

Applied Programming - 1.Task

1) Communication between two microcontrollers using the UART interface

1.1) Important chapters in the datasheet of the ATmega32

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

1.2) Preface

Two microcontrollers (transmitter, receiver) should communicate by means of an UART interface. One microcontroller transmits collected data to the receiver where the data are displayed on a graphical display.

1.3) Detailed description of the task

One microcontroller (transmitter) collects the data of a photo transistor via the internal Analog to Digital Converter and sends the data to the second microcontroller (receiver) using an UART interface in asynchronous mode. 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 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.

1.4) Interrupt-controlled Programming of the UART interface and of the Analog to Digital Conversion (UART-Interrupt: receiver, AD-Conversion-Interrupt: transmitter)

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