Applied Programming - 3.Task

3) Communication between two microcontrollers using the UART/TWI interface

3.1) Important chapters in the datasheet of the ATmega32

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

3.2) Preface

Two microcontrollers should communicate interrupt-controlled by means of an UART or TWI interface. The current interface should be selected by a push-button. One microcontroller transmits collected data to the receiver where the data are displayed on a graphical display.

3.3) Detailed description of the task

One microcontroller (transmitter, slave) collects the data of a photo transistor via the internal Analog to Digital Converter and sends the data to the second microcontroller (receiver, master) using an UART or TWI interface. The interface should be selected by a push-button. 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 (UART/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.

The whole software has to be implemented Interrupt-controlled.

3.4) Changing the interface automatically using a Watchdog-Timer:

Implementation of a Watchdog-Timer for the monitoring of the communication. If the current interface fails the second interface should be selected automatically and a message has to be displayed on the graphical display.