from the receiver unit, which determines the levels of the ground comparing with the reference point and then control the hydraulic system unit to work on cutting or filling the agricultural land to reach for the required level.

D. Hydraulic System Unit

This unit is concerned with cutting or filling of the agricultural land until to reach for the inclination and desired level.

Figure 1: Settlement of Lands System Using Laser Technology

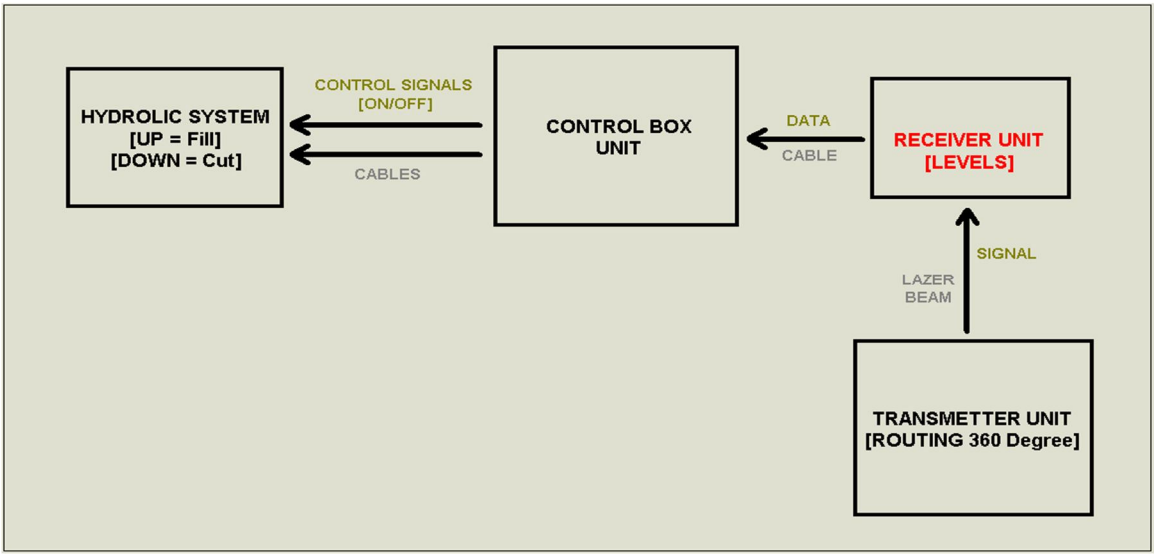


Figure 2: The Sequence Process of Complete System

The Settlement of lands project was regard as the most private engineering irrigation techniques because the benefits which can be provide through this project as the following points:

1) The most important strategic projects locally and internationally.
2) Ensure the provision of large amounts of water wasted up to 30%.
3) Contributes to reduce the employment used in the control of irrigation operations.
4) Improvement and raise the production rate for the land as a result of the arrival of water to all parts of the ground target.
5) The effectiveness of the settlement process will continue for 3 years at least.

II. RELATED STUDIES

The fundamental purpose of this paper is to solve all the problems which occur in both of (Control Box Unit and Receiver Unit) for the old system, that because the imported system is not compatible with the environment in Sudan (Temperatures and Dust).So the system must be redesigning to be compatible and efficient.

III. METHODOLOGY

Through this paper the pursuing types of procedures and steps were considered

A. Accumulating the software.
B. Compiling the code using Bascom Compiler.
C. Running PROTEUS simulator for (Control Box Unit and Receiver Unit).
D. Hardware design for (Control Box Unit and Receiver Unit).
E. Evaluation of PROTEUS simulator results from experimental test.
F. Usng the evaluatong Board kit (EASY AVR V7).
G. Printed Circuit Board Design for (Control Box Unit and Receiver Unit).
H. Prototype Design for (Control Box Unit and Receiver Unit) with casing.

IV. REQUIREMENTS OF CONTROL BOX UNIT AND RECEIVER UNIT DESIGN

A. ATMEGA32 Microcontrollers

ATmega32 is an 8-bit microcontroller High-performance, Low-power of Atmel's Mega AVR family which is based on enhanced Advanced RISC (Reduced Instruction Set Computing) architecture with 131 strong instructions. Instructions execute in one machine cycle. Atmega32 can work on a maximum frequency of 16MHz. [1, 2 and 3].

Figure 3: ATMEGA32

B. Light-emitting Diode (LED)

The Light emitting diode is a two-lead semiconductor light source. In 1962, Nick Holonyak has come up with an idea of light emitting diode, and he was working for the general electric company. This device emits visible light when an electric current passes through it. The light is not particularly bright, but in most LEDs it is monochromatic, occurring at a single wavelength. The output from an LED can range from red (at a wavelength of approximately 700 nanometers) to blue-violet (about 400 nanometers). Some LEDs emit infrared (IR) energy (830 nanometers or longer); such a device is known as an infrared-emitting diode (IRED). The LED is a special type of diode and they have similar electrical characteristics of a PN junction diode. Hence the LED allows the flow of current in the forward direction and blocks the current in the reverse direction. The LED occupies the small area which is less than the 1 mm2. [4, 5]

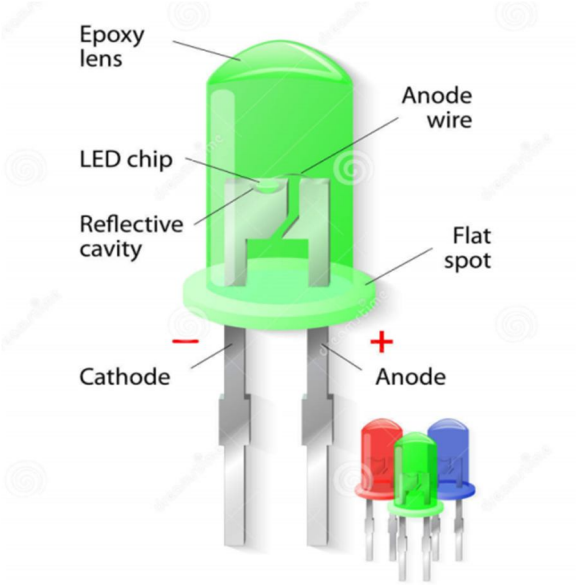


Figure 4: LED

C. Relay 12V DC

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. In this project we use DIP-2C Relay 12V DC [6, 7]

