PROJECT NAME

Principle of Arduino.

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Abstract: -

In this Report, we analyze the working principle of an Arduino. These days many people try to use the Arduino because it makes things easier due to the simplified version of C++ and the already made Arduino microcontroller that you can programme ,erase and reprogrammed at any given time .In this Report we will discuss the hardware components used in the Arduino board, the software used to programme it(Arduino board) with the guide on how to write and construct your own projects, and a one of examples of an Arduino project, This will give you the overall view of an Arduino Uno, that after reading this Report you will get the basic concept and use of an Arduino Uno.

introduction

Arduino is an open source microcontroller which can be easily programmed, erased and reprogrammed at any instant of time. Introduced in 2005 the Arduino platform was designed to provide an inexpensive and easy way for hobbyists, students and professionals to create devices that interact with their environment using sensors and actuators. Based on simple microcontroller boards, it is an open source computing platform that is used for constructing and programming electronic devices[1]. An Arduino can help you read information from input devices such as e.g. Sensors, Antenna, Trimmer(potentiometer) etc. ... and can also send information to output devices such as LED , Speakers, LCD Screen, DC motor etc.[2] ...

NEED FOR ARDUINO

Why is there a need to use Arduino in specific? or What makes it different from others? a Co-founder of Arduino mentions some very important reasons for this question.

1) Active User Community: A group of people using a similar product can hold posted message conversations and share their experiences or solve the problems of the other users in the communities with their own experiences [3].

2) Growth of Arduino: Arduino was developed with intent to provide an economical and trouble-free way for hobbyists, students and professionals to build devices that interact with their situation using sensors and actuators. This makes it perfect for newcomers to get started quickly [3].

3) Inexpensive Hardware: Since Arduino is an open source platform the software is not purchased and only the cost of buying the board or its parts is incurred, thus making it very cheap. The hardware designs are also available online for free from its official website [3].

4) Arduino Board as a Programmer: To make Arduino board function easy and also making it available everywhere these boards come with a USB cable for power requirements as well as functioning as a programmer [3].

5) Multi-platform Environment: The Arduino IDE is capable of running on a number of platforms including Microsoft, Linux and Mac OS X making the user community even larger [3].

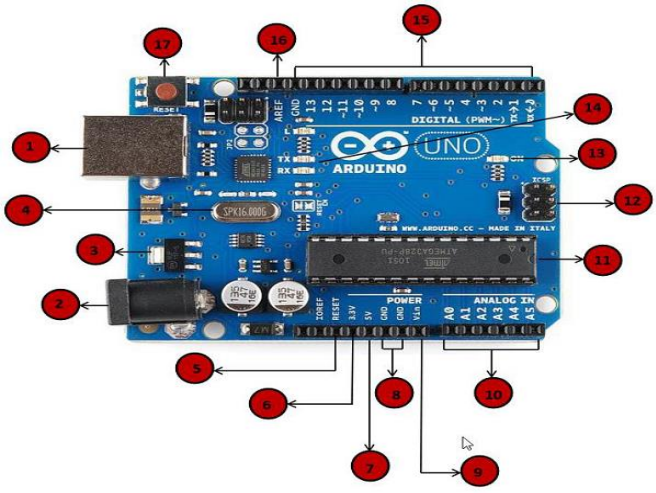
ELEMENTS OF ARDUINO

BOARDS Elements of an Arduino Board can be done into two categories:

- Hardware
- Software

1- Hardware

The Arduino has recently become a very popular micro-controller board, and is based on an ATmega328 microprocessor with a variety of interfaces. The processor can be programmed using a very simple programming language called Wiring. Thanks to its popularity among enthusiasts, the price of this board is relatively low, which is a considerable advantage for use in schools. This is why several laboratory experiments using this board have emerged lately, including photovoltaic cell measurements , photometry and the construction of autonomous land robots for educational purposes[4] . The Arduino Development Board consists of many components that together makes it work. Here are some of those main component blocks that help in its functioning:



1-Power USB

Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection[5] .

2-Power (Barrel Jack)

Arduino boards can be powered directly from the AC mains power supply by connecting it to the Barrel Jack [5].

3-Voltage Regulator

The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements[5].

