Reaction_game

v1.0

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Contents

Chapter 1

Blinking Reaction Game

1.1 Introduction

This game is developed with the Miosix kernel and made for the discoveryboard STM32F407G. It is a project for Embedded Systems 1 and Advanced Operating Systems of prof. William Fornaciari at the Politecnico di Milano.

1.2 Gameplay

The game starts when the player pushes on the button. To emphasize the start of the game, the four LED's will blink once. From then on each button push can cause gameover. The blinking ritual will start with the blue LED and goes random clockwise or counterclockwise. The main issue of the game is pushing the button when the LED (blue/green/orange/red) blinks twice. If the player pushes the button correctly the time between the blinks will be shorter and consequentely the game will become more difficult. If the player pushes the button to late or in a wrong situation then the board will play a buzzer sound or a high score sound. After the buzzer/high score sound, the game will start over again with blinking the LED's 3 times. Have Fun!

1.3 Improvements

Some improvements are listed in the issue area of the git repository. They are signed with the label "extra feature".

Chapter 2

Reaction_game

This game is developed with the Miosix kernel and made for the discoveryboard STM32F407G. It is a project for Embedded Systems 1 and Advanced Operating Systems of prof. William Fornaciari at the Politecnico di Milano.

Miosix_kernel

You can find information on how to configure and use the kernel at the following url: http://miosix.org

Chapter 3

Hierarchical Index

3.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 4

Class Index

4.1 Class List

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

Chapter 5

File Index

5.1 File List

Here is a list of all files with brief descriptions:

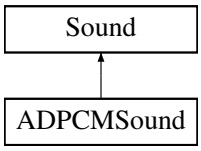
Chapter 6

Class Documentation

6.1 ADPCMSound Class Reference

`#include <player.h>`

Inheritance diagram for ADPCMSound:



Public Member Functions

- ADPCMSound (const unsigned char *data, int size)
- virtual bool fillMonoBuffer (unsigned short *buffer, int size)
- virtual bool fillStereoBuffer (unsigned short *buffer, int length)
- virtual void rewind ()

6.1.1 Detailed Description

Class to play a buffer contatinig ADPCM compressed audio

6.1.2 Constructor & Destructor Documentation

6.1.2.1 ADPCMSound()

```
ADPCMSound::ADPCMSound (
            const unsigned char * data,
            int size )  [inline]
```

Constructor

Parameters

data	ADPCM encoded data. Ownership of the buffer remains of the caller, which is responsible to make sure it remains valid for the entire lifetime of this class. This is not a problem in the expected use case of the buffer being const and static
size	size of data

6.1.3 Member Function Documentation

6.1.3.1 fillMonoBuffer()

```
bool ADPCMSound::fillMonoBuffer (
            unsigned short * buffer,
            int size )  [virtual]
```

Fill a buffer with audio samples

Parameters

buffer	a buffer where audio samples (16bit unsigned, 44100Hz) are to be stored. If there is not enough data to fill the entire buffer the remaining part must be filled with 0
length	buffer length, must be divisible by two

Returns

true if this is the last valif buffer (eof encountered)

Implements Sound.

6.1.3.2 fillStereoBuffer()

```
bool ADPCMSound::fillStereoBuffer (
            unsigned short * buffer,
            int length )  [virtual]
```

Fill a stereo buffer with audio samples

Parameters

buffer	a buffer where audio samples (16bit unsigned, 44100Hz) are to be stored. If there is not enough data to fill the entire buffer. The buffer format is alternating left-right samples, so buffer[0] is left buffer[1] is right, buffer[2] is again left... the remaining part must be filled with 0
length	buffer length, must be divisible by four

Returns

true if this is the last valif buffer (eof encountered)

Implements Sound.

6.1.3.3 rewind()

```
void ADPCMSound::rewind ( )  [virtual]
```

Rewind the internal sound pointer so that succesive calls to fillBuffer() start brom the beginning of the sound.

Implements Sound.

