WinAVR und Eclipse

Da es für mich immer wieder Thema ist, wie ich eine Toolchain - hier für AVR - zum Laufen bekomme, werd ich das hier nun einmal dokumentieren.

Downloads

Ich verwende WinAVR-201001 und Eclipse CDT Kepler auf Windows 7

Umgebungsvariablen

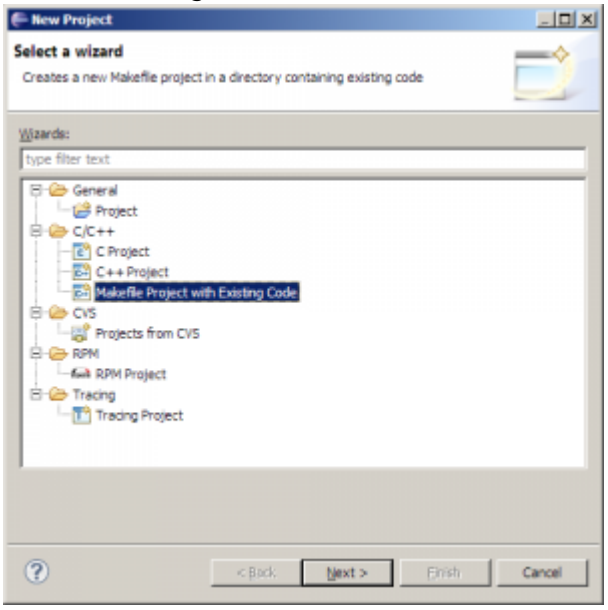
Damit avr-gcc erkannt wird, müssen im System-Pfad die Verzeichnisse für avr-gcc und für die bin-utils eingetragen werden:

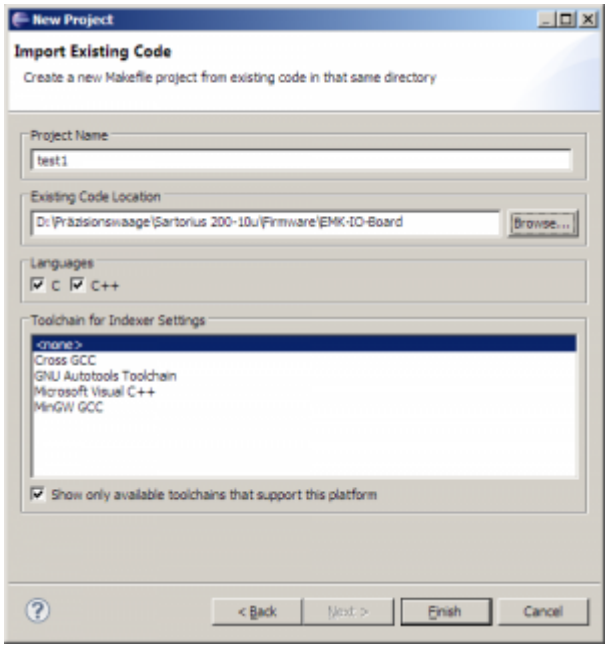
```
PATH =
[...];D:\Programme\WinAVR_20100110\bin;D:\Programme\WinAVR_20100110\utils\bi
n
```

Nach dem Ändern ist ein erneutes Einloggen in Windows notwendig (Benutzer abmelden).

Projekt in Eclipse erstellen

Ich gehe davon aus, dass es bereits ein existierendes Verzeichnis gibt, wo der Quellcode des Projektes bereits vorhanden ist - inklusive Makefile.