Figure 5: Relays

D. Regulater LM7805

The voltage regulator IC 7805 is actually a member of 78xx series of voltage regulator ICs. It is a fixed linear voltage regulator. The xx present in 78xx represents the value of the fixed output voltage that the particular IC provides. For 7805 IC, it is +5V DC regulated power supply. This regulator IC also adds a provision for heat sink. The input voltage to this voltage regulator can be up to 35V and this IC can give a constant 5V for any value of input less than or equal to 35V which is the threshold limit. [8]

Specification: [9]

1) 3-Terminal Regulators.
2) Output Current up to 1.5 A.
3) Internal Thermal-Overload Protection.
4) High Power-Dissipation Capability.
5) Internal Short-Circuit Current Limiting.
6) Output Transistor Safe-Area Compensation.

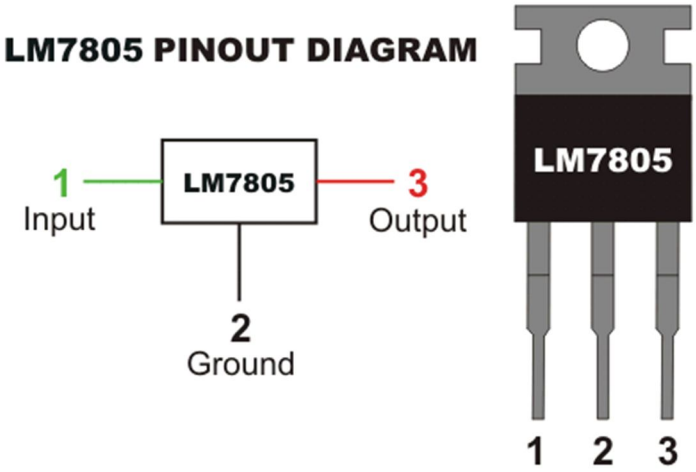


Figure 6: REGULATER LM7805

E. Uln2003a Driver

The ULN2003A is an array of seven NPN Darlington transistors capable of 500 mA, 50 V output. It features common-cathode flyback diodes for switching inductive loads. [10, 11]

Figure 7: ULN2003A DRIVER

F. Phototransstor

The phototransistor can be used in a variety of circuits and in a number of ways dependent upon the application. Being a low cost device the phototransistor is widely used in electronic circuits and it is also easy to incorporate. The phototransistor symbol for use in electronic circuit diagrams is very straightforward. It is formed from the basic transistor symbol with arrows point in to it to indicate that it is light sensitive. [12]

Required specification: [13]

1) Spectral range of sensitivity: (typ) 740 ... 1100 nm.
2) Package: 3mm Radial (T 1), Epoxy.
3) Special: high photosensitivity.

Figure 8: PHOTOTRANSSTOR

V. CONTROL BOX UNIT DESIGN

This unit consists of two main parts

A. Main Control Processing Unit

This unit is regard as the mind controller over all the logical processes at the whole system. . It reads all data from the receiver unit and then gives the control decision for the hydraulic system unit and the display unit.

This unit works in two modes

1) Manual mode: In this mode the hydraulic unit be controlled by a joystick up or down.
2) Auto mode: In this mode the hydraulic unit be controlled by the signals received from the receiver unit (UP - DOWN - STOP).

