

SMART ALIGNMENT SYSTEM

P.S. SINDHU AYYAGARI¹, P. VENNELA², P. MOUNIKA PRIYA³, V.S. RAJA RAJESWARI⁴

^{1,2,3,4}Students, Dept. of Electrical and Electronics Engineering, Pragati Engineering College, A.P, India

Abstract - With the enhancement of technology, there is more reliability on the automatic systems to reduce the human effort. This implies there is need to find ways to automate the daily routine which in-turn may reduce human effort. One of those ways is the automatic alignment system. The concept of automatic alignment system is that the system adjusts itself according to the surrounding environment through the pre-programmed instructions. Here, the system needs to be controlled to adjust. There may be various control methods but the one used here is by using a light source. The system has a light-sensor circuit which detects the light and moves the system in the direction of light with the help of servo motors via the ARDUINO interface.

This way, we can control the system by just moving a light source to the desired direction. This system is not completely automatic but may be considered as semi-automatic alignment system.

Key Words: ARDUINO, SERVO, LDR

1. INTRODUCTION

There are many types of automatic alignment systems. The very concept of automatic alignment system implies the movement of the system autonomously using the pre-programmed instructions. The approach to achieve this is a step-by-step procedure. The circuit for the automatic alignment system can be divided into three stages: input stage, which comprises of light-sensor circuit; embedded software which consists of the program instructions to run the machine; and finally, the output stage, which provides to the ultimate movement of the system[1].

The brief description of these stages is as follows:

Input Stage: The input stage of the automatic alignment system is comprised of the light-sensor circuit which is the basic input of the system. The control of the system is done by focusing a light source onto the system. The LDR sensors sense the light and ensure the movement of the system in the direction of the light source.

Embedded Software: The required movement is achieved only when there is a transmitter-receiver based board where the program can be introduced to work accordingly. The embedded software makes sure the criteria are satisfied by programming the component 'ARDUINO'.

Output Stage: The output stage consists of the rotating axes which is the ultimate output of the system. The required output i.e. necessary movement of the system can be achieved by the use of SERVO mechanism. The servo motors are used here which receive the signals from the ARDUINO and provide with the required movement.

1.1 HARDWARE SPECIFICATIONS

The above stages comprise of the hardware components which satisfy the respective functions. The components required in this system are:

- 1) Light-sensor circuit.
- 2) Servo motors.
- 3) ARDUINO UNO Board.
- 4) ARDUINO IDE Software.

1.2 ARDUINO

An ARDUINO is actually a microcontroller based kit which can be either used directly by purchasing from the vendor or can be made at home using the components, owing to its open source hardware feature[2]. It is basically used in communications and in controlling or operating many devices. It was founded by Massimo Banzi and David Cuartielles in 2005. Arduino board with UNO is as shown fig.1



Figure 1: ARDUINO UNO

List of Arduino boards and compatible systems:

The original Arduino hardware was manufactured by the Italian company Smart Projects. Some Arduino-branded boards have been designed by the American companies Spark Fun Electronics and Adafruit Industries. Seventeen versions of the Arduino hardware have been commercially produced to date.

2. PROJECT DESIGN & HARDWARE IMPLIMENTATION

The circuit design of the automatic alignment system is simple but setting up the system must be done carefully. Four LDRs and Four 100KΩ resistors are connected in a voltage divider fashion and the output is given to 4 Analog input pins of Arduino. The PWM inputs of two servos are given from digital pins 9 and 10 of Arduino.

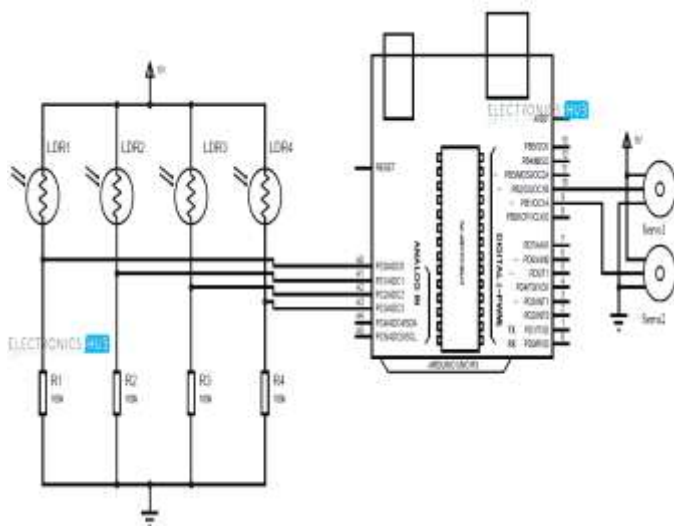


Figure .2: Circuit diagram of all three stages of circuit.

