CHIP-8 Emulator

0.3

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Chapter 1

Class Index

1.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 2

File Index

2.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 3

Class Documentation

3.1 Chip8 Class Reference

CHIP-8 Emulator.

`#include <Chip8.h>`

Public Member Functions

- Chip8 ()
  Constructor: Initializes the CHIP-8 emulator.
- ~Chip8 ()=default
  Default destructor.
- std::array< uint8_t, NUM_KEYS > get_keypad () const
  Get the current state of the keypad.
- std::array< uint32_t, VIDEO_HEIGHT *VIDEO_WIDTH > get_video () const
  Get the current state of the video display.
- void LoadROM (const std::string &filename)
  Loads a ROM file into memory.
- void OP_00E0 ()
  Clears the display.
- void OP_00EE ()
  Returns from a subroutine.
- void OP_1nnn ()
  Jumps to address NNN.
- void OP_2nnn ()
  Calls subroutine at address NNN.
- void OP_3xkk ()
  Skips next instruction if Vx == kk.
- void OP_4xkk ()
  Skips next instruction if Vx != kk.
- void OP_5xy0 ()
  Skips next instruction if Vx == Vy.
- void OP_6xkk ()
  Sets Vx = kk.

- void OP_7xkk ()

  Sets Vx = Vx + kk.
- void OP_8xy0 ()

  Sets Vx = Vy.
- void OP_8xy1 ()

  Performs bitwise OR: Vx = Vx | Vy.
- void OP_8xy2 ()

  Performs bitwise AND: Vx = Vx & Vy.
- void OP_8xy3 ()

  Performs bitwise XOR: Vx = Vx ^ Vy.
- void OP_8xy4 ()

  Adds Vx and Vy, storing result in Vx and setting VF if overflow occurs.
- void OP_8xy5 ()

  Subtracts Vy from Vx, storing result in Vx and setting VF to NOT borrow.
- void OP_8xy6 ()

  Shifts Vx right by 1, storing the least significant bit in VF.
- void OP_8xy7 ()

  Sets Vx = Vy - Vx, setting VF to NOT borrow.
- void OP_8xyE ()

  Shifts Vx left by 1, storing the most significant bit in VF.
- void OP_9xy0 ()

  Skips next instruction if Vx != Vy.
- void OP_Annn ()

  Sets I = NNN.
- void OP_Bnnn ()

  Jumps to location NNN + V0.
- void OP_Cxkk ()

  Sets Vx = random byte & kk.
- void OP_Dxyn ()

  Draws a sprite at coordinate (Vx, Vy).
- void OP_Ex9E ()

  Skips next instruction if key Vx is pressed.
- void OP_ExA1 ()

  Skips next instruction if key Vx is not pressed.
- void OP_Fx07 ()

  Sets Vx to the value of the delay timer.
- void OP_Fx0A ()

  Waits for a key press and stores the value in Vx.
- void OP_Fx0A_optimized ()

  Optimized version of OP_Fx0A.
- void OP_Fx15 ()

  Sets the delay timer to Vx.
- void OP_Fx18 ()

  Sets the sound timer to Vx.
- void OP_Fx1E ()

  Sets I = I + Vx.
- void OP_Fx29 ()

  Sets I to the location of the sprite for digit Vx.
- void OP_Fx33 ()

  Stores the BCD representation of Vx at memory locations I, I+1, and I+2.
- void OP_Fx55 ()

Stores registers V0 through Vx in memory starting at I.

- void OP_Fx65 ()

  Reads registers V0 through Vx from memory starting at I.

- void Table0 ()

  Handles OP_00E∗ opcode.

- void Table8 ()

  Handles OP_8xy∗ opcode.

- void TableE ()

  Handles OP_Ex∗∗ opcode.

- void TableF ()

  Handles OP_Fx∗∗ opcode.

- void OP_NULL ()

  Handles unimplemented opcodes (NOP).

- void Cycle ()

  Executes one cycle of the CHIP-8 CPU.

Friends

- class TestChip8

  Allows TestChip8 to access private members for unit testing.

3.1.1 Detailed Description

CHIP-8 Emulator.

This class emulates a CHIP-8 CPU, providing methods to load ROMs, execute instructions, and interact with the display and keypad.

3.1.2 Member Function Documentation

3.1.2.1 get_keypad()

```
std::array<uint8_t, NUM_KEYS> Chip8::get_keypad ( ) const  [inline]
```

Get the current state of the keypad.

Returns

An array representing the keypad state (pressed keys).

3.1.2.2 get_video()

```
std::array<uint32_t, VIDEO_HEIGHT * VIDEO_WIDTH> Chip8::get_video ( ) const  [inline]
```

Get the current state of the video display.