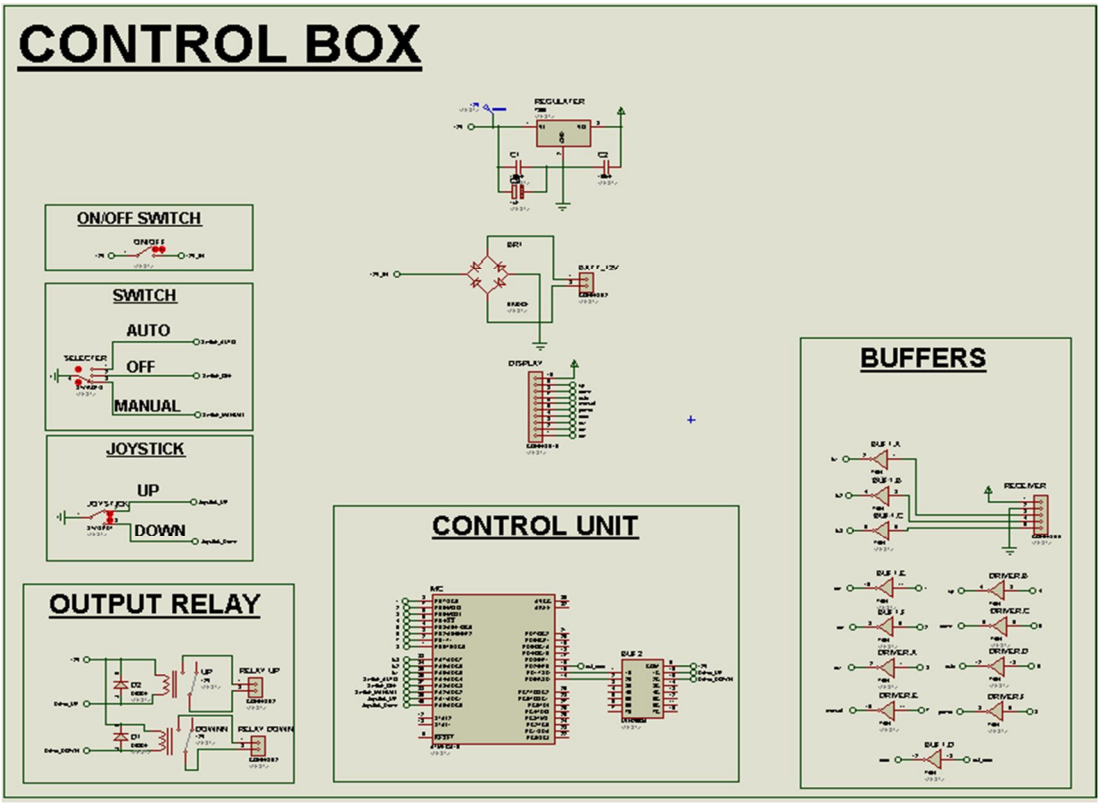


Figure 9: The Main Control Processing Unit Schematic

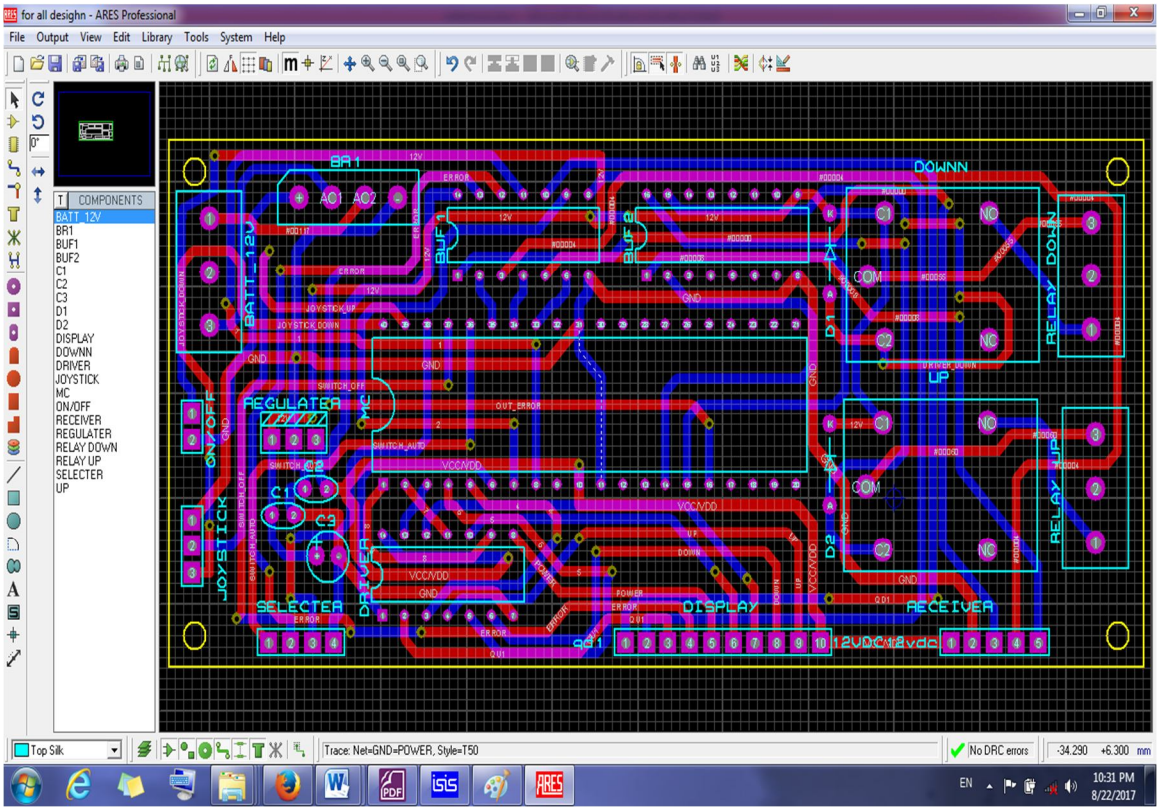


Figure 10: Wiring of the Main Control Processing Unit

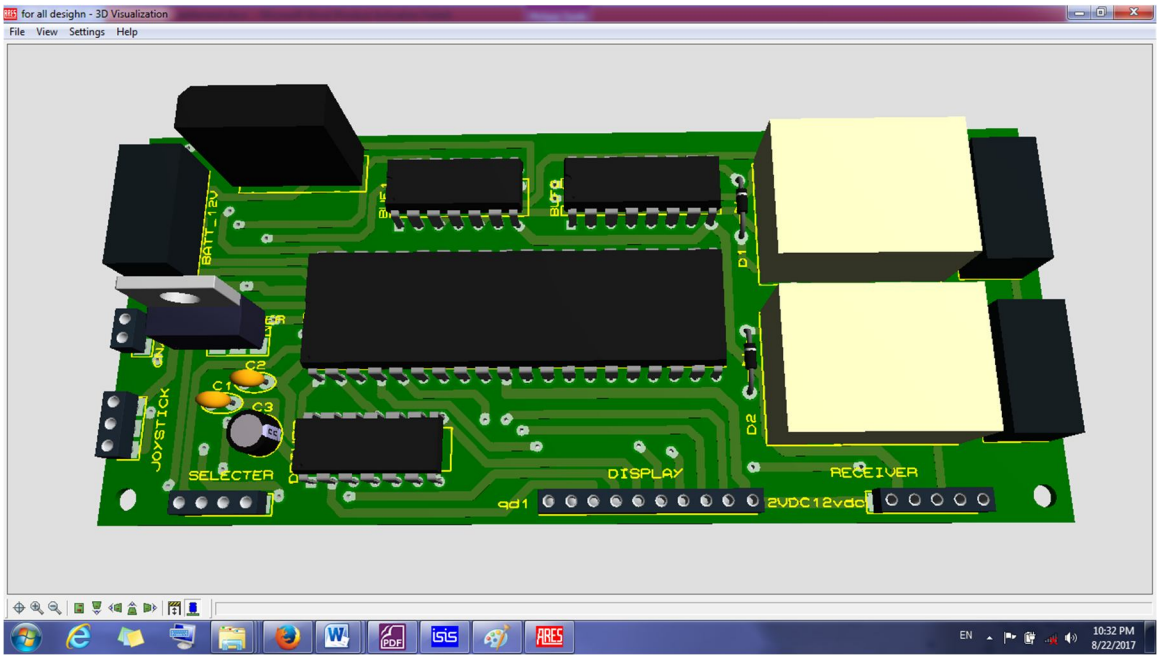


Figure 11: 3D PCB View of the Main Control Processing Unit

B. Display unit

This unit is concerned with display all the internal cases of the system by displaying them in a group of Light Emitting Diode for the driver of the agricultural machinery, Represented in the following:

1) System Work Mode (AUTO / MANUAL).
2) The level of the Scrapper (UP / DOWN).
3) The error signal in case of interruption of communication between the transmitter and the receiver.

