
.PNG Arduino Framework Documentation

Release 1.0

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Sep 27, 2017

Contents

1	About .PNG Team	1
1.1	Contact	1
1.2	.PNG Team	1
2	Showcase	3
3	Installation	5
4	Bluetooth	7
4.1	Tutorials	7
4.2	Simple Example	7
4.3	Full example - Chat	8
4.4	Documentation	8
5	LED Matrix	11
5.1	Tutorials	11
5.2	Example	11
5.3	Documentation	12
6	Motor	13
6.1	Simple Example	13
6.2	Full example	13
6.3	Documentation	14
7	Temperature	15
7.1	Example	15
7.2	Methods	15
8	Arduino Timer	17
8.1	Tutorials	17
8.2	Simple Example	17
8.3	Full example - Two timers	18
8.4	Documentation	18
9	Ultrasonic	21
9.1	Simple Example	21
9.2	Full example - Distance	21
9.3	Methods	22

10	Helpers	23
10.1	BluetoothArduinoHelper	23
11	Contribute	25
12	License	27

CHAPTER 1

About .PNG Team

.PNG Arduino Framework was developed by students of Unesp - University of the State of São Paulo, Brazil, with the goal to turn Arduino project development easier. The framework has a chain of modular classes, compatible with some Arduino components.

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CHAPTER 2

Showcase

Some projects developed with .PNG Arduino Framework. Contact us to share your projects :)

- [Line Follower Robot with Android and Arduino](#)
- [Flappy Duino - An Arduino clone of Flappy Bird with LED Matrix](#)
- [Bit Race - 16x16 Arduino LED Matrix Game](#)

CHAPTER 3

Installation

1. Download the master branch from GitHub.
2. Unzip it
3. Move all folders to your Library folder (On your *libraries* folder inside Sketchbooks of Arduino software).

The Library folder will change depending on you OS. In Arch Linux, Arduino IDE 1.6, library folder is ~/Arduino/libraries

CHAPTER 4

Bluetooth

This module can be used to send and receive bluetooth data. If you want to connect your Arduino with a Bluetooth device, Arduino, Android, iOS or any other, check the Helpers module to find some classes that will help you to connect them. This module was tested with:

- Bluetooth-RS232 HC-05

It'll probably work with similar components. If you test it a component not listed here, please add a comment in my blog, open a pull request or edit this file to share if it's working or if you are getting some error.

Tutorials

- [How to connect an Android device with Arduino and bluetooth](#)

Simple Example

Include the library

```
#include <SoftwareSerial.h>
#include "Bluetooth.h"
```

Create a new Bluetooth object

```
Bluetooth *blue = new Bluetooth(5, 6);
```

Add the following method in **void setup()** to start the bluetooth serial

```
blue->begin();
```

Now you can use any method on **void loop()**

```
String msg = blue->read(); // read and receive a message
blue->send("I'm sending a message");
```

Full example - Chat

```
#include "Bluetooth.h"
#include <SoftwareSerial.h>

Bluetooth *blue = new Bluetooth(2, 3); //RX=2, TX=3

void setup() {
    Serial.begin(9600);
    blue->setName("PNGArduinoFramework");
    blue->setPIN(6666);
    blue->setMessageEnd('#');
    blue->setupBluetooth(); //apply this changes to the module. You need to run_
    ↳ it only in the first time
    blue->begin(); //start the bluetooth serial
}

void loop() {
    String msg = blue->read();
    if (msg.length() > 0) {
        Serial.println(msg);
    }
}
```

Documentation

Bluetooth(int r, int t); - Create a new Bluetooth object with RX and TX PINs

int getrxPin(); - Get the RX PIN

int gettxPin(); - Get the TX PIN

char * getPIN(); - Get Bluetooth PIN

char * read(); - Read and receive a message

char * getName(); - Get the Bluetooth device name

char getMessageEnd(); - Get the char that means 'end of string'

void setMessageEnd(char end); - Set the char that mean 'end of string'

void setName(char name[]); - Set Bluetooth device name

void setrxPin(int rx); - Set RX PIN

void settxPin(int tx); - Set TX PIN

void setupBluetooth(); - Apply the bluetooth changes(name or pin). Must be used in the **void setup()**

void send(char c[]); - Send a message

void setPIN(int pin); - Set bluetooth PIN

void setBaudrate(unsigned long baudrate); - Set the Bluetooth serial Baudrate

void begin(); - Start the Bluetooth serial. Must be used in the **void setup()**

CHAPTER 5

LED Matrix

This module will help you to work with 16x16 LED Matrix with Arduino.