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

- player.h
- player.cpp

6.2 Player Class Reference

```
#include <player.h>
```

Public Member Functions

- void play (Sound &sound)
- bool isPlaying () const

Static Public Member Functions

- static Player & instance ()

6.2.1 Detailed Description

Class to play an audio file on the STM32's DAC

6.2.2 Member Function Documentation

6.2.2.1 instance()

```
Player & Player::instance ( )  [static]
```

Returns

an instance of the player (singleton)

6.2.2.2 isPlaying()

```
bool Player::isPlaying ( ) const
```

Returns

true if the resource is busy

6.2.2.3 play()

```
void Player::play (
            Sound & sound )
```

Play an audio file, returning after the file has coompleted playing

Parameters

sound	sound file to play

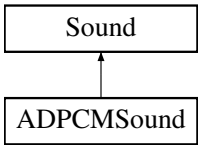
The documentation for this class was generated from the following files:

- player.h
- player.cpp

6.3 Sound Class Reference

```
#include <player.h>
```

Inheritance diagram for Sound:



Public Member Functions

- virtual bool fillMonoBuffer (unsigned short *buffer, int length)=0
- virtual bool fillStereoBuffer (unsigned short *buffer, int length)=0
- virtual void rewind ()=0
- virtual ~Sound ()

6.3.1 Detailed Description

Interface class from where all sound classes derive

6.3.2 Constructor & Destructor Documentation

6.3.2.1 ~Sound()

```
Sound::~Sound ( )  [virtual]
```

Destructor

6.3.3 Member Function Documentation

6.3.3.1 fillMonoBuffer()

```
virtual bool Sound::fillMonoBuffer (
            unsigned short * buffer,
            int length )  [pure virtual]
```

Fill a buffer with audio samples

Parameters

buffer	a buffer where audio samples (16bit unsigned, 44100Hz) are to be stored. If there is not enough data to fill the entire buffer the remaining part must be filled with 0
length	buffer length, must be divisible by two

Returns

true if this is the last valif buffer (eof encountered)

Implemented in ADPCMSound.

6.3.3.2 fillStereoBuffer()

```
virtual bool Sound::fillStereoBuffer (
            unsigned short * buffer,
            int length )  [pure virtual]
```

Fill a stereo buffer with audio samples

Parameters

buffer	a buffer where audio samples (16bit unsigned, 44100Hz) are to be stored. If there is not enough data to fill the entire buffer. The buffer format is alternating left-right samples, so buffer[0] is left buffer[1] is right, buffer[2] is again left... the remaining part must be filled with 0
length	buffer length, must be divisible by four

Returns

true if this is the last valif buffer (eof encountered)

Implemented in ADPCMSound.

6.3.3.3 rewind()

```
virtual void Sound::rewind ( )  [pure virtual]
```

Rewind the internal sound pointer so that succesive calls to fillBuffer() start brom the beginning of the sound.

Implemented in ADPCMSound.

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

- player.h
- player.cpp

Chapter 7

File Documentation

7.1 adpcm.c File Reference

```
#include "adpcm.h"
```

Functions

- uint8_t ADPCM_Encode (int32_t sample)

  ADPCM_Encode.
- int16_t ADPCM_Decode (uint8_t code)

  ADPCM_Decode.

Variables

- const uint16_t StepSizeTable [89]
- const int8_t IndexTable [16] ={0xff,0xff,0xff,0xff,2,4,6,8,0xff,0xff,0xff,0xff,2,4,6,8}

7.1.1 Function Documentation

7.1.1.1 ADPCM_Decode()

```
int16_t ADPCM_Decode (
            uint8_t code )
```

ADPCM_Decode.

Parameters

code	a byte containing a 4-bit ADPCM sample.

Return values

	16-bit ADPCM sample

7.1.1.2 ADPCM_Encode()

```
uint8_t ADPCM_Encode (
            int32_t sample )
```

ADPCM_Encode.

Parameters

sample	a 16-bit PCM sample

Return values

	a 4-bit ADPCM sample

7.1.2 Variable Documentation

7.1.2.1 IndexTable

```
const int8_t IndexTable[16] ={0xff,0xff,0xff,0xff,2,4,6,8,0xff,0xff,0xff,0xff,2,4,6,8}
```

7.1.2.2 StepSizeTable

```
const uint16_t StepSizeTable[89]
```

Initial value:

```
={7,8,9,10,11,12,13,14,16,17,
                          19,21,23,25,28,31,34,37,41,45,
                          50,55,60,66,73,80,88,97,107,118,
                          130,143,157,173,190,209,230,253,279,307,
                          337,371,408,449,494,544,598,658,724,796,
                          876,963,1060,1166,1282,1411,1552,1707,1878,2066,
                          2272,2499,2749,3024,3327,3660,4026,4428,4871,5358,
                          5894,6484,7132,7845,8630,9493,10442,11487,12635,13899,
                          15289,16818,18500,20350,22385,24623,27086,29794,32767}
```

7.2 adpcm.d File Reference

7.3 adpcm.h File Reference

```
#include <stdint.h>
```

Functions

- uint8_t ADPCM_Encode (int32_t sample)
  ADPCM_Encode.
- int16_t ADPCM_Decode (uint8_t code)
  ADPCM_Decode.