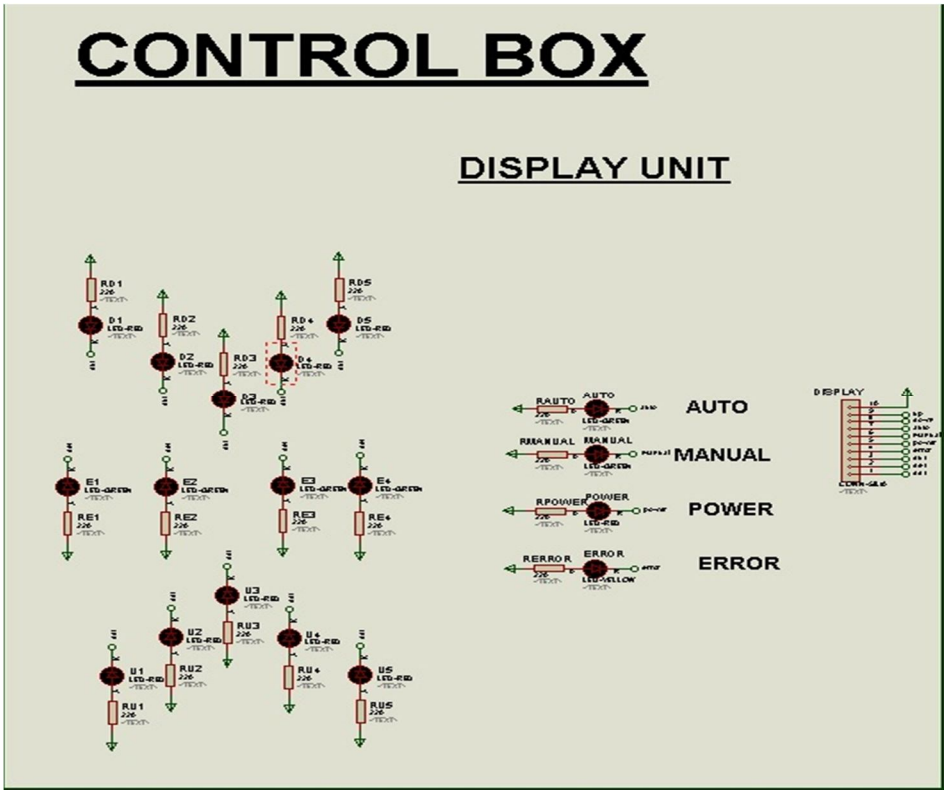


Figure 12: The Display Unit Schematic

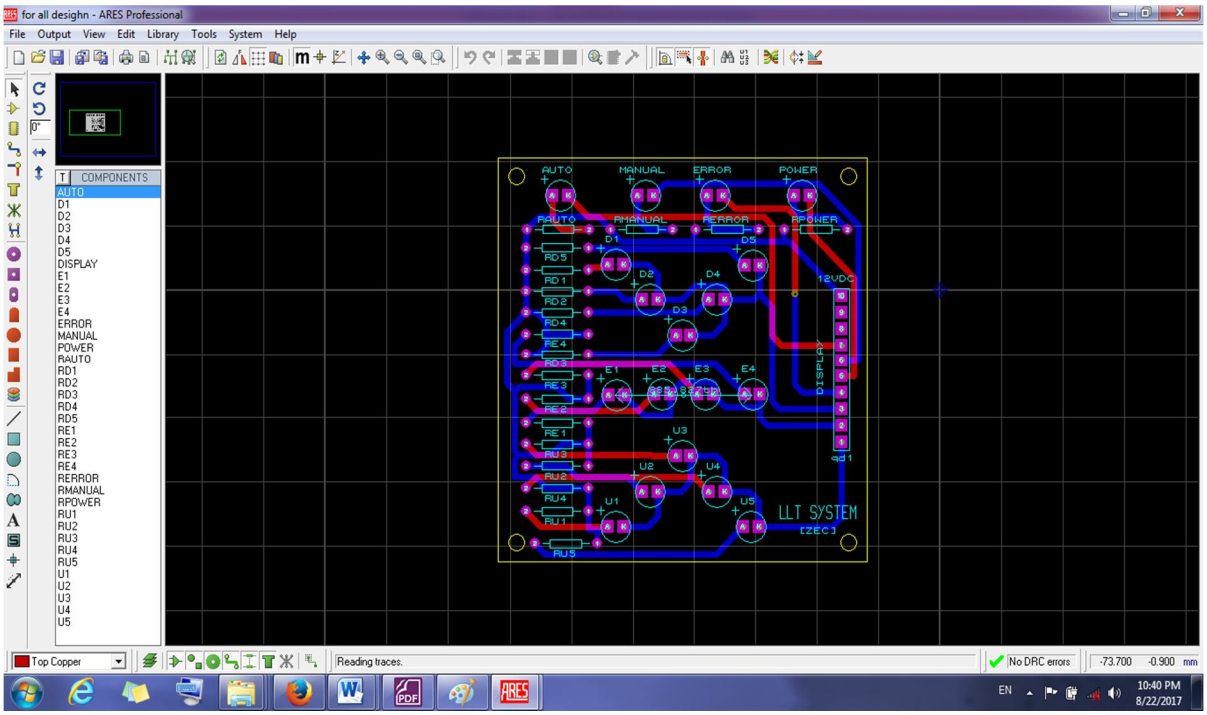


Figure 13: Wiring of the Display Unit

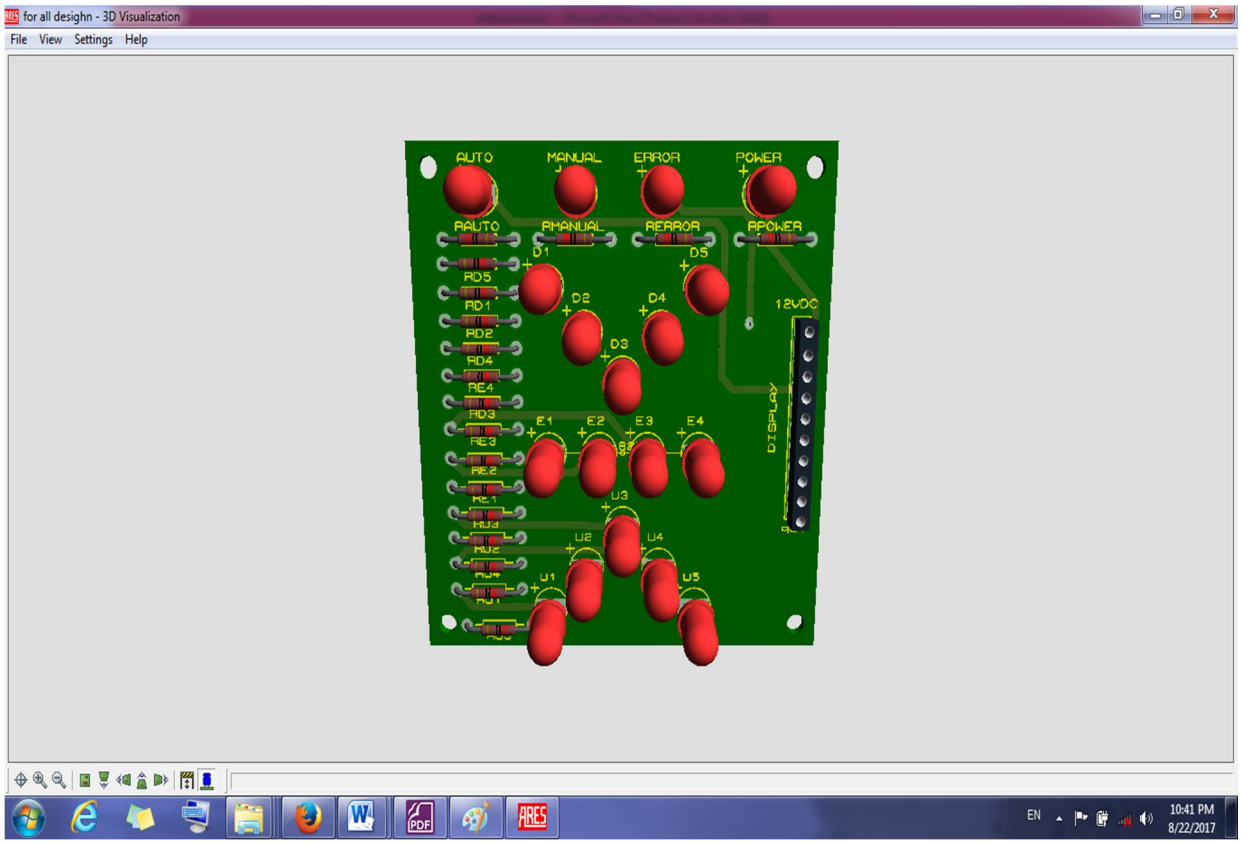


Figure 14: 3D PCB View of the Display Unit

After finishing the design of the control box unit, the next step is designing the cover for this unit with fan window to cooling the electronic circuits.

