AVRCubeRev2

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Chapter 1

File Index

1.1 File List

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

Chapter 2

File Documentation

2.1 /Users/FabianFranz/Development/Projects/AVRCubeRev2/AvrCube↩ V2Code/src/main.hpp File Reference

Implementation of functionality for the "Cube Project".

```
#include <math.h>
#include <stdlib.h>
#include <avr/io.h>
#include <avr/sleep.h>
#include <util/delay.h>
#include <avr/interrupt.h>
```

Macros

- #define **F_CPU** 8000000
- #define **__DELAY_BACKWARD_COMPATIBLE__**
- #define **BUTTON** PB2
- #define **D1** PA0
- #define **D2** PA1
- #define **D3** PA2
- #define **D4** PA3
- #define **D5** PA5
- #define **D6** PA7
- #define **D7** PB1
- #define **SCK** PA4
- #define **MISO** PA5
- #define **MOSI** PA6
- #define **SCL** PA4
- #define **SDA** PA6
- #define **UNCONNECTED** PB0
- #define **OUTPUT** 0
- #define **INPUT** 1
- #define **ENABLE** true
- #define **DISABLE** false

- #define **ON** true
- #define **OFF** false
- #define **SLEEP_THRESHOLD** 60000
- #define **ACCELERATION_THRESHOLD** 100
- #define **DICE_STEPS_FIRST_ROUND** 5
- #define **DICE_STEPS_SECOND_ROUND** 5
- #define **DICE_TIME_STEPS** 100
- #define **DICE_TIME_STEPS_INCREASE** 10
- #define **ANGLETHRESHOLD** 5
- #define **CALIBRATION_STEP_DELAY** 500
- #define **OFFSET_CALIBRATION_STEPS** 10
- #define **OFFSET_CALIBRATION_STEP_DELAY** 10
- #define **FORCE_SLEEP_STEPTIME** 500
- #define **FORCE_SLEEP_TIME** 6 ∗ FORCE_SLEEP_STEPTIME
- #define **I2C_DELAY** 10
- #define **SDA_ON** (PORTA |= (1 << SDA))
- #define **SDA_OFF** (PORTA &= ∼(1 << SDA))
- #define **SCL_READ** (PINA & (1 << SCL))
- #define **SDA_READ** (PINA & (1 << SDA))
- #define **MMA8653FC_ADD** 0x1D
- #define **MMA8653FC_ADDR_READ** 0x3B
- #define **MMA8653FC_ADDR_WRITE** 0x3A
- #define **MMA8653FC_WHO_AM_I** 0x0D
- #define **MMA8653FC_XYZ_DATA_CFG** 0x0E
- #define **MMA8653FC_CTRL_REG1** 0x2A
- #define **MMA8653FC_SYSMOD** 0x0B
- #define **MMA8653FC_OUT_X_MSB** 0x01
- #define **MMA8653FC_OUT_X_LSB** 0x02
- #define **MMA8653FC_OUT_Y_MSB** 0x03
- #define **MMA8653FC_OUT_Y_LSB** 0x04
- #define **MMA8653FC_OUT_Z_MSB** 0x05
- #define **MMA8653FC_OUT_Z_LSB** 0x06

Functions

- void setLedPins (uint8_t mode)

  Set the LED Pins eigther "INPUT" or "OUTPUT".
- void setSDA (bool mode)

  Set the SDA pin eighter "ON" or "OFF".
- void setSCL (bool mode)

  Set the SCL pin eighter "ON" or "OFF".
- void **init** ()

  Initialises all the AVR hardware E.g. ports, interrupts, timers, etc.
- void **allLedOn** ()

  Turn on all LEDs (LED1 - LED7)
- void **allLedOff** ()

  Turn off all LEDs (LED1 - LED7)
- void deInit ()

  Deeinitialises all the AVR hardware E.g. ports, interrupts, timers, etc.
- void showNumber (uint8_t numberToShow)

  Show a number between 1 and 6 on the LEDs.
- void showCross ()

Show a cross on the LEDs.

- void showHook ()

  Show a hook on the LEDs.

- void testLeds ()

  Check if all LEDs are working correctly.

- void start ()

  I2C BitBang start condition.

- void stop ()

  I2C BitBang stop condition.

- bool tx (uint8_t dat)

  I2C BitBang tx of one byte.

- uint8_t rx (bool ack)

  I2C BitBang rx of one byte.