7.3.1 Function Documentation

7.3.1.1 ADPCM_Decode()

```
int16_t ADPCM_Decode (
            uint8_t code )
```

ADPCM_Decode.

Parameters

code	a byte containing a 4-bit ADPCM sample.

Return values

	16-bit ADPCM sample

7.3.1.2 ADPCM_Encode()

```
uint8_t ADPCM_Encode (
            int32_t sample )
```

ADPCM_Encode.

Parameters

sample	a 16-bit PCM sample

Return values

	a 4-bit ADPCM sample

7.4 button.cpp File Reference

```
#include "button.h"
#include <miosix.h>
#include <miosix/kernel/scheduler/scheduler.h>
#include <pthread.h>
```

Typedefs

- typedef Gpio< GPIOA_BASE, 0 > button

Functions

- void __attribute__ ((naked)) EXTI0_IRQHandler()
- void __attribute__ ((used)) EXTI0HandlerImpl()
- void configureButtonInterrupt ()
- void waitForButton ()

Variables

- pthread_mutex_t mutex
- bool action

7.4.1 Detailed Description

Author

Federico Terraneo
Simon Mastrodicasa
Arne Vlietinck

Version

1.0

Date

30/12/2017

7.4.2 Typedef Documentation

7.4.2.1 button

```
typedef Gpio<GPIOA_BASE,0> button
```

7.4.3 Function Documentation

7.4.3.1 __attribute__() [1/2]

```
void __attribute__ (
             (naked)  )
```

7.4.3.2 __attribute__() [2/2]

```
void __attribute__ (
             (used)  )
```

7.4.3.3 configureButtonInterrupt()

```
void configureButtonInterrupt ( )
```

7.4.3.4 waitForButton()

```
void waitForButton ( )
```

7.4.4 Variable Documentation

7.4.4.1 action

```
bool action
```

Boolean which represents the action of a player. If (action==true), the player did an action. Elseif (action==false), the player didn't do an action.

7.4.4.2 mutex

```
pthread_mutex_t mutex
```

A pthread_mutex_t variable to prevent a race condition when changing action.

7.5 button.d File Reference

7.6 button.h File Reference

Functions

- void configureButtonInterrupt ()
- void waitForButton ()

7.6.1 Detailed Description

Author

Federico Terraneo
Simon Mastrodicasa
Arne Vlietinck

Version

1.0

Date

30/12/2017

7.6.2 Function Documentation

7.6.2.1 configureButtonInterrupt()

```
void configureButtonInterrupt ( )
```

7.6.2.2 waitForButton()

```
void waitForButton ( )
```

7.7 Buzzer.h File Reference

The h-file for the buzzer sound. It contains the buzzer_bin[], which representates the char array for the buzzer sound to emphasize the fault of the player.

Variables

- const unsigned char buzzer_bin [ ]
- const unsigned int buzzer_bin_len = 67392

7.7.1 Detailed Description

The h-file for the buzzer sound. It contains the buzzer_bin[], which representates the char array for the buzzer sound to emphasize the fault of the player.

Author

Simon Mastrodicasa
Arne Vlietinck

Version

1.0

Date

30/12/2017

7.7.2 Variable Documentation

7.7.2.1 buzzer_bin

```
const unsigned char buzzer_bin[]
```

7.7.2.2 buzzer_bin_len

```
const unsigned int buzzer_bin_len = 67392
```

7.8 convert.cpp File Reference

```
#include <iostream>
#include <fstream>
#include <vector>
#include <cstdlib>
#include "adpcm.h"
```

Functions

- void run (const string &s)
- int main (int argc, char ∗argv[ ])

7.8.1 Function Documentation

7.8.1.1 main()

```
int main (
            int argc,
            char * argv[] )
```

7.8.1.2 run()

```
void run (
            const string & s )
```

7.9 game.cpp File Reference

The cpp-file of the gameplay library.

```
#include <miosix.h>
#include <pthread.h>
#include "game.h"
#include "led.h"
#include "player.h"
#include "buzzer.h"
#include "highscore.h"
```

Typedefs

- typedef Gpio< GPIOA_BASE, 0 > button

Functions

- bool shouldBlinkAgain ()
- void buzzerSound ()
- void highscoreSound ()
- void gameOver ()
- int gamePlay (int currentLed, bool clockwise)

Variables

- bool action
- bool game
- bool interaction
- int difficulty
- int level
- int highscore
- pthread_mutex_t mutex

7.9.1 Detailed Description

The cpp-file of the gameplay library.