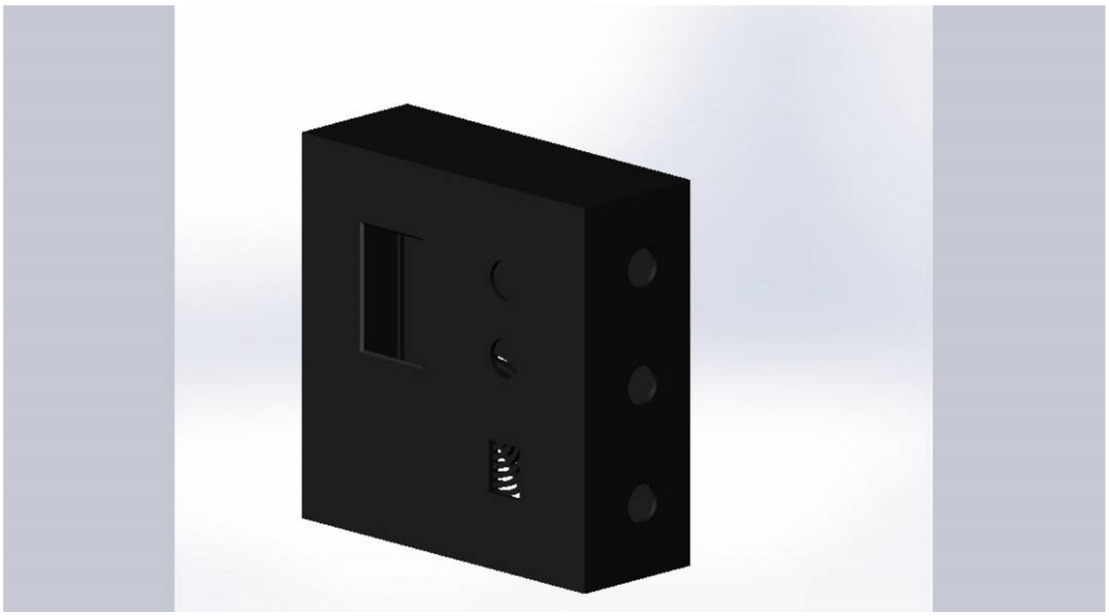


Figure 15: 3D Cover Front Side for Control Box Unit

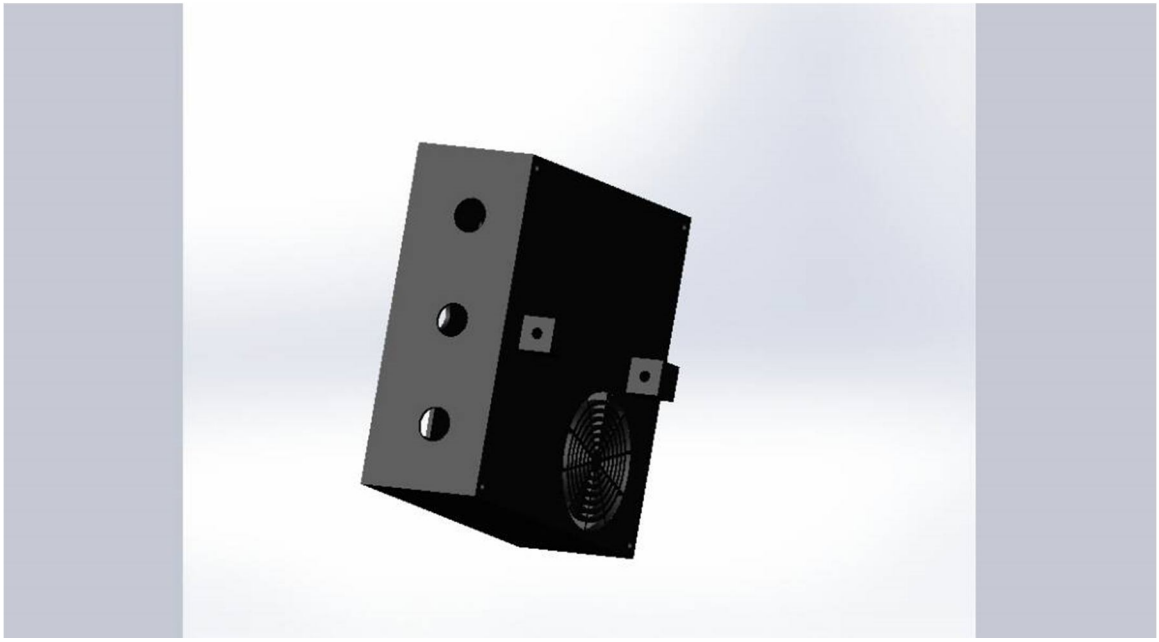


Figure 16: 3D Cover Back Side for Control Box Unit

VI. RECEIVER UNIT DESIGN

This unit consists of a matrix of phototransistor that acts on receiving of the transmitted laser beam from the Laser Transmitter Unit. According to the location of its fall on the matrix up or down or in the middle. The cutter level is determined at that moment relative to the reference point.

The phototransistor matrix is divided into three levels:

A. UP

In this case, the ground shall be lower relative to the reference point, so the Scrapper goes up to fill the earth with the dirt collected in the Scrapper.

B. Down

In this case, the ground shall be upper relative to the reference point, so the Scrapper goes down to cut the earth.

C. Middle Point

In this case, the ground shall be equal relative to the reference point, so the Scrapper does not move (up or down) just stay at the old case.

