Light Seeker Circuit

Monish H. Nene, Sanika S. Dongre

Abstract- Light seeker uses two LDRs to find the difference between the intensity in two different directions. This circuit uses operational amplifier to amplify the small difference in voltage measured by LDRs. The amplifier stage's output can further be used to control or send signal to microprocessor or microcontroller. The advantage of using this circuit is that it can measure the minute differences with utmost accuracy and it has no digital components thus it provides a wide range of operation. This circuit uses very simple electronic devices and thus it is very economic and useful.

Keywords: Light, LDRs, difference, economic and useful.

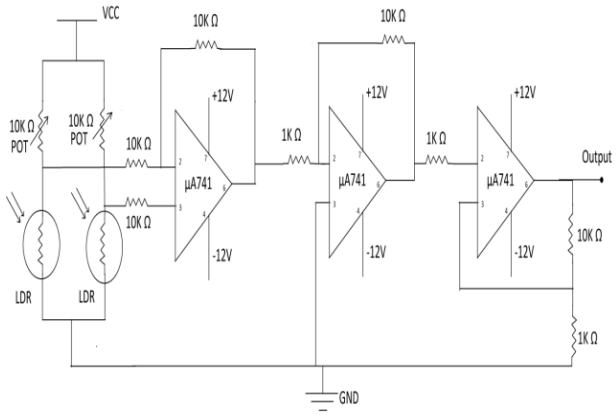
I. INTRODUCTION

The Light seeker circuit uses the ability of LDR (Light dependent resistance) of changing its resistance with change in the intensity of light incident on the LDR. The Two LDR can be placed at different locations where there is a difference between the intensity of light. This difference in the intensity of incident light between the two LDRs will be found with the help of a operational amplifier (Op-Amp). The second Op-Amp gives an analog output while the third Op-Amp gives a digital output. The analog output can be controlled by modifying the gain of Op-Amp by changing the values of the resistances in the circuit. It is a low cost circuit and gives a flexible and reliable output.

II. COMPONENTS

- IC1: LM358N
- IC2: L293DNE
- D1, D2 : 3mm/5mm Photodiodes (light level sensors)
- D3: 1N4007
- LED1,LED2: 3mm/5mm Red LEDs (only for indication purpose)
  P1,P2 : 10K multi-turn POTs
- R1,R3: 10K ¼ w
- R2,R4: 1K ¼ w
- C1: 100nF
- S1: Power Switch SPST
- M1,M2 : Gear Motors (200 -300 RPM)
- Battery : 6V (1.5Vx 4)
- (Accessories: Plastic wheels x 2 , Caster bullet x 2, Motor clamps x 2, Chassis board x 1, etc)

III. CIRCUIT DIAGRAM



IV. WORKING

The Circuit uses two LDRs. LDR's resistance is inversely proportional to the intensity of light. The resistance is high in darkness and is low in bright light. When the value of the resistance changes, the potential difference across it also changes. The difference in potential can be adjusted to a set zero value by changing the resistances across the potentiometer.

The potential difference across the two LDRs is given as an input to the first op-amp which works as an adder-subtracter . It gives the output as the difference between the two inputs along with polarity depending on the values.

The magnitude of the output of the first op-amp is very small and thus it can't be processed further directly. So, it is given as an input to the second op-amp which amplifies the magnitude of the input and reverses it's polarity and gives an analog output. This output is large enough to be used directly with any another circuit. The gain of the amplifier depends on the feedback resistance and can be modified according to the requirement.

The third op-amp converts the analog output of the second op-amp into a digital output. This op-amp works as a Schmitt trigger and gives two distinct well defined values as outputs that are equal to the saturation voltage of the op-amp along with the polarity. The output of the circuit changes it's polarity when the analog input crosses the Voltage threshold point.

IP=Input, OP= Output

OP1= - (RF1/R2) IPA + (1+RF/R2)[R3/(R1+R3)]IPB

OP2(Analog output) = - (RF2/R4)OP1

VUTP (Upper threshold) = +V (saturation) [R6/(R6+RF3)]

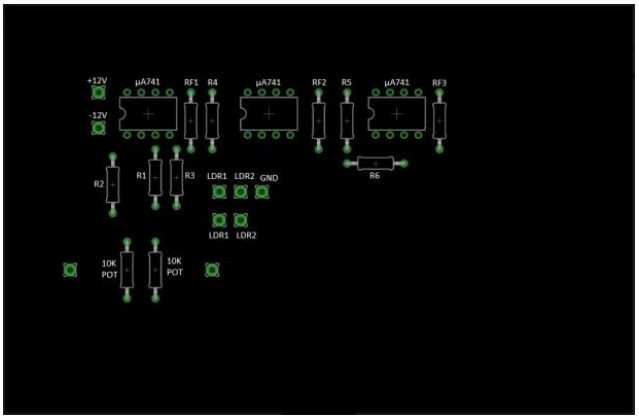
VLTP (Lower threshold) = -V (saturation) [R6/(R6+RF3)]