Author

Simon Mastrodicasa
Arne Vlietinck

Version

1.0

Date

30/12/2017

7.9.2 Typedef Documentation

7.9.2.1 button

```
typedef Gpio<GPIOA_BASE,0> button
```

7.9.3 Function Documentation

7.9.3.1 buzzerSound()

```
void buzzerSound ( )
```

Function which plays the buzzer sound.

7.9.3.2 gameOver()

```
void gameOver ( )
```

Function which does the gameOver ritual.

Postcondition

If and only if (level>highscore), the high score sound is played.
If and only if (level>highscore), highscore is set to level.
If (level<=highscore), the buzzer sound is played.
The gameOver blinking ritual is played.
Game is set to GAMEOVER.

See also

buzzerSound()
highscoreSound()
onOffBlinking()

7.9.3.3 gamePlay()

```
int gamePlay (
            int currentLed,
            bool clockwise )
```

Function which takes care of the gameplay. It checks the several possible conditions and increment or decrement the several game parameters. When the player did a wrong interaction the gameover ritual is started.

Parameters

int	currentled - The number of the current LED.
bool	clockwise - Represents the order of blinking the LED's.

Postcondition

If and only if (interaction==false && shouldBlinkAgain()==true), interaction is set true.
If (interaction==true && action==false), gameOver() is excecuted.
If (interaction==false && action==true), gameOver() is excecuted.
If and only if (interaction==true && action==true), interaction is set false.
If and only if (interaction==true && action==true), action is set false.
If and only if (interaction==true && action==true), difficulty is incremented by one.

If and only if (interaction==true && action==true), level is incremented by one.
If and only if (clockwise==true), currentLed is incremented by one.
If and only if (clockwise!=false), currentLed is decremented by one.
If and only if (currentLed>RED), currentLed is set to the smallest LED (BLUE).
If and only if (currentLed<BLUE), currentLed is set to the biggest LED (RED).

Returns

int currentLed - The number of the current LED.

See also

gameOver()
shouldBlinkAgain();

7.9.3.4 highscoreSound()

```
void highscoreSound ( )
```

Function which plays the high score sound.

7.9.3.5 shouldBlinkAgain()

```
bool shouldBlinkAgain ( )
```

Function which calculate if the LED should blink for a second time.

Returns

Returns a random boolean which tells if the LED should blink again.

Note

The boolean is in 30% of the situations true and in the other 70% false.

7.9.4 Variable Documentation

7.9.4.1 action

```
bool action
```

Boolean which represents the action of a player. If (action==true), the player did an action. Elseif (action==false), the player didn't do an action.

7.9.4.2 difficulty

```
int difficulty
```

Integer which represents the difficulty level of the game. Higher integer means higher degree of difficulty. It affects the time between the blinking LED's.

7.9.4.3 game

```
bool game
```

Boolean which represents the state of the game. If (game==1), the current game is finished. Elseif (game==0), the current game is still running.

7.9.4.4 highscore

```
int highscore
```

Integer which represents the current high score of the game.

7.9.4.5 interaction

```
bool interaction
```

Boolean which represents the need of a players' interaction. When interaction is true, the player must do something (e.g. press the user button) to avoid a game over.

7.9.4.6 level

```
int level
```

Integer which represents the level of the game.

7.9.4.7 mutex

```
pthread_mutex_t mutex
```

A pthread_mutex_t variable to prevent a race condition when changing action.

7.10 game.d File Reference

7.11 game.h File Reference

The h-file of the gameplay library.

Macros

- #define GAMEOVER 1

Functions

- bool shouldBlinkAgain ()
- void buzzerSound ()
- void highscoreSound ()
- void gameOver ()
- int gamePlay (int currentLed, bool clockwise)

7.11.1 Detailed Description

The h-file of the gameplay library.

Author

Simon Mastrodicasa
Arne Vlietinck

Version

1.0

Date

30/12/2017

7.11.2 Macro Definition Documentation

7.11.2.1 GAMEOVER

```
#define GAMEOVER 1
```

7.11.3 Function Documentation

7.11.3.1 buzzerSound()

```
void buzzerSound ( )
```

Function which plays the buzzer sound.