- uint8_t readRegister (uint8_t reg)

  Read a register from the MMA8653FC.

- void writeRegister (uint8_t reg, uint8_t value)

  Write a value to a register of the MMA8653FC.

- void testI2C_read ()

  Checks, if the I2C connection to the MMA8653FC is working.

2.1.1 Detailed Description

Implementation of functionality for the "Cube Project".

Function includes, defines and function prototypes for main.cpp.

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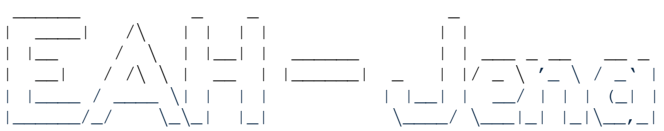

2.1.2 Function Documentation

2.1.2.1 deInit()

```
void deInit ( )
```

Deeinitialises all the AVR hardware E.g. ports, interrupts, timers, etc.

Remarks

Calling deInit(); is necessary to save power before the CPU goes to sleep.

2.1.2.2 readRegister()

```
uint8_t readRegister (
            uint8_t reg )
```

Read a register from the MMA8653FC.

Parameters

reg	The register to read.

Returns

The value of the register.

2.1.2.3 rx()

```
uint8_t rx (
            bool ack )
```

I2C BitBang rx of one byte.

Parameters

ack	ACK or NACK (acknowledge or no acknowledge)

Returns

The received byte.

2.1.2.4 setLedPins()

```
void setLedPins (
            uint8_t mode )
```

Set the LED Pins eigther "INPUT" or "OUTPUT".

Parameters

mode	OUTPUT = 0 or INPUT = 1

2.1.2.5 setSCL()

```
void setSCL (
            bool mode )
```

Set the SCL pin eighter "ON" or "OFF".

Parameters

mode	"ON" (input pullup) or "OFF" (output low)

2.1.2.6 setSDA()

```
void setSDA (
            bool mode )
```

Set the SDA pin eighter "ON" or "OFF".

Parameters

mode	"ON" (input pullup) or "OFF" (output low)

2.1.2.7 showCross()

```
void showCross ( )
```

Show a cross on the LEDs.

Remarks

This function is used to indicate some error.

2.1.2.8 showHook()

```
void showHook ( )
```

Show a hook on the LEDs.

Remarks

This function is used to indicate some success.

2.1.2.9 showNumber()

```
void showNumber (
            uint8_t numberToShow )
```

Show a number between 1 and 6 on the LEDs.

Parameters

numberToshow	The number to show on the LEDs.

Lremark If the number is larger than 6, no LED will be turned on.

2.1.2.10 start()

```
void start ( )
```

I2C BitBang start condition.

2.1.2.11 stop()

```
void stop ( )
```

I2C BitBang stop condition.

2.1.2.12 testI2C_read()

```
void testI2C_read ( )
```

Checks, if the I2C connection to the MMA8653FC is working.

Remarks

If the communication is not working, it will be shown on the LEDs as a cross. Furthermore, the device will go to sleep.

2.1.2.13 testLeds()

```
void testLeds ( )
```

Check if all LEDs are working correctly.

2.1.2.14 tx()

```
bool tx (
            uint8_t dat )
```

I2C BitBang tx of one byte.

Parameters

dat	The byte to send.

Returns

ACK or NACK (acknowledge or no acknowledge)

2.1.2.15 writeRegister()

```
void writeRegister (
            uint8_t reg,
            uint8_t value )
```

Write a value to a register of the MMA8653FC.

Parameters

reg	The register to write.
value	The value to write.