Returns

An array representing the monochrome 64x32 display.

3.1.2.3 LoadROM()

```
void Chip8::LoadROM (
            const std::string & filename )
```

Loads a ROM file into memory.

Parameters

filename	Path to the ROM file.

3.1.2.4 OP_Dxyn()

```
void Chip8::OP_Dxyn ( )
```

Draws a sprite at coordinate (Vx, Vy).

The sprite is `n` bytes in height and starts at memory location I. VF is set to 1 if any pixels are erased due to collision.

3.1.2.5 OP_Fx0A()

```
void Chip8::OP_Fx0A ( )
```

Waits for a key press and stores the value in Vx.

Execution pauses until a key is pressed.

The documentation for this class was generated from the following files:

- include/Chip8.h
- src/chip8/Chip8.cpp
- src/chip8/Opcodes.cpp

3.2 Platform Class Reference

Handles the window, rendering, and input for the CHIP-8 emulator using SDL.

`#include <Platform.h>`

Public Member Functions

- Platform (const char *title, int windowWidth, int windowHeight, int textureWidth, int textureHeight)

  Constructs a Platform object.
- ~Platform ()

  Destroys the Platform object and cleans up SDL resources.
- void Update (const void *buffer, int pitch)

  Updates the display with new pixel data.
- bool ProcessInput (uint8_t *keys)

  Processes user input and updates the CHIP-8 keypad state.

Friends

- class TestPlatform

3.2.1 Detailed Description

Handles the window, rendering, and input for the CHIP-8 emulator using SDL.

3.2.2 Constructor & Destructor Documentation

3.2.2.1 Platform()

```
Platform::Platform (
            const char * title,
            int windowWidth,
            int windowHeight,
            int textureWidth,
            int textureHeight )
```

Constructs a Platform object.

Parameters

title	The title of the window.
windowWidth	The width of the window in pixels.
windowHeight	The height of the window in pixels.
textureWidth	The width of the CHIP-8 screen texture.
textureHeight	The height of the CHIP-8 screen texture.

3.2.3 Member Function Documentation

3.2.3.1 ProcessInput()

```
bool Platform::ProcessInput (
            uint8_t * keys )
```

Processes user input and updates the CHIP-8 keypad state.

Parameters

keys	Pointer to the CHIP-8 keypad state array (16 keys).

Returns

True if the user wants to quit, otherwise false.

3.2.3.2 Update()

```
void Platform::Update (
            const void * buffer,
            int pitch )
```

Updates the display with new pixel data.

Parameters

buffer	A pointer to the pixel data buffer.
pitch	The number of bytes per row in the buffer.

3.2.4 Friends And Related Function Documentation

3.2.4.1 TestPlatform

```
friend class TestPlatform  [friend]
```

Allows unit tests to access private members.

The documentation for this class was generated from the following files:

- include/Platform.h
- src/platform/Platform.cpp

Chapter 4

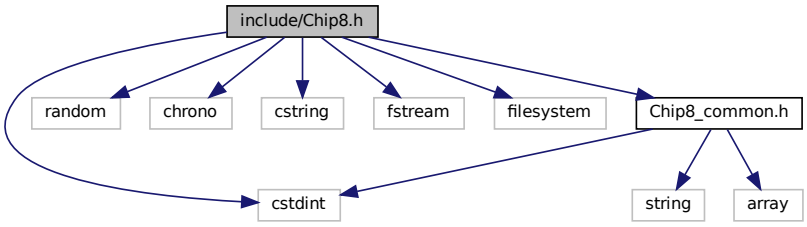
File Documentation

4.1 include/Chip8.h File Reference

CHIP-8 Emulator Class.

```
#include <cstdint>
#include <random>
#include <chrono>
#include <cstring>
#include <fstream>
#include <filesystem>
#include "Chip8_common.h"
```

Include dependency graph for Chip8.h:



Classes

- class Chip8

  CHIP-8 Emulator.

4.1.1 Detailed Description

CHIP-8 Emulator Class.

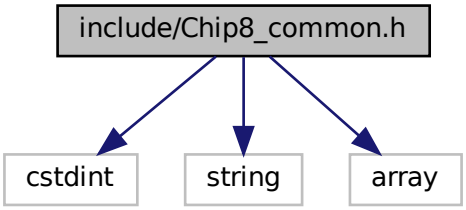
This file contains the declaration of the Chip8 class, which emulates a CHIP-8 system. The class provides functionality to load ROMs, execute instructions, and manage memory, registers, and timers.

