Applied Programming - 2.Task

2) Communication between two microcontrollers using the TWI interface

2.1) Important chapters in the datasheet of the ATmega32

- Two-wire Serial Interface
- Analog to Digital Converter
- 16-bit/8-bit Timer/Counter including PWM
- Interrupt-Programming
- Watchdog Timer

2.2) Preface

Two microcontrollers (master, slave) should communicate by means of a TWI interface. One microcontroller (slave) transmits collected data to the master where the data are displayed on a graphical display.

2.3) Detailed description of the task

One microcontroller (slave) collects the data of a photo transistor via the internal Analog to Digital Converter and sends the data to the second microcontroller (master) using a TWI interface. The received data have to be displayed on a graphical display (numerical value, time-dependent curve - the gap between the new value and the old (overwritable) one should be 6 pixels) and must generate a PWM-signal according to the light intensity. The PWM-signal controls a LED. A Watchdog-Timer has to be implemented for the monitoring of the communication. If the communication (TWI interface) fails the microcontroller has to be reset and a message has to be displayed on the graphical display.

The sampling rate should be chosen appropriate (for slow changes of the light intensity - several ms up to several seconds) and has to be constant (independent of code length, use a Timer/Counter). The PWM-signal controls a LED, which becomes brighter when the surrounding light intensity darkens and vice versa.

2.4) Interrupt-controlled Programming of the TWI interface and of the Analog to Digital Conversion (TWI-Interrupt: slave, AD-Conversion-Interrupt: slave)

Hint: One system must be developed as a time-triggered system, the other one as an event triggered system.