7.11.3.2 gameOver()

```
void gameOver ( )
```

Function which does the gameOver ritual.

Postcondition

If and only if (level>highscore), the high score sound is played.
If and only if (level>highscore), highscore is set to level.
If (level<=highscore), the buzzer sound is played.
The gameOver blinking ritual is played.
Game is set to GAMEOVER.

See also

buzzerSound()
highscoreSound()
onOffBlinking()

7.11.3.3 gamePlay()

```
int gamePlay (
            int currentLed,
            bool clockwise )
```

Function which takes care of the gameplay. It checks the several possible conditions and increment or decrement the several game parameters. When the player did a wrong interaction the gameover ritual is started.

Parameters

int	currentled - The number of the current LED.
bool	clockwise - Represents the order of blinking the LED's.

Postcondition

If and only if (interaction==false && shouldBlinkAgain()==true), interaction is set true.
If (interaction==true && action==false), gameOver() is excecuted.
If (interaction==false && action==true), gameOver() is excecuted.
If and only if (interaction==true && action==true), interaction is set false.
If and only if (interaction==true && action==true), action is set false.
If and only if (interaction==true && action==true), difficulty is incremented by one.
If and only if (interaction==true && action==true), level is incremented by one.
If and only if (clockwise==true), currentLed is incremented by one.
If and only if (clockwise!=false), currentLed is decremented by one.
If and only if (currentLed>RED), currentLed is set to the smallest LED (BLUE).
If and only if (currentLed<BLUE), currentLed is set to the biggest LED (RED).

Returns

int currentLed - The number of the current LED.

See also

gameOver()
shouldBlinkAgain();

7.11.3.4 highscoreSound()

```
void highscoreSound ( )
```

Function which plays the high score sound.

7.11.3.5 shouldBlinkAgain()

```
bool shouldBlinkAgain ( )
```

Function which calculate if the LED should blink for a second time.

Returns

Returns a random boolean which tells if the LED should blink again.

Note

The boolean is in 30% of the situations true and in the other 70% false.

7.12 highscore.h File Reference

The h-file for the high score sound. It contains the highscore_bin[], which representates the char array for the high score sound to emphasize a new high score of the player.

Variables

- const unsigned char highscore_bin [ ]
- const unsigned int highscore_bin_len = 136366

7.12.1 Detailed Description

The h-file for the high score sound. It contains the highscore_bin[], which representates the char array for the high score sound to emphasize a new high score of the player.

Author

Simon Mastrodicasa
Arne Vlietinck

Version

1.0

Date

30/12/2017

7.12.2 Variable Documentation

7.12.2.1 highscore_bin

```
const unsigned char highscore_bin[]
```

7.12.2.2 highscore_bin_len

```
const unsigned int highscore_bin_len = 136366
```

7.13 led.cpp File Reference

The cpp-file of the LED library.

```
#include <miosix.h>
#include "led.h"
#include "game.h"
```

Typedefs

- typedef Gpio< GPIOD_BASE, 12 > greenLed
- typedef Gpio< GPIOD_BASE, 13 > orangeLed
- typedef Gpio< GPIOD_BASE, 14 > redLed
- typedef Gpio< GPIOD_BASE, 15 > blueLed

Functions

- void initLeds ()
- bool clockOrCounterClockWise ()
- int calculateSleepTime (int difficulty)
- void blinkLed (int currentLed, int sleepTime)
- void blinkingClockwise (int currentLed, int sleepTime)
- void blinkingCounterClockwise (int currentLed, int sleepTime)
- void blinkingsequence (int currentLed, int sleepTime, int level)
- void blinkingGame ()
- void turnAllOn ()
- void turnAllOff ()
- void onOffBlinking (int times)

Variables

- bool game
- int difficulty
- int level

7.13.1 Detailed Description

The cpp-file of the LED library.

Author

Simon Mastrodicasa
Arne Vlietinck

Version

1.0

Date

30/12/2017

7.13.2 Typedef Documentation

7.13.2.1 blueLed

```
typedef Gpio<GPIOD_BASE,15> blueLed
```

7.13.2.2 greenLed

```
typedef Gpio<GPIOD_BASE,12> greenLed
```

7.13.2.3 orangeLed

```
typedef Gpio<GPIOD_BASE,13> orangeLed
```

7.13.2.4 redLed

```
typedef Gpio<GPIOD_BASE,14> redLed
```

7.13.3 Function Documentation

7.13.3.1 blinkingClockwise()

```
void blinkingClockwise (
            int currentLed,
            int sleepTime )
```

Function for the clockwise blinking.