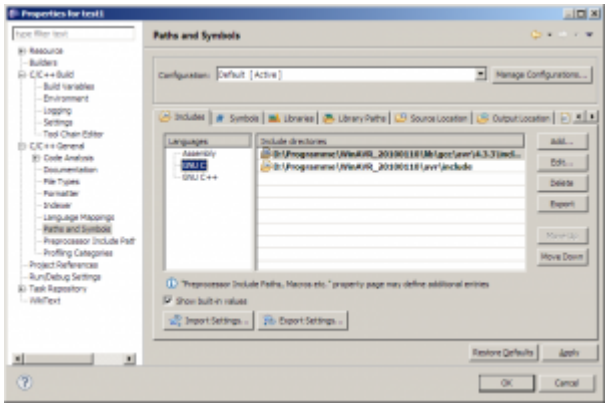


Projekt-Einstellungen

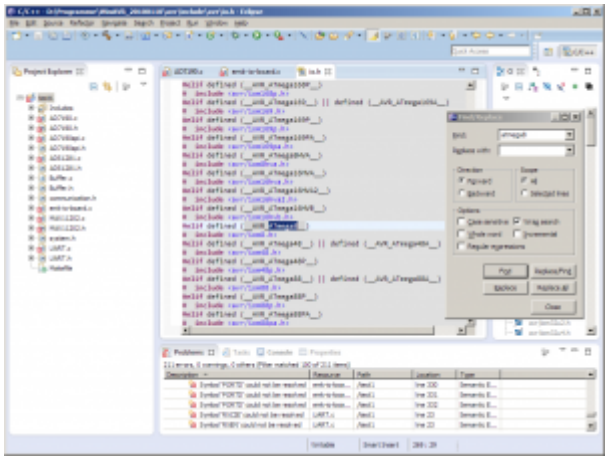
Der C/CIndexer, der sehr hilfreich ist beim Browsen durch den Code (STRG+Klick auf Varaible/Funktion/Define/...), funktioniert Anfangs noch nicht richtig:\\ {{:winavr:indexer-errors.png?direct&300 }}
Damit der C/C Indexer in Eclipse richtig funktioniert, müssen die AVR-Includepaths im Projekt eingetragen werden: Mit Rechtsklick auf das Projekt und Eigenschaften geht man zum Unterpunkt „C/C++ General –> Paths and Symbols“.

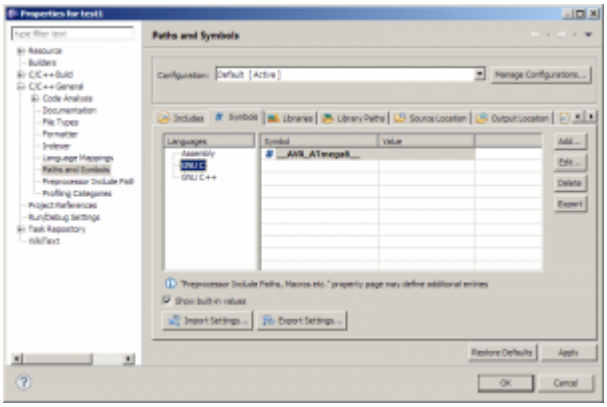
Im Reiter Includes werden unter Language „GNU C“ folgende (File-System-)Pfade hinzugefügt:

```
D:\Programme\WinAVR_20100110\lib\gcc\avr\4.3.3\include
D:\Programme\WinAVR_20100110\avr\include
```

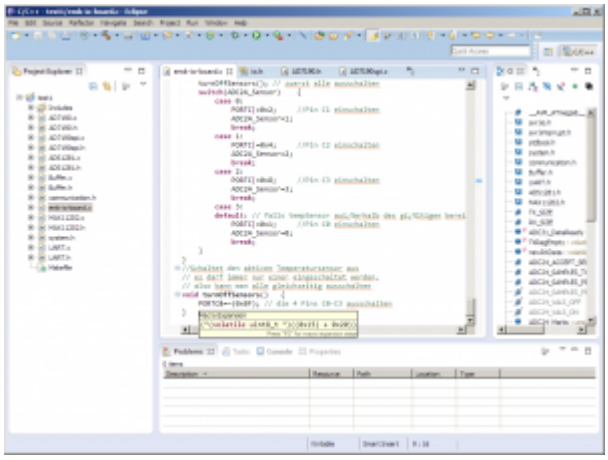


Damit die Definitionen in <avr/io.h> richtig aufgelöst werden, braucht es noch die Definition des Mikrocontroller-Typs. Im Reiter „Symbols“ wird der entsprechende Mikrocontroller eingetragen. In meinem Fall ist es der ATMEGA8. Wie das Define genau heißt, findet man in der Header-Datei <avr/io.h>





Nun wird der Index erneut erstellt (wird beim Schließen des Properties-Fenster automatisch vorgeschlagen). Öffnet man nun die mit Fehler-Markern gekennzeichneten Datein erneut, verschwinden die Fehlermaker.



Man kann den Index auch manuell erneut erstellen lassen, indem man auf das Projekt rechtsklickt und auf „Index –> Rebuild“ bzw. „Index –> Freshen All Files“ klickt.