You can read the full tutorial here: <https://bytedebugger.wordpress.com/2015/01/28/tutorial-how-to-use-dot-led-matrix-display-with-arduino/>

Tutorials

- How to use Dot LED Matrix Display with Arduino
- Flappy Duino – Creating an Arduino clone of Flappy Bird with LED Matrix
- Creating a simple car game with Arduino LED Matrix

Example

```
#include "LedMatrixObject.h"

LedMatrixObject *led = new LedMatrixObject(2, 3, 4, 5, 6, 7, 8, 9);

unsigned char Scene[16][16] = {
    {1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1},
    {1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1},
    {1, 1, 0, 0, 0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1},
```

```
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1},
    {1, 1, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1},
    {1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1},
    {1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1},
};

void setup() {

}

void loop() {
    led->setScene(Scene);
    led->setLedOn(0, 0);
    led->setLedOff(8, 5);
    led->draw();
}
```

Documentation

LedMatrixObject(byte LEDARRAY_D, byte LEDARRAY_C, byte LEDARRAY_B, byte LEDARRAY_A, byte LEDARRAY_G, byte LEDARRAY_DI, byte LEDARRAY_CLK, byte LEDARRAY_LAT); - Create the LED matrix

void clear(); - clear the scene

void draw(); - draw the scene on the led matrix - call it on loop()

void setScene(unsigned char Scene[16][16]); - set and Scene[16][16]

void setLedOn(int x, int y); - Turn on the led x, y on

void setLedOff(int x, int y); - Turn off the led x,y

void toggleLed(int x, int y); - Toggle the state of the led x,y

CHAPTER 6

Motor

This module is used to control the L298 Dual H-Bridge Motor driver. Tested with:

- L298

It'll probably work with similar components. If you test it a component not listed here, please add a comment in my blog, open a pull request or edit this file to share if it's working or if you are getting some error.

Simple Example

Include the library

```
#include "Motor.h"
```

Create a new Motor object. Set the PIN values as parameters, in this sequence: IN1, IN2, ENA, IN3, IN3, ENB

```
Motor *m = new Motor(6, 7, 5, 8, 9, 11);
```

Now you can use any method on **void loop()**

```
m->goFront();
```

Full example

```
#include "Motor.h"

Motor *m = new Motor(6, 7, 5, 8, 9, 11);

void setup() {
    m->setSpeed(200); //value from 0 to 255
}
```

```
}  
  
void loop() {  
    m->goFront();  
    delay(1000);  
    m->goRightStrong();  
    delay(1000);  
    m->goBack();  
    delay(1000);  
    m->goRightStrong();  
    delay(1000);  
}
```

Documentation

Motor(byte m1_a, byte m1_b, byte m1_pwm, byte m2_a, byte m2_b, byte m2_pwm); - Create the Motor with IN1, IN2, ENA, IN3, IN3, ENB

void setPINs(byte m1_a, byte m1_b, byte m1_pwm, byte m2_a, byte m2_b, byte m2_pwm); - Set IN1, IN2, ENA, IN3, IN3, ENB values

void setSpeed(byte v); - Set the speed of both motors. Value from 0 to 255

void setMotorSpeed1(byte v); - Set the speed of motor 1. Value from 0 to 255

void setMotorSpeed2(byte v); - Set the speed of motor 2. Value from 0 to 255

void goFront(); - Go front

void goRight(); - Go right, activating one wheel

void goRightStrong(); - Go right, activating both wheels

void goLeft(); - Go left, activating one wheel

void goLeftStrong(); - Go left, activating both wheels

void goBack(); - Go back

void goStop(); - Stop the movement

CHAPTER 7

Temperature

This module can be used to read the temperature. Tested with the following components:

- LM35

It'll probably work with similar components. If you test it a component not listed here, please add a comment in my blog, open a pull request or edit this file to share if it's working or if you are getting some error.

Example

```
#include "Temperature.h"

Temperature *temp = new Temperature(A7); //module PIN

void setup() {
    Serial.begin(9600);
}

void loop() {
    Serial.print("Temperature: ");
    Serial.print(temp->getTemperatureC());
    Serial.print(" degrees Celsius ");
    Serial.print(temp->getTemperatureF());
    Serial.println(" degrees Fahrenheit");
    delay(500);
}
```

Methods

Temperature(int PIN); - Create the Temperature object with the PIN

int getTemperatureC(); - Get the temperature in Celsius

int getTemperatureF(); - Get the Temperature in Fahrenheit

int getTemperatureRaw(); - Return the raw value read by the sensor

CHAPTER 8

Arduino Timer

This module allow us to easily create Timer callbacks. In a predetermined interval, your function will be called. Works as a “thread”, where a secondary function will run when necessary.