Parameters

int	currentLed - The number of the current LED.
int	sleepTime - The sleeptime between the on and off initialistation of the LED.

Postcondition

blinkLed(currentLed, sleepTime)
Sets currentLed to gamePlay(currentLed)

See also

gamePlay()
blinkLed()

7.13.3.2 blinkingCounterClockwise()

```
void blinkingCounterClockwise (
            int currentLed,
            int sleepTime )
```

Function for the counterclockwise blinking.

Parameters

int	currentLed - The number of the current LED.
int	sleepTime - The sleeptime between the on and off initialistation of the LED.

Postcondition

blinkLed(currentLed, sleepTime)
Sets currentLed to gamePlay(currentLed)

See also

gamePlay()
blinkLed()

7.13.3.3 blinkingGame()

```
void blinkingGame ( )
```

Function with the game ritual.

See also

calculateSleepTime(int difficulty)
blinkingsequence(int currentLed, int sleepTime, int level)

7.13.3.4 blinkingsequence()

```
void blinkingsequence (
            int currentLed,
            int sleepTime,
            int level )
```

Function with the gameplay for the blinking sequence.

Parameters

int	currentLed - The number of the current LED.
int	sleepTime - The sleeptime between the on and off initialistation of the LED.
int	level - Specifies the level of the current game.

Postcondition

If and only if (clockOrCounterClockWise() == true), blinkingClockwise() is excecuted.
If and only if (clockOrCounterClockWise() != true), blinkingCounterClockwise() is excecuted.

See also

clockOrCounterClockWise()
blinkingClockwise()
blinkingCounterClockwise()

7.13.3.5 blinkLed()

```
void blinkLed (
            int currentLed,
            int sleepTime )
```

Function which blinks the currentLed (BLUE, GREEN, ORANGE, RED).

Parameters

int	currentLed - The number of the current LED.
int	sleepTime - The sleeptime between the on and off initialistation of the LED.

Postcondition

Repeat the sequence: Turn currentLed high, sleep for sleepTime, turn currentLed low, sleep for sleepTime.

7.13.3.6 calculateSleepTime()

```
int calculateSleepTime (
            int difficulty )
```

Calculate the sleepTime between the on and off initialistation of the LED.

Parameters

int	difficulty - The current difficulty level of the game.

Returns

int sleepTime - The sleepTime between the on and off initialistation of the LED.

7.13.3.7 clockOrCounterClockWise()

```
bool clockOrCounterClockWise ( )
```

Function which calculate if the LED should blink in clock or counterclockwise.

Returns

Returns a random boolean which tells if the LED's should blink in clock or counterclockwise.

7.13.3.8 initLeds()

```
void initLeds ( )
```

Initialisation of the Green, Orange, Red and Blue LED in output mode.

7.13.3.9 onOffBlinking()

```
void onOffBlinking (
            int times )
```

On off blinking ritual by LED's.

Parameters

int	times - Number of times the LED's should blink.

Postcondition

Repeat - times - the sequence: turn all LED's on, sleep for 500ms, turn all LED's off, sleep for 500ms.

7.13.3.10 turnAllOff()

```
void turnAllOff ( )
```

Turn Red, Blue, Green and Orange LED's off.

7.13.3.11 turnAllOn()

```
void turnAllOn ( )
```

Turn Red, Blue, Green and Orange LED's on.

7.13.4 Variable Documentation

7.13.4.1 difficulty

```
int difficulty
```

Integer which represents the difficulty level of the game. Higher integer means higher degree of difficulty. It affects the time between the blinking LED's.

7.13.4.2 game

```
bool game
```

Boolean which represents the state of the game. If (game==1), the current game is finished. Elseif (game==0), the current game is still running.

7.13.4.3 level

```
int level
```

Integer which represents the level of the game.

7.14 led.d File Reference

7.15 led.h File Reference

The h-file of the LED library.

Macros

- #define BLUE 1
- #define GREEN 2
- #define ORANGE 3
- #define RED 4

Functions

- void initLeds ()
- bool clockOrCounterClockWise ()
- int calculateSleepTime (int difficulty)
- void blinkLed (int currentLed, int sleepTime)
- void blinkingClockwise (int currentLed, int sleepTime)
- void blinkingCounterClockwise (int currentLed, int sleepTime)
- void blinkingsequence (int currentLed, int sleepTime, int level)
- void blinkingGame ()
- void turnAllOn ()
- void turnAllOff ()
- void onOffBlinking (int times)

7.15.1 Detailed Description

The h-file of the LED library.