2.2 main.hpp

Go to the documentation of this file.

```
1
21 #ifndef MAIN_HPP
22 #define MAIN_HPP
23
24 // ------------------------------------------------------------- //
25 // -- Includes ------------------------------------------------- //
26 // ------------------------------------------------------------- //
27 #include <math.h>
28 #include <stdlib.h>
```

```
29 #include <avr/io.h>
30 #include <avr/sleep.h>
31 #include <util/delay.h>
32 #include <avr/interrupt.h>
33
34 // ------------------------------------------------------------- //
35 // -- Defines ---------------------------------------------------- //
36 // ------------------------------------------------------------- //
37 #define F_CPU 8000000
38 #define __DELAY_BACKWARD_COMPATIBLE__
39 // Defines for the button pin
40 #define BUTTON PB2
41 // Defines for the connected LEDs
42 #define D1 PA0
43 #define D2 PA1
44 #define D3 PA2
45 #define D4 PA3
46 #define D5 PA5
47 #define D6 PA7
48 #define D7 PB1
49 // Defines for the SPI interface.
50 #define SCK PA4
51 #define MISO PA5
52 #define MOSI PA6
53 // Defines for the I2C interface (no hardware interface).
54 #define SCL PA4
55 #define SDA PA6
56 // Defines for unconnected pins
57 #define UNCONNECTED PB0
58
59 // General defines
60 #define OUTPUT 0
61 #define INPUT 1
62 #define ENABLE true
63 #define DISABLE false
64 #define ON true
65 #define OFF false
66
67 // Defines for control flow
68 #define SLEEP_THRESHOLD 60000       // Millieconds until the device go to sleep if no action occurs
69 #define ACCELERATION_THRESHOLD 100  // The threshold for the absolute motion value in LSB registers
70 #define DICE_STEPS_FIRST_ROUND 5    // The number of steps the dice has to roll
71 #define DICE_STEPS_SECOND_ROUND 5   // The number of steps the dice has to roll
72 #define DICE_TIME_STEPS 100         // The time step between dice rolls in ms
73 #define DICE_TIME_STEPS_INCREASE 10 // The time step increase between dice rolls in ms in secon round
74 #define ANGLETHRESHOLD 5            // The threshold for the angle in degrees
75 #define CALIBRATION_STEP_DELAY 500  // The delay between calibration steps in ms
76 #define OFFSET_CALIBRATION_STEPS 10      // The number of calibration steps
77 #define OFFSET_CALIBRATION_STEP_DELAY 10 // The delay between offset calibration steps in ms
78 #define FORCE_SLEEP_STEPTIME 500         // The delay until new number
79 #define FORCE_SLEEP_TIME 6 * FORCE_SLEEP_STEPTIME // When button is hold this amout of milliseconds the
       device will go to sleep
80
81 // Defines for I2C
82 #define I2C_DELAY 10 // 10 us -> 100 kHz
83 #define SDA_ON (PORTA |= (1 << SDA))
84 #define SDA_OFF (PORTA &= ~(1 << SDA))
85 #define SCL_READ (PINA & (1 << SCL))
86 #define SDA_READ (PINA & (1 << SDA))
87 // Defines for Acceleration Sensor
88 #define MMA8653FC_ADD 0x1D
89 #define MMA8653FC_ADDR_READ 0x3B
90 #define MMA8653FC_ADDR_WRITE 0x3A
91 // Defines for Acceleration Sensor Registers
92 #define MMA8653FC_WHO_AM_I 0x0D
93 #define MMA8653FC_XYZ_DATA_CFG 0x0E
94 #define MMA8653FC_CTRL_REG1 0x2A
95 #define MMA8653FC_SYSMOD 0x0B    // System Mode, to control STANDBY, WAKE and SLEEP
96 #define MMA8653FC_OUT_X_MSB 0x01 // Most significant byte of X-axis acceleration data
97 #define MMA8653FC_OUT_X_LSB 0x02 // Least significant byte of X-axis acceleration data
98 #define MMA8653FC_OUT_Y_MSB 0x03 // Most significant byte of Y-axis acceleration data
99 #define MMA8653FC_OUT_Y_LSB 0x04 // Least significant byte of Y-axis acceleration data
100 #define MMA8653FC_OUT_Z_MSB 0x05 // Most significant byte of Z-axis acceleration data
101 #define MMA8653FC_OUT_Z_LSB 0x06 // Least significant byte of Z-axis acceleration data
102
103 // ------------------------------------------------------------- //
104 // -- Function Prototypes ---------------------------------------- //
105 // ------------------------------------------------------------- //
111 void setLedPins(uint8_t mode);
117 void setSDA(bool mode);
123 void setSCL(bool mode);
127 void init();
132 void allLedOn();
136 void allLedOff();
142 void deInit();
150 void showNumber(uint8_t numberToShow);
156 void showCross();
```

```
162 void showHook();
167 void testLeds();
172 void start();
177 void stop();
185 bool tx(uint8_t dat);
193 uint8_t rx(bool ack);
201 uint8_t readRegister(uint8_t reg);
208 void writeRegister(uint8_t reg, uint8_t value);
209
217 void testI2C_read();
218
219 #endif /* MAIN_HPP */
```

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