Rushikesh S. Rakhonde, 2021, 9:1
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

A Review on Role of Arduino Uno Used in Dual Axis Solar Tracker

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Abstract- The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases. The ATmega328 on the board comes pre programmed with a boot loader that allows uploading new code to it without the use of an external hardware programmer.

Keywords: - Arduino, Expansion Board, USB Cable, Arduino IDE, Microcontroller Board.

I. INTRODUCTION

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs-light on a sensor, a finger on a button, or a Twitter message-and turn it into an output-activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instru ctions to the microcontroller on the board.

The Arduino project started in 2005 as a tool for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner. The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet.

Design Institute Ivrea (IDII) in Ivrea, Italy. At that time, the students used a BASIC Stamp microcontroller at a cost of $50, a considerable expense for many students. In 2003 Hernando Barragán created the development platform wiring as a Master's thesis project at IDII, under the supervision of Massimo Banzi and Casey Reas. Casey Reas is known for co-creating, with Ben Fry, the Processing development platform. The project goal was to create simple, low cost tools for creating digital projects by non-engineers.

The Wiring platform consisted of a printed circuit board (PCB) with an at mega 168 microcontroller, an IDE based on Processing and library functions to easily program the microcontroller. In 2005, Massimo Banzi, with David Mellis, another IDII student, and David Cuartielles, extended Wiring by adding support for the cheaper atmega8 microcontroller.

Following the completion of the platform, lighter and less expensive versions were distributed in the open-source community. It was estimated in mid-2011 that over 300,000official Arduinos had been commercially produced and in 2013 that 700,000 in early 2008, the five co-founders of the Arduino project created a company, Arduino LLC, to hold the trademarks associated with Arduino. The manufacture and sale of the boards was to be done by external companies, and Arduino LLC would get a royalty from them.

At the end of 2008, Gianluca Martino's company, Smart Projects, registered the Arduino trademark in Italy and kept this a secret from the other co-founders for about two years. This was revealed when the Arduino company tried to register the trademark in other areas of the world (they originally registered only in the US), and that it was already registered in Italy. Negotiations with Gianluca and his firm to bring the trademark under control of the original Arduino Company failed. In 2014, Smart Projects began refusing to pay royalties. They then appointed a new CEO, Federico Musto, who renamed the company Arduino SRL and created the website arduino.org, copying the graphics and layout of the original arduino.cc.

1. Objective of Study:

- To classify Arduino boards.
- To understand the working of Arduino uno board.
- To explain various parts and pin functions of arduino Uno board.
- To study arduino Software.

II. INTRODUCTION OF ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read input-light on a sensor, a finger on a button, or a Twitter message and turn it into an output-activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

1. Arduino Classification:

1.1 Arduino UNO:

The development of Arduino UNO board is considered as new compared to other Arduino boards. This board comes up with numerous features that help the user to use this in their project. The Arduino UNO uses the Atmega16U2 microcontroller that helps to increase the transfer rate and contain large memory compared to other boards. No extra devices are needed for the Arduino UNO board like joystick, mouse, keyboard and many more. The Arduino UNO contains SCL and SDA pins and also have two additional pins fit near to RESET pin.

The board contains 14 digital input pins and output pins in which 6 pins are used as PWM, 6 pins as analog inputs, USB connection, reset button and one power jack. The Arduino UNO board can be attached to computer system buy USB port and also get power supply to board from computer system. The Arduino UNO contains flash memory of size 32 KB that is used to the data in it. The other feature of the Arduino UNO is compatibility with other shield and can be combined with other Arduino products.

Fig 1. Arduino UNO.

1.2 LilyPad Arduino:

The LilyPad Arduino is considered as other Arduino board type that is designed for integrating with wearable projects and e-textile projects. This board

comes in round shape that helps to decrease the snagging and can be easily connected to other devices. This board uses the Atmega328 micro controller and Arduino boot loader in it. This board uses very less external component in it that makes the design easy and compatible. The board requires 2 volt to 5 volt power supply and use large size pin holes so that it can be easily connect to other devices. This board is widely used for controlling different device that includes motor, light and switch. The components of this board like sensor board, input board and output board can be washable because this board is used in clothing industries.

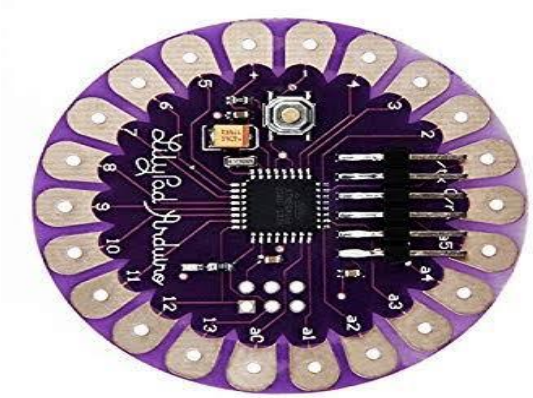

Fig 2. Lily pad Arduino.