Author

Simon Mastrodicasa
Arne Vlietinck

Version

1.0

Date

30/12/2017

7.15.2 Macro Definition Documentation

7.15.2.1 BLUE

```
#define BLUE 1
```

7.15.2.2 GREEN

```
#define GREEN 2
```

7.15.2.3 ORANGE

```
#define ORANGE 3
```

7.15.2.4 RED

```
#define RED 4
```

7.15.3 Function Documentation

7.15.3.1 blinkingClockwise()

```
void blinkingClockwise (
            int currentLed,
            int sleepTime )
```

Function for the clockwise blinking.

Parameters

int	currentLed - The number of the current LED.
int	sleepTime - The sleeptime between the on and off initialistation of the LED.

Postcondition

blinkLed(currentLed, sleepTime)
Sets currentLed to gamePlay(currentLed)

See also

gamePlay()
blinkLed()

7.15.3.2 blinkingCounterClockwise()

```
void blinkingCounterClockwise (
            int currentLed,
            int sleepTime )
```

Function for the counterclockwise blinking.

Parameters

int	currentLed - The number of the current LED.
int	sleepTime - The sleeptime between the on and off initialistation of the LED.

Postcondition

blinkLed(currentLed, sleepTime)
Sets currentLed to gamePlay(currentLed)

See also

gamePlay()
blinkLed()

7.15.3.3 blinkingGame()

```
void blinkingGame ( )
```

Function with the game ritual.

See also

calculateSleepTime(int difficulty)
blinkingsequence(int currentLed, int sleepTime, int level)

7.15.3.4 blinkingsequence()

```
void blinkingsequence (
            int currentLed,
            int sleepTime,
            int level )
```

Function with the gameplay for the blinking sequence.

Parameters

int	currentLed - The number of the current LED.
int	sleepTime - The sleeptime between the on and off initialistation of the LED.
int	level - Specifies the level of the current game.

Postcondition

If and only if (clockOrCounterClockWise() == true), blinkingClockwise() is excecuted.
If and only if (clockOrCounterClockWise() != true), blinkingCounterClockwise() is excecuted.

See also

clockOrCounterClockWise()
blinkingClockwise()
blinkingCounterClockwise()

7.15.3.5 blinkLed()

```
void blinkLed (
            int currentLed,
            int sleepTime )
```

Function which blinks the currentLed (BLUE, GREEN, ORANGE, RED).

Parameters

int	currentLed - The number of the current LED.
int	sleepTime - The sleeptime between the on and off initialistation of the LED.

Postcondition

Repeat the sequence: Turn currentLed high, sleep for sleepTime, turn currentLed low, sleep for sleepTime.

7.15.3.6 calculateSleepTime()

```
int calculateSleepTime (
            int difficulty )
```

Calculate the sleepTime between the on and off initialistation of the LED.

Parameters

int	difficulty - The current difficulty level of the game.

Returns

int sleepTime - The sleepTime between the on and off initialistation of the LED.

7.15.3.7 clockOrCounterClockWise()

```
bool clockOrCounterClockWise ( )
```

Function which calculate if the LED should blink in clock or counterclockwise.

Returns

Returns a random boolean which tells if the LED's should blink in clock or counterclockwise.

7.15.3.8 initLeds()

```
void initLeds ( )
```

Initialisation of the Green, Orange, Red and Blue LED in output mode.

7.15.3.9 onOffBlinking()

```
void onOffBlinking (
            int times )
```

On off blinking ritual by LED's.

Parameters

int	times - Number of times the LED's should blink.

Postcondition

Repeat - times - the sequence: turn all LED's on, sleep for 500ms, turn all LED's off, sleep for 500ms.

7.15.3.10 turnAllOff()

```
void turnAllOff ( )
```

Turn Red, Blue, Green and Orange LED's off.

7.15.3.11 turnAllOn()

```
void turnAllOn ( )
```

Turn Red, Blue, Green and Orange LED's on.

7.16 main.cpp File Reference

```
#include <miosix.h>
#include <pthread.h>
#include "led.h"
#include "game.h"
#include "player.h"
#include "button.h"
```

Functions

- void mainInitialisation ()
- void reInitialisation ()
- int main ()

Variables

- bool game
- bool interaction
- bool action
- int difficulty
- int level
- int highscore
- pthread_mutex_t mutex =PTHREAD_MUTEX_INITIALIZER

7.16.1 Detailed Description

Author

Simon Mastrodicasa
Arne Vlietinck

Version

1.0

Date

30/12/2017

7.16.2 Function Documentation

7.16.2.1 main()

```
int main ( )
```

7.16.2.2 mainInitialisation()

```
void mainInitialisation ( )
```

Initialisation process of the main.