2.1. Working:

LDRs are used as the main light sensors. Two servo motors are fixed to the structure that holds the moving plate. The program for Arduino is uploaded to the microcontroller. The working of the project is as follows. LDRs sense the amount of light falling on them. Four LDRs are divided into top, bottom, left and right. For east - west tracking, the analog values from two top LDRs and two bottom LDRs are compared and if the top set of LDRs receive more light, the vertical servo will move in that direction.

If the bottom LDRs receives more light, the servo moves in that direction. For angular deflection of the solar panel, the analog values from two left LDRs and two right LDRs are compared. If the left set of LDRs receives more light than the right set, the horizontal servo will move in that direction. If the right set of LDRs receives more light, the servo moves in that direction[3].

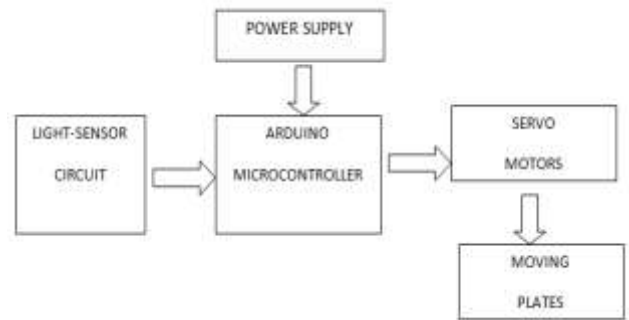


Fig.3.Block diagram

3. RESULTS

In this project, LDRs are used in the light-sensing circuit. The servo motors are used for the required movement of the moving plate. The program for the ARDUINO is uploaded to the microcontroller. The output of the system is as follows: LDRs sense the amount of light falling on them. The four LDRs are divided into top, bottom, left, and right.



Figure 4: Arrangement of 4 LDRs.

Case 1: For east-west tracking of light, the two analog values from two top LDRs and two bottom LDRs are compared. If the top set of LDRs receives more amount of light, the vertical servo will move in that direction. If the bottom set of LDRs receives more amount of light, the servo will move in that direction.



Figure 5: East-West tracking of light.

Case 2: For angular deflection of the moving plate, the analog values from the two left LDRs and the two right LDRs are compared. If the left set of LDRs receives more amount of light than the right set, the horizontal servo will move in that direction. If the right set of LDRs receives more amount of light, the servo will move in that direction[4].



Figure 6: Angular deflection of moving plate.

4. CONCLUSION

The concept of smart alignment system is used in almost all the present-day technologies. This concept serves as a replacement to the human-touch operations. In this aspect, it may not be completely automatic but it can be considered as semi-automatic. The concept of adjusting the position of an object mechanically with hand may be replaced by controlling it with the projection of a light-source onto it. Thus, this can be considered as a project to provide with the luxury i.e. to provide with the facility of reducing the human effort.

REFERENCES

- 1) [1] T.A. Papalias and M. Wong, "Making sense of light sensors," <http://www.embedded.com>, 2006.
- 2) [2] R. Condit and D. W. Jones, "Simple DC motor fundamentals Texas Instruments. Publication AN907, pp. 1 – 22, 2004.
- 3) [3] M. F. Khan and R. L. Ali, "Automatic sun tracking system," presented at the All Pakistan Engineering Conference, Islamabad, Pakistan, 2005.
- 4) [4] A.K. Saxena and V. Dutta, "A versatile microprocessor based controller for solar tracking", in Proc. IEEE, 1990, pp. 1105 – 1109

BIOGRAPHIES



I am P.S.Sindhu Ayyagari pursuing b.tech final year in Pragati Engineering college . I am belongs to department of Electrical And Electronics Engineering



I am P. Vennela pursuing b.tech final year in Pragati Engineering college. I am belongs to department of Electrical And Electronics Engineering .



I am P. Mounika priya pursuing b.tech final year in Pragati Engineering college . I am belongs to department of Electrical And Electronics Engineering .



I am v.s. Raja Rajeswari pursuing b.tech final year in Pragati Engineering college . I am belongs to department of Electrical And Electronics Engineering