4-Crystal Oscillator

The crystal oscillator helps Arduino in dealing with time issues. How does Arduino calculate time? The answer is, by using the crystal oscillator. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16 MHz[5].

5-17-Arduino Reset

You can reset your Arduino board, i.e., start your program from the beginning. You can reset the UNO board in two ways. First, by using the reset button (17) on the board. Second, you can connect an external reset button to the Arduino pin labelled RESET (5)[5].

6-7-8-9Pins (3.3, 5, GND, Vin)

- 3.3V (6) − Supply 3.3 output volt
- 5V (7) − Supply 5 output volt
- Most of the components used with Arduino board works fine with 3.3 volt and 5 volts.
- GND (8) (Ground) − There are several GND pins on the Arduino, any of which can be used to ground your circuit.
- Vin (9) − This pin also can be used to power the Arduino board from an external power source, like AC mains power supply[5].

10-Analog pins

The Arduino UNO board has six analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

2-Software

The program code written for Arduino is known as a sketch. The software used for developing such sketches for an Arduino is commonly known as the Arduino IDE. This IDE contains the following parts in it[1].

• Text editor: This is where the simplified code can be written using a simplified version of C++ programming language[1].

• Message area: It displays error and also gives a feedback on saving and exporting the code.

• Text: The console displays text output by the Arduino environment including complete error messages and other information

• Console Toolbar: This toolbar contains various buttons like Verify, Upload, New, Open, Save and Serial Monitor. On the bottom right hand corner of the window there displays the Development Board and the Serial Port in use[1].

PROGRAMMING BASICS

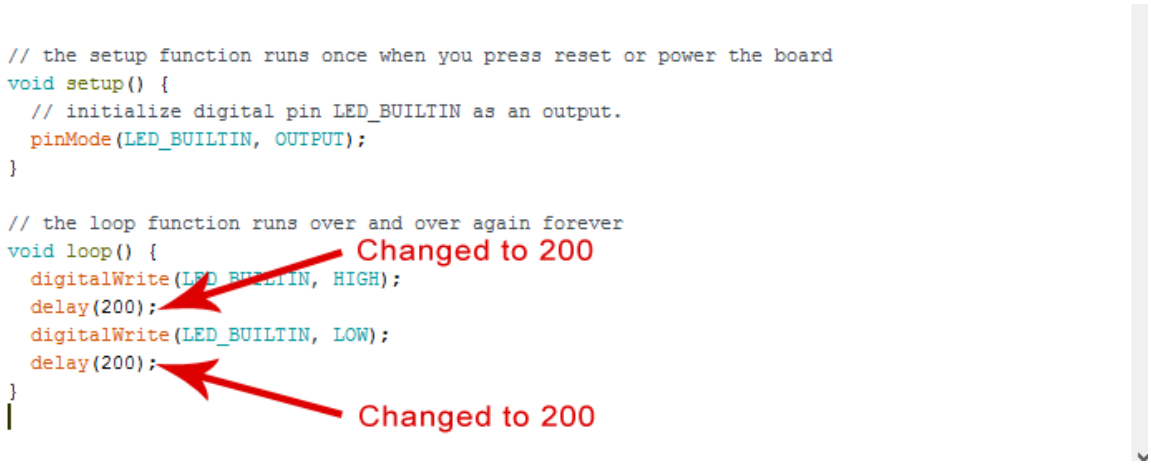
Now we'll discuss about the programming techniques of Arduino sketch in the Arduino IDE. There are two main parts every sketch will always have; they are:

- void setup ()
- void loop ()

1-void setup (): This is the first routine that begins when the Arduino starts functioning. This function is executed only once throughout the entire program functioning.