Makefile

Hier als Beispiel das verwendete Makefile

Makefile

```
# Hey Emacs, this is a -*- makefile -*-
#
# WinAVR Sample makefile written by Eric B. Weddington, Jï¿½rg Wunsch,
et al.
# Released to the Public Domain
# Please read the make user manual!
#
# Additional material for this makefile was submitted by:
#  Tim Henigan
#  Peter Fleury
#  Reiner Patommel
#  Sander Pool
```

```
#  Frederik Rouleau
#  Markus Pfaff
#
# On command line:
#
# make all = Make software.
#
# make clean = Clean out built project files.
#
# make coff = Convert ELF to AVR COFF (for use with AVR Studio 3.x or
VMLAB).
#
# make extcoff = Convert ELF to AVR Extended COFF (for use with AVR
Studio
#                4.07 or greater).
#
# make program = Download the hex file to the device, using avrdude.
Please
#                customize the avrdude settings below first!
#
# make filename.s = Just compile filename.c into the assembler code
only
#
# To rebuild project do "make clean" then "make all".
#


# MCU name
MCU = atmega8

# Output format. (can be srec, ihex, binary)
FORMAT = ihex
#FORMAT = binary

# Target file name (without extension).
TARGET = emk-io-board


# List C source files here. (C dependencies are automatically
generated.)
SRC = $(TARGET).c Buffer.c UART.c ADS1281.c MAX11202.c  AD7190.c
AD7190spi.c
#readraw.c mmc_spi.c fat.c dos.c dir.c


# List Assembler source files here.
# Make them always end in a capital .S.  Files ending in a lowercase .s
# will not be considered source files but generated files (assembler
# output from the compiler), and will be deleted upon "make clean"!
# Even though the DOS/Win* filesystem matches both .s and .S the same,
# it will preserve the spelling of the filenames, and gcc itself does
```

```
# care about how the name is spelled on its command-line.
ASRC =



# Optimization level, can be [0, 1, 2, 3, s].
# 0 = turn off optimization. s = optimize for size.
# (Note: 3 is not always the best optimization level. See avr-libc
FAQ.)
OPT = s

# Debugging format.
# Native formats for AVR-GCC's -g are stabs [default], or dwarf-2.
# AVR (extended) COFF requires stabs, plus an avr-objcopy run.
DEBUG = stabs

# List any extra directories to look for include files here.
#     Each directory must be seperated by a space.
EXTRAINCDIRS =


# Compiler flag to set the C Standard level.
# c89   - "ANSI" C
# gnu89 - c89 plus GCC extensions
# c99   - ISO C99 standard (not yet fully implemented)
# gnu99 - c99 plus GCC extensions
CSTANDARD = -std=gnu99

# Place -D or -U options here
CDEFS =

# Place -I options here
CINCS =


# Compiler flags.
#  -g*:          generate debugging information
#  -O*:          optimization level
#  -f...:        tuning, see GCC manual and avr-libc documentation
#  -Wall...:     warning level
#  -Wa,...:      tell GCC to pass this to the assembler.
#    -adhlns...: create assembler listing
CFLAGS = -g$(DEBUG)
CFLAGS += $(CDEFS) $(CINCS)
CFLAGS += -O$(OPT)
CFLAGS += -fsigned-char -funsigned-bitfields -fpack-struct -fshort-
enums
CFLAGS += -Wall -Wstrict-prototypes
#CFLAGS += -Wa,-adhlns=$(<:.c=.lst)
CFLAGS += $(patsubst %,-I%,$(EXTRAINCDIRS))
CFLAGS += $(CSTANDARD)
```

```
# Assembler flags.
#  -Wa,...:   tell GCC to pass this to the assembler.
#  -ahlms:    create listing
#  -gstabs:   have the assembler create line number information; note
that
#             for use in COFF files, additional information about
filenames
#             and function names needs to be present in the assembler
source
#             files -- see avr-libc docs [FIXME: not yet described
there]
ASFLAGS = -Wa,-adhlns=$(<:.S=.lst),-gstabs



#Additional libraries.

# Minimalistic printf version
PRINTF_LIB_MIN = -Wl,-u,vfprintf -lprintf_min

# Floating point printf version (requires MATH_LIB = -lm below)
PRINTF_LIB_FLOAT = -Wl,-u,vfprintf -lprintf_flt

PRINTF_LIB =

# Minimalistic scanf version
SCANF_LIB_MIN = -Wl,-u,vfscanf -lscanf_min

# Floating point + %[ scanf version (requires MATH_LIB = -lm below)
SCANF_LIB_FLOAT = -Wl,-u,vfscanf -lscanf_flt

SCANF_LIB =

MATH_LIB = -lm

# External memory options

# 64 KB of external RAM, starting after internal RAM (ATmega128!),
# used for variables (.data/.bss) and heap (malloc