Postcondition

The LED's are initialised.
The button is initialised.
highscore is set to 0.

See also

initLeds()
configureButtonInterrupt()

7.16.2.3 reInitialisation()

```
void reInitialisation ( )
```

Reinitialisation process of the main. This is used to reset the game without a complete reset by using the computer.

Postcondition

Difficulty is set on 1.
Interaction is set on false.
Action is set on false while protected by mutex.
Game is set on 0.
Level is set on 0.
onOffBlinking(1) is executed.

See also

onOffBlinking()

7.16.3 Variable Documentation

7.16.3.1 action

```
bool action
```

Boolean which represents the action of a player. If (action==true), the player did an action. Elseif (action==false), the player didn't do an action.

7.16.3.2 difficulty

```
int difficulty
```

Integer which represents the difficulty level of the game. Higher integer means higher degree of difficulty. It affects the time between the blinking LED's.

7.16.3.3 game

```
bool game
```

Boolean which represents the state of the game. If (game==1), the current game is finished. Elseif (game==0), the current game is still running.

7.16.3.4 highscore

```
int highscore
```

Integer which represents the current high score of the game.

7.16.3.5 interaction

```
bool interaction
```

Boolean which represents the need of a players' interaction. When interaction is true, the player must do something (e.g. press the user button) to avoid a game over.

7.16.3.6 level

```
int level
```

Integer which represents the level of the game.

7.16.3.7 mutex

```
pthread_mutex_t mutex =PTHREAD_MUTEX_INITIALIZER
```

A pthread_mutex_t variable to prevent a race condition when changing action.

7.17 main.d File Reference

7.18 player.cpp File Reference

```
#include <algorithm>
#include <stdexcept>
#include <cstring>
#include "miosix/kernel/scheduler/scheduler.h"
#include "util/software_i2c.h"
#include "adpcm.h"
#include "player.h"
```

Typedefs

- typedef Gpio< GPIOB_BASE, 6 > scl
- typedef Gpio< GPIOB_BASE, 9 > sda
- typedef Gpio< GPIOA_BASE, 4 > lrck
- typedef Gpio< GPIOC_BASE, 7 > mclk
- typedef Gpio< GPIOC_BASE, 10 > sclk
- typedef Gpio< GPIOC_BASE, 12 > sdin
- typedef Gpio< GPIOD_BASE, 4 > reset
- typedef SoftwareI2C< sda, scl > i2c

Functions

- void __attribute__ ((naked)) DMA1_Stream5_IRQHandler()
- void __attribute__ ((used)) I2SdmaHandlerImpl()
- void cs43l22volume (int db)

7.18.1 Typedef Documentation

7.18.1.1 i2c

```
typedef SoftwareI2C<sda,scl> i2c
```

7.18.1.2 lrck

```
typedef Gpio<GPIOA_BASE,4> lrck
```

7.18.1.3 mclk

```
typedef Gpio<GPIOC_BASE,7> mclk
```

7.18.1.4 reset

```
typedef Gpio<GPIOD_BASE,4> reset
```

7.18.1.5 scl

```
typedef Gpio<GPIOB_BASE,6> scl
```

7.18.1.6 sclk

```
typedef Gpio<GPIOC_BASE,10> sclk
```

7.18.1.7 sda

```
typedef Gpio<GPIOB_BASE,9> sda
```

7.18.1.8 sdin

```
typedef Gpio<GPIOC_BASE,12> sdin
```

7.18.2 Function Documentation

7.18.2.1 __attribute__() [1/2]

```
void __attribute__ (
             (naked)  )
```

DMA end of transfer interrupt

7.18.2.2 __attribute__() [2/2]

```
void __attribute__ (
             (used)  )
```

DMA end of transfer interrupt actual implementation

7.18.2.3 cs43l22volume()

```
void cs43l22volume (
             int db )
```

Parameters

db	volume level in db (0 to -102). Warning: 0db volume is LOUD!

Returns

value to store in register 0x20 and 0x21

7.19 player.d File Reference

7.20 player.h File Reference

```
#include "miosix.h"
```

Classes

- class Sound
- class ADPCMSound
- class Player

7.21 README.md File Reference

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