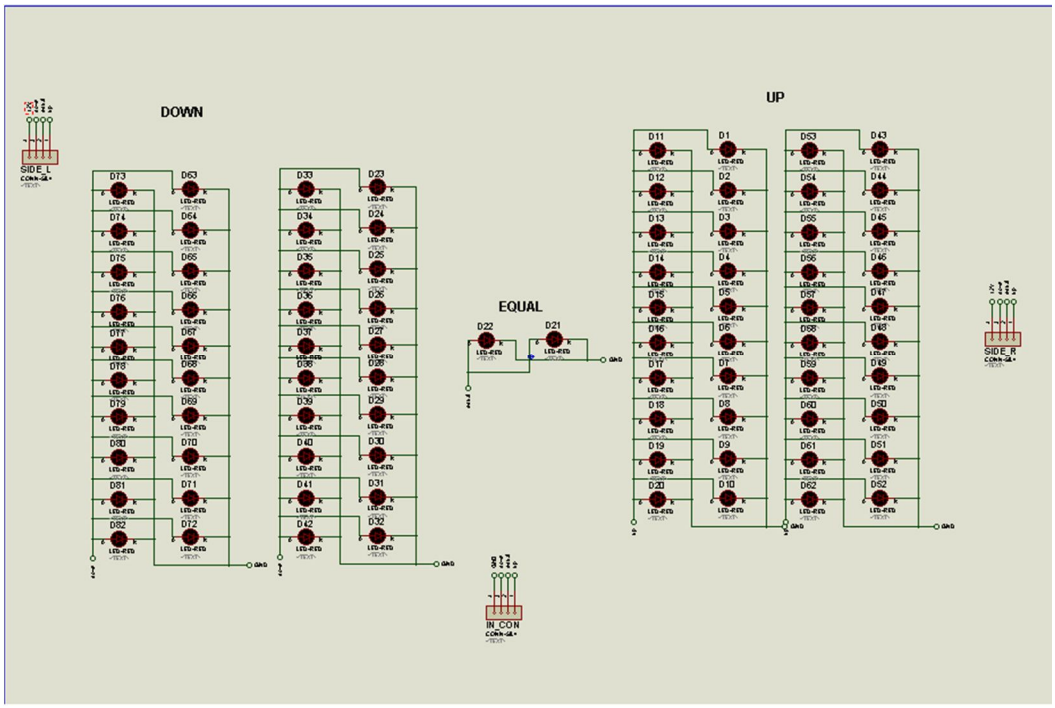


Figure 17: The Receiver Unit Schematic

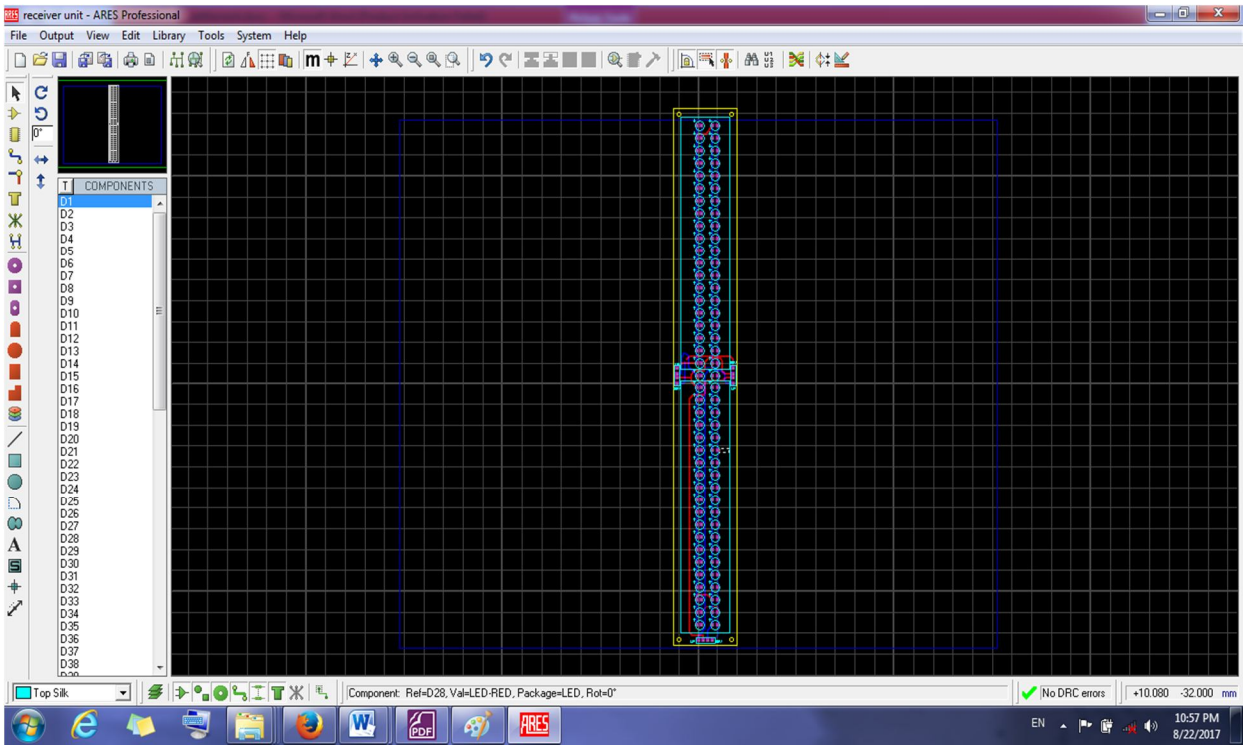


Figure 18: Wiring of the Receiver Unit

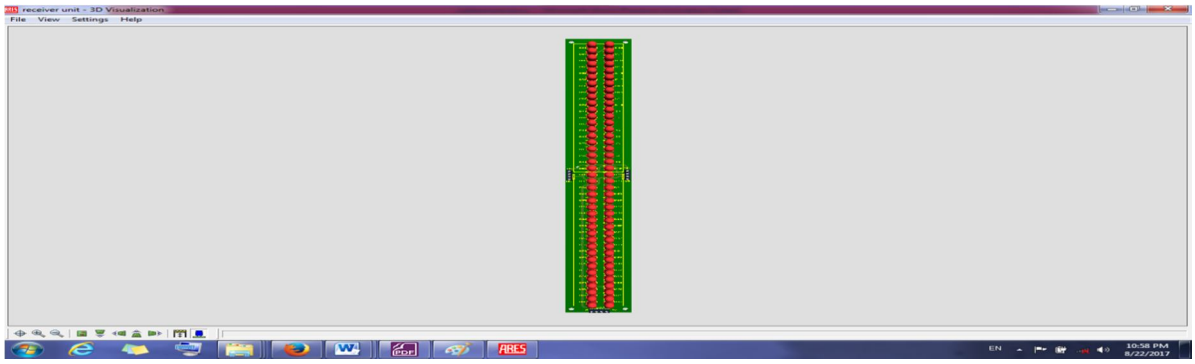


Figure 19: 3D PCB View of the Receiver Unit

After finishing design of the Receiver unit, the next step is designing the cover for this unit.