Revised Version Manuscript Received on October 23, 2016

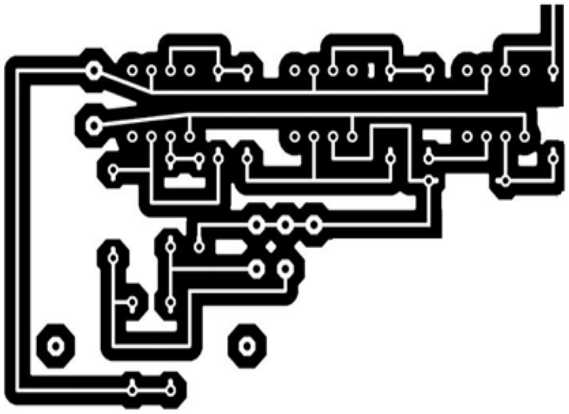
Monish H. Nene, B.E Tech, Department of Electronics Engineering, Vivekanand Education Society's Institute of Technology, Chembur, Mumbai (Maharashtra)-400074. India.

Sanika S. Dongre, B.E Tech, Department of Electronics Engineering, Vivekanand Education Society's Institute of Technology, Chembur, Mumbai (Maharashtra)-400074. India.

V. COMPONENT PLACEMENT DIAGRAM



VI. NEGATIVE IMAGE



APPLICATIONS

1. The circuit can be used to get a feedback. The analog output can be used along with LEDs (light emitting diodes) to control the intensity of light to maintain uniform intensity of light at two locations.
2. The digital output can be converted to '1' and '0' i.e. 5V and 0V by using a diode and a 7805 IC. This binary output can then be directly given as an input to a microcontroller.
3. The digital output can be processed properly and used to control motors. The motors can then be used for circuits like
   a) Sunlight Following solar panels. (Requires multiple circuits) If the Solar panel follows the direction of the Sun as it travels from east to west the solar energy captured and converted to electricity can be increased.
   b) Light follower robots can be developed which can be used to explore planets without running short of solar energy. They can also be used to find exits to caves and explore underwater terrain.
4. The circuit can be used to trigger a response when the intensity of light incident on one LDR goes above or below a reference value at the second LDR.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the contributions of Mrs. Asawari Dudhwadkar, Asst. Professor, V.E.S.I.T. who guided us at every stage and gave her valuable time during our research.

REFRENCES

1. J.S. Katre Dlic
2. Ramakant Gaikwad Dlic

AUTHORS PROFILE

Monish Nene, I am a student of fourth year engineering with majors in Electronics. I am a member of IEEE, ISTE and CSI. I have done a course of making wireless robot and track follower robot. I have learnt Python and C programming for Arduino. I have studied and practiced MATLAB for signal and image processing, Eagle, Pspice, uvision Keil, Proteus, Autocad, Turbo C, Cadence Virtuoso and Scilab. I have worked with Raspberry Pi, Arduino and Microcontroller. I have made a bidirectional counter and a random event generator using Microcontroller and LED 7-Segment displays. I have made a night lamp using LDRs and LEDs along with BJTs. I am currently working on an Automated Robot using voice control. It uses Raspberry Pi for voice decoding, RF module for data transmission and Arduino for controlling the physical operations of the robot. I have planned to do my Masters in Embedded Systems and I am currently applying at universities in United States of America for the same. I have an attraction towards sensors and I want to explore their applications and make devices that have practical applications. I feel that electronics is a child in a cradle as the first transistor was not even made before hundred years. So I believe that there is still a huge territory left unexplored with application which can take human life in next hundred years beyond the limits of one's imagination.

Sanika Dongre, I am a student of fourth year engineering B.E. Electronics. I am a member of IEEE and ISTE. I actively participate in the events organized by these societies. I have a department rank of 8 in the Electronics department of V.E.S.I.T which comprises of 160 students. I Have won the First Prize in the Technical Quiz conducted by CII-Emerson. I have done a course of making a wireless L3 robot and have learnt softwares like MATLAB, Python, C programming, Eagle, Pspice, uvision Keil, Autocad, Proteus, Turbo C, Java and Cadence Virtuoso. I have done a project on 'Motion based message conveyor for disabled and paralytic people' as a part of 'Learning beyond syllabus' project in my college. My current B.E. project is about a 'Blind navigation system using computer vision' which uses digital image processing to create map of the images captured by CCTVs used in college and then an algorithm that would detect the shortest path for the blind person to reach safely to his destination. I am planning to do masters in United States of America in the Electrical domain with Embedded Systems as specialization. I believe that technology is expanding, as Moore's law states that the no of transistors used in a device doubles every year and thus it is important for an engineer to provide his contribution towards the development of technology and its facilities.