The setup function contains the initialization of every pin we intend use in our project for input or output. Here is an example of how it should be written:

2 void loop (): This function is the next important function in the Sketch. It consists of that part of the code that needs to be continuously executed unlike the part of the code written in the setup function. An example of a void loop is as follows:
Similarly, if there is a need for delay in the sketch then there is another function that creates a delay in the execution of the code



PROJECT

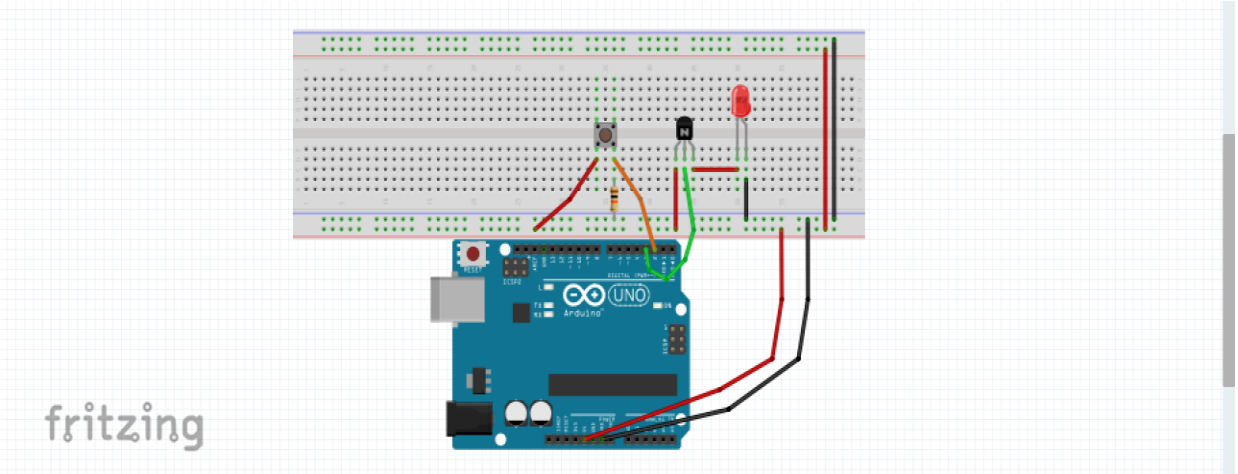
Do you have one of those $1 LED flashlights?

My standard flashlight ran on a triple A battery trio in series circuit, so around 4.5V. I compared my $1 flashlight to others more expensive versions and saw it's weakness. On and Off. That's all it could do. Though that's great for some uses, I wanted an upgrade. I took the little flashlight apart and removed the LED head. See the terminals were exposed nicely, I melted power and ground wires to it. Connecting it to a 5V power bank, I was so happy to see the extra 0.5V brighten to LED head without burning them out.

Second, I wrote a code and added three different light modes and a rapid strobe. By pressing the button, you can cycle between them. I love looking at a random object and thinking of what code is running behind it. This was a fun, quick project.

The circuit includes a single LED to act as the LED head for the diagram. The 5V from the transistor will blow the LED if a 220 Ohm resistor is not placed between the LED and ground. I am using the 2N 2222A transistor[6].

Needs for Circuit: Arduino UNO. Jumper wires (generic), Resistor 10k ohm B3F-1000, PN2222ABU, MCBB400



Programming:-

```
int buttonPin = 2;
int lightPin = 3;
static int value = 0;                  //Create a changing
number
void setup() {
  pinMode(buttonPin,INPUT);
  pinMode(lightPin,OUTPUT);    //Create the pin Modes
}

void full_light(){
  digitalWrite(lightPin,HIGH);
  delay(50);
}
void half_light(){
  analogWrite(lightPin,127);          //Use PWM for
brightness level
  delay(50);
}
void fourth_light(){
  analogWrite(lightPin,64);
  delay(50);
}
void strobe(){
  digitalWrite(lightPin,HIGH);        //Change the delays
if you want a faster strobe
  delay(100);
  digitalWrite(lightPin,LOW);
  delay(100);
}
void loop() {
int button_check = digitalRead(buttonPin);
if (button_check == 1){               //Check if the button
was pressed
  value = value + 1;
  delay(220);
  if (value > 4){
    value = 0;
    delay(70);
  }}
```

```
else{                              //Keep the LEDs off if the
button was not pressed
  digitalWrite(lightPin,LOW);
}
if (value == 1){                   //Output the mode according
to the button
  full_light();
}
if (value == 2){
  half_light();
}
if (value == 3){
  fourth_light();
}
if (value == 4){
  strobe();
}
}
```

Conclusion: -

In this Report, We examined the working principle of an Arduino Uno both the hardware and software of the Arduino, from the components on the Arduino Hardware to knowing how to write the code in the software(IDE), and how to combine both and contract your own project.

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