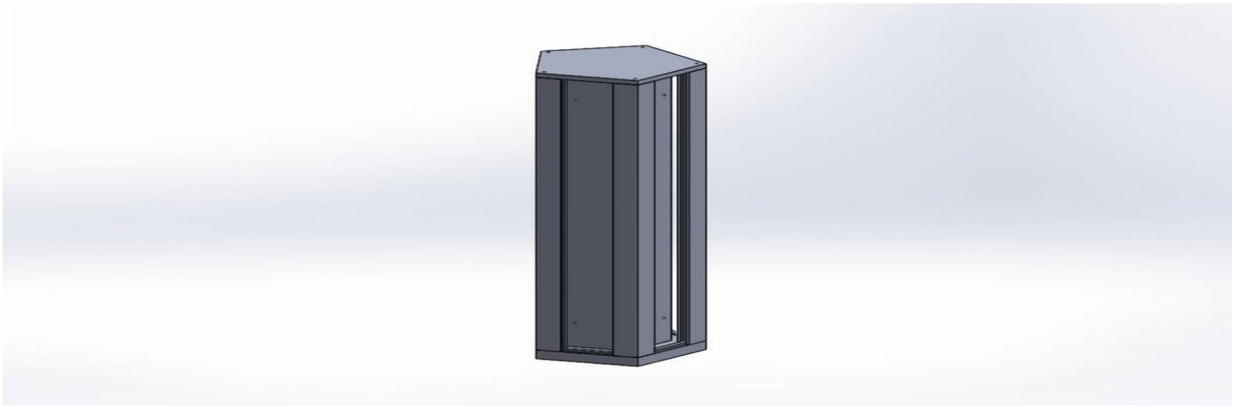


Figure 20: 3D Cover for Receiver Unit

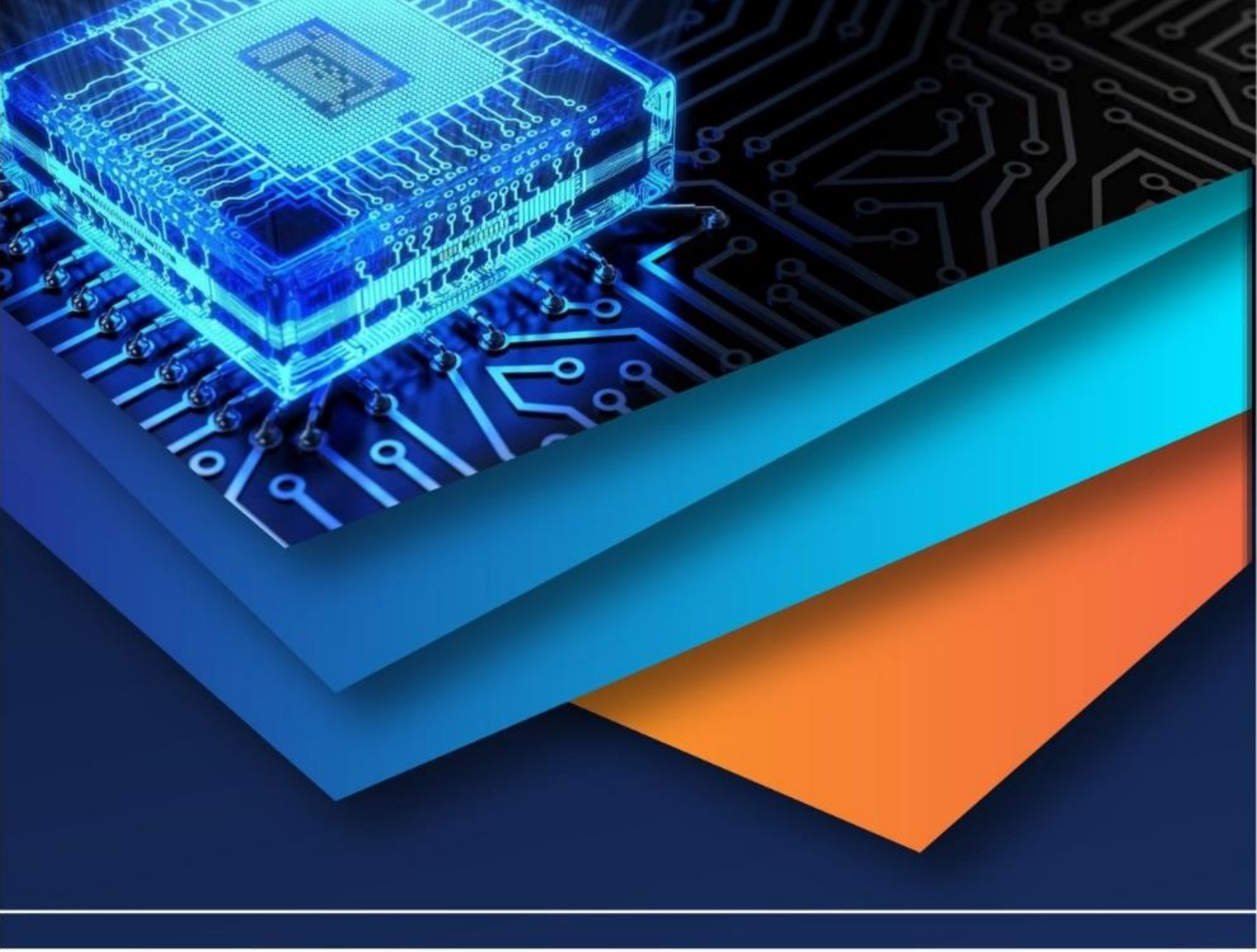
VII. RESULT AND CONCLUSION

It has been experiment the final prototype with Hydraulic System module for both Auto mode and Manual mode and the results were very satisfying, the Control Box Unit receive the signal level from the Transmitter Unit and process it then Actuated successfully the Hydraulic System (UP, DOWN AND STOP) depending on the location of the beam laser fall on the phototransistors matrix.

It was reducing the cost of the system by the use of a cheap and efficient processor, easy to maintenance compared with the old systems.

REFERENCES

[1] ATmega32 | Mega32 AVR Microcontroller - Engineers Garage, https://www.engineersgarage.com/electronic-componenets/atmega32-avr-microcontroller;21/8/2017 time 11:06 PM
[2] ATmega32/L Datasheet - Atmel datasheets, http://www.atmel.com/images/doc2503.pdf ; 21/8/2017 time 11:15 PM
[3] ATmega32/L Datasheet Summary - Atmel Corporation, http://www.atmel.com/Images/2503S.pdf ; 21/8/2017 time 11:20 PM
[4] What is light-emitting diode (LED)? - Definition, http://whatis.techtarget.com/definition/light-emitting-diode-LED ; 21/8/2017 time 11:42 PM
[5] Light Emitting Diodes Circuit Working Principle and Application, https://www.elprocus.com/light-emitting-diode-led -working-application; 21/8/2017 time 11:42 PM
[6] Relay - Wikipedia, https://en.wikipedia.org/wiki/Relay; 22/8/2017 time 12:15 AM
[7] WJ104-RELAYS, www.x-on.com.au/cgi-bin/PDF/Relay/WJ104.pdf; 22/8/2017 time 12:25 AM
[8] Voltage Regulator 7805 | Electrical4u, https://www.electrical4u.com/voltage-regulator-7805/; 22/8/2017 time 8:48 AM
[9] 7805 Datasheet, https://www.sparkfun.com/datasheets/Components/LM7805.pdf; 22/8/2017 time 8:55 AM
[10] ULN2003A - Wikipedia, https://en.wikipedia.org/wiki/ULN2003A;22/8/2017 time 9:11 AM
[11] Datasheet for the uln2003, http://cdselectronics.com/kits/uln2003.PDF;22/8/2017 time 9:18 AM
[12] Phototransistor Symbol and Circuit Configurations, http://www.radio-electronics.com/info/data/semicond/phototransistor/photo-transistor-circuits-symbols.php; 22/8/2017 time 9:42 AM
[13] PHOTOTRANSISTOR NPN 780NM 3MM, http://www.osram-os.com/Graphics/XPic6/00211499_0.pdf; 22/8/2017 time 9:51 AM



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