There are two types of timers

- **Default:** Will run the callback each interval
- **Single-shot:** Run only once. If you need to run a single shot timer again, use the method ->Start();

Tutorials

- Using Timer Object – interval and singleshoot callback – in Arduino

Simple Example

Include the library

```
#include "Timer.h"
```

Create a new Timer object

```
Timer *timer1 = new Timer(6000); //timer with 6 seconds
```

Add the following methods in **void setup()**

```
timer1->setOnTimer(&FunctionCallback);  
timer1->Start(); //start the thread.
```

Now add this method on **void loop()**

```
timer1->Update(); //will check the Timer and if necessary, will run it.
```

Full example - Two timers

```
#include "Timer.h"

Timer *timer1 = new Timer(6000);
Timer *timer2 = new Timer(500);

void setup() {
    Serial.begin(9600);
    timer1->setOnTimer(&PrintHello1);
    timer1->Start();

    timer2->setOnTimer(&PrintHello2);
    timer2->Start();
}

void PrintHello1() {
    Serial.println("Hello timer 1 !!");
}

void PrintHello2() {
    Serial.println("Hello timer 2!!");
}

void loop() {
    timer1->Update();
    timer2->Update();
}
```

Documentation

Timer(unsigned long int ms); - Create a Timer with the time

Timer(unsigned long int ms, CallbackType callback); Create a Timer with time and callback

Timer(unsigned long int ms, CallbackType callback, bool isSingle); Create a Timer with time, callback and set if is single shot

void setInterval(unsigned long int ms); - Set callback interval

void setEnabled(bool Enabled); - Set if the timer is Enabled.

void setSingleShot(bool isSingle); - If isSingle is True, the callback will be called once, until you call Start() or Resume() again

void setOnTimer(CallbackType callback); - Set function callback

void Start(); - Start the Timer. Will count the interval from the moment that you start it. If the timer is paused, it will restart the Timer.

void Resume(); - Resume the Timer. If not started, will start it. If paused, will resume it. For example, in a timer of 5 seconds, if it was paused in 3 seconds, the resume will continue in 3 seconds.

void Pause(); - Pause the timer, so you can resume it later.

void Stop(); - Stop the timer.

void Update(); - Must to be called in the loop(), will check the timer, and if necessary, will run the callback

unsigned long int getInterval(); - Get the interval

unsigned long int getCurrentTime(); - Get time passed since the last tick

CallBackType getOnTimerCallback(); - Get the Timer Callback

bool isEnabled(); - Check if the Timer is enabled

bool isSingleShot(); - Check if it is Single Shot

This module can be used to read distance with ultrasonic on Arduino. This module was tested with:

- HC-SR04

It'll probably work with similar components. If you test it a component not listed here, please add a comment in my blog, open a pull request or edit this file to share if it's working or if you are getting some error.

Simple Example

Include the library

```
#include "Ultrasonic.h"
```

Create a new Ultrasonic object

```
Ultrasonic *ult = new Ultrasonic(A5, A4); //TRIGGER_PIN and ECHO_PIN
```

Now you can use any method on **void loop()**

```
Serial.println(ult->readDistanceCM());
```

Full example - Distance

```
#include "Ultrasonic.h"

Ultrasonic *ult = new Ultrasonic(A5, A4);

void setup() {
    Serial.begin(9600);
}
```

```
void loop() {  
    Serial.print("Raw distance = ");  
    Serial.print(ult->readDistanceRaw());  
    Serial.print(" - Distance(CM) = ");  
    Serial.println(ult->readDistanceCM());  
    delay(500);  
}
```

Methods

Ultrasonic(int T_PIN, int E_PIN); - Create the Ultrasonic object

void setupPINS(); - If you change any PIN value, you'll need to run this method to update it

void setTriggerPIN(int T_PIN); - Set the TRIGGER_PIN

void setEchoPIN(int E_PIN); - Set the ECHO_PIN

int getTriggerPIN(); - Get the TRIGGER_PIN

int getEchoPIN(); - Get the ECHO_PIN

float readDistanceCM(); - Read the distance in CM

float readDistanceRaw(); - Read the raw value returned by the sensor

CHAPTER 10

Helpers

BluetoothArduinoHelper

See the old docs for a while. I'll work on this one ASAP.

<https://github.com/aron-bordin/Android-with-Arduino-Bluetooth>

TODO

CHAPTER 11

Contribute

This library still under development. We need help adding new components and testing with different Arduino and components versions. Any help will be appreciated :)

If you are a company, we can get you own items and integrate with .PNG Arduino Framework. If you are a developer, you can help us with the source code :)

CHAPTER 12

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Version 3, 29 June 2007

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