4.2 include/Chip8_common.h File Reference

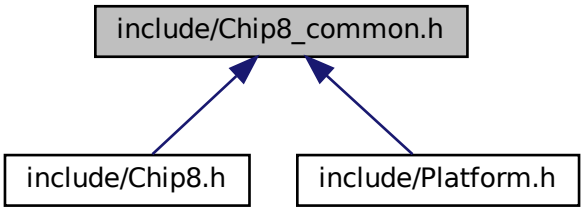
Constant values, useful for building the emulator.

```
#include <cstdint>
#include <string>
#include <array>
```

Include dependency graph for Chip8_common.h:



This graph shows which files directly or indirectly include this file:



Variables

- const int DEFAULT_VIDEO_SCALE = 10

  Default video scaling factor for rendering.
- const int DEFAULT_CYCLE_DELAY = 1

  Default cycle delay for the emulator (in milliseconds).
- const unsigned int START_ADDRESS = 0x200

  Start address in memory where CHIP-8 programs are loaded.
- const unsigned int FONTSET_START_ADDRESS = 0x50

  Memory address where the CHIP-8 fontset starts.
- const unsigned int FONT_SIZE = 5

  Size (in bytes) of each character in the fontset.
- const unsigned int MEMORY_SIZE = 4096

Total size of CHIP-8 memory (4KB).

- const unsigned int VIDEO_WIDTH = 64

  Width of the CHIP-8 display (in pixels).

- const unsigned int VIDEO_HEIGHT = 32

  Height of the CHIP-8 display (in pixels).

- const unsigned int FONTSET_SIZE = 80

  Total size of the CHIP-8 fontset (in bytes).

- constexpr std::array< uint8_t, FONTSET_SIZE > fontset

  CHIP-8 built-in fontset.

- const unsigned int NUM_REGISTERS = 16

  Number of general-purpose registers (V0-VF).

- const unsigned int STACK_SIZE = 16

  Stack size for subroutine calls (16 levels).

- const unsigned int NUM_KEYS = 16

  Number of keys in the CHIP-8 hexadecimal keypad (0-F).

4.2.1 Detailed Description

Constant values, useful for building the emulator.

This file contains the declaration of the Chip8 global values, to build the CHIP-8 system.

4.2.2 Variable Documentation

4.2.2.1 fontset

```
constexpr std::array<uint8_t, FONTSET_SIZE> fontset  [constexpr]
```

Initial value:

```
= {
    0xF0, 0x90, 0x90, 0x90, 0xF0,
    0x20, 0x60, 0x20, 0x20, 0x70,
    0xF0, 0x10, 0xF0, 0x80, 0xF0,
    0xF0, 0x10, 0xF0, 0x10, 0xF0,
    0x90, 0x90, 0xF0, 0x10, 0x10,
    0xF0, 0x80, 0xF0, 0x10, 0xF0,
    0xF0, 0x80, 0xF0, 0x90, 0xF0,
    0xF0, 0x10, 0x20, 0x40, 0x40,
    0xF0, 0x90, 0xF0, 0x90, 0xF0,
    0xF0, 0x90, 0xF0, 0x10, 0xF0,
    0xF0, 0x90, 0xF0, 0x90, 0x90,
    0xE0, 0x90, 0xE0, 0x90, 0xE0,
    0xF0, 0x80, 0x80, 0x80, 0xF0,
    0xE0, 0x90, 0x90, 0x90, 0xE0,
    0xF0, 0x80, 0xF0, 0x80, 0xF0,
    0xF0, 0x80, 0xF0, 0x80, 0x80
}
```

CHIP-8 built-in fontset.

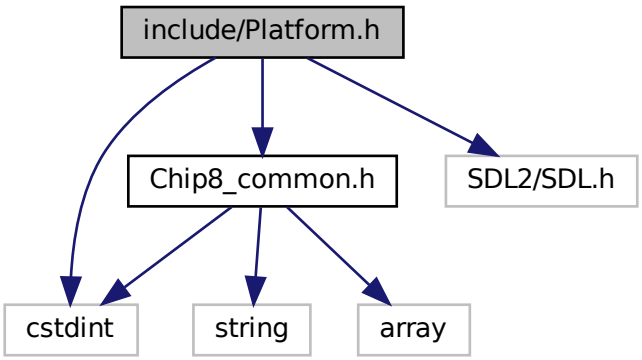
This array stores the 16 hexadecimal characters (0-F) used for rendering.

4.3 include/Platform.h File Reference

Platform and input output handling Class.

```
#include "Chip8_common.h"
#include <cstdint>
#include <SDL2/SDL.h>
```

Include dependency graph for Platform.h:



Classes

- class Platform

  Handles the window, rendering, and input for the CHIP-8 emulator using SDL.

4.3.1 Detailed Description

Platform and input output handling Class.

This file contains the declaration of the Platform class, which emulates the keypad and the screen. The class provides functionality to update the screen and the keys input.