1.3 Arduino Mega:

This board is considered as the microcontroller that uses the Atmega2560 in it. There are total 54 input pins and output pins in it in which 14 pins are of PWM output, 4 pins are of hardware port, 16 pins as analog inputs. The board also contains one USB connection; ICSP header, power jack and one REST pin. There are additional pins that act as crystal oscillator having frequency of 16 MHz The board also has flash memory of 256KB size that uses to store the data in it.

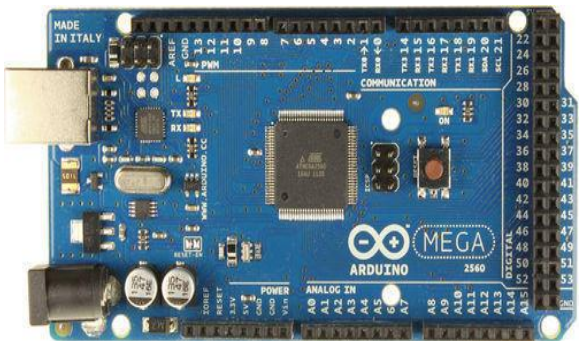

Fig 3. Arduino Mega.

The Arduino Mega board can be attached to computer system via USB connection and power supply can be provided to board by using battery or AC to DC adapter. As the board has large number of pins fitted in it that make the board suitable for projects that requires more number of pins in it.

1.4 Arduino Leonardo:

This board is considered as the microcontroller that uses the Atmega32u4 in it. There are total 20 digital input pins and output pins in it, in that 7 pins are used As PWM and 12 pins used as analog inputs. The board also contains one micro USB connection, power jack, and one RESET button fit in it. There are additional pins which act as crystal oscillator of frequency 16 MHz the Arduino Leonardo board can be attached to computer system via USB connection and power supply can be provided to board by using battery or AC to DC adapter.

The microcontroller used by the Arduino Leonardo has in-built USB connection that removes the dependency of extra processor in it. As there is no additional USB connection in the board, it helps the board to act as mouse or keyboard for the computer system. The Arduino Leonardo is considered as cheapest Arduino boards compare to other Arduino products.

Fig 4. Arduino Leonardo.

1.5 Arduino Red Board:

The Arduino Red board is another type of Arduino board that uses the mini USB cable for getting programmed and the Arduino IDE is used for this purpose. This board is compatible with Windows 8 operating system and there is no need to change the security settings to make this board working. The Red board uses the FTDI chip and USB chip for the connection to other device. As the design of red board is very simple it can be easily integrate with other projects. The only requirement if to plug the red board and select appropriate option and can

upload program in no time. The barrel jack can be used to control the USB cable of the Arduino Red board.

Fig 5. Arduino Red Board.

1.6 Arduino Shields:

The Arduino shields are considered as pre-build circuit boards that are used to connect other Arduino boards. The Arduino shield are placed on top of Arduino boards and enhance the capability of board to get connected to internet network, controlling of motor, controlling of LCD and also help to establish wireless communication. There is different type of shields available for the use. It includes Wireless Shields, Ethernet Shield, Proto Shield and GSM shield. This helps to increase the compatibility of the Arduino boards.

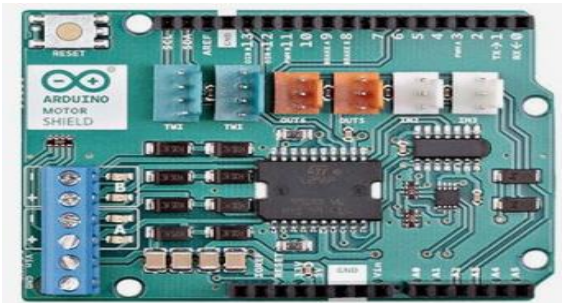

Fig 6. Arduino Shields.

III. ROLE OF ARDUINO UNO

Arduino can be used to communicate with a computer, another Arduino board or other micro controllers. The AT mega 328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (Tx). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer.

The ATmega16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. There are two RX and TX LEDs on the arduino board which will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328P also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

Arduino Uno is a microcontroller board based on 8-bit AT mega 328P microcontroller. Along with AT mega 328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller.

Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

IV. BLOCK DIAGRAM

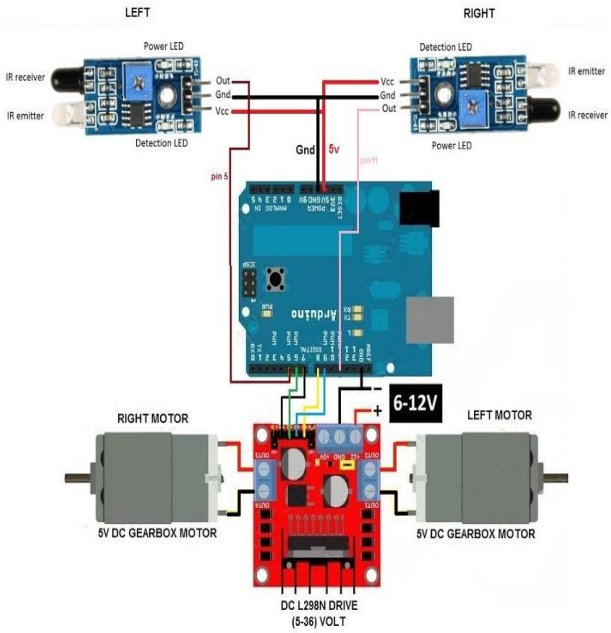

Fig 7. Block Diagram of Arduino UNO with L298N motor drive and IR Sensor Module.

The Arduino Uno is one kind of microcontroller board based on ATmega328, and Uno is an Italian

term which means one. Arduino Uno is named for marking the upcoming release of microcontroller board namely Arduino Uno Board 1.0. This board includes digital I/O pins-14, a power jack, analog i/ps-6, ceramic resonator-A 16 MHz, a USB connection, an RST button, and an ICSP header.

All these can support the microcontroller for further operation by connecting this board to the computer. The power supply of this board can be done with the help of an AC to DC adapter, a USB cable, otherwise a battery. This article discusses what is an Arduino Uno microcontroller, pin configuration, Arduino Uno specifications or features, and applications.

The ATmega328 is one kind of single-chip micro-controller formed with Atmel within the mega AVR family. The architecture of this Arduino Uno is a customized Harvard architecture with 8 bit RISC processor core. Other boards of Arduino Uno include Arduino Pro Mini, Arduino Nano, Arduino Due, Arduino Mega, and Arduino Leonardo.

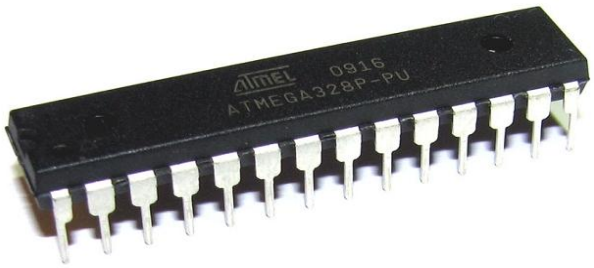

Fig 8. ATmega328 Microcontroller.

V.CONCLUSION

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs-light on a sensor, a finger on a button, or a Twitter message-and turn it into an output-activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instruct ions to the microcontroller on the board.

REFERENCES

[1] Appelbaum, J. The operation of loads powered by separate sources or by a common source of solar cells IEEE Transactions on Energy Conversion, 4(3), 351.June 1989.

[2] J. Brodkin, 11 Arduino projects that require major hacking skills or a bit of insanity Ars Technica, technologic arduinoprojects-that-require-major-hacking-skills-or-a-bit-of-insanity. 2013.

[3] Galadima, A.A., "Arduino as a learning tool in Electronics Computer and Computation (ICECCO) International Conference on, vol., no., pp.1-4, Sept. 2014.

[4] Badamasi, Y.A., "The working principle of an Arduino," in Electronics, Computer and Computation (ICECCO) International Conference on , vol., no., pp.1-4, Oct 2014.

[5] Appelbaum, J., & Sarma, M. S.—The operation of permanent magnet DC motors powered by a common source of solar cell. IEEE Transactions on Energy Conversion, 4(4), 635.Aguest 1989.

[6] Bleck, O.—Electric drive systems: Understanding and selecting the proper drive system for an electric vehicle Wilmington: APN2001 (preliminary), Solectria Corporation.1993.

[7] Hanselman, D. C.—Brushless permanent magnet motor design. New York: McGraw-Hill 1997.

[8] Ibramim, F.—Polyphase brushless DC motor (HSSS3810). Tulsa: Hathaway Corporation. Jan. 1989.

[9] Kay, R.—The new ball bearings. Bike Tech, 10. Feb. 1988.

[10] King, R. D., Haefner, K. B., Salasoo, L., & Koegl, R. A Hybrid electric transit bus pollutes less, conserves fuel. IEEE Spectrum, 32(7), 26. 1995.

[11] Korff, W. H. —Motor vehicle design. Burbank: M-C Publications. 1980.

[12] Loew, E. A. —Direct and alternating currents. New York: McGraw-Hill Book Company, Inc. 1954.

[13] Lovatt, H. C., Ramsden, V. S., & Mecrow, B. C. —Design of an in-wheel motor for a solar-powered electric vehicle. IEEE Proceedings-Electric Power Applcations, 145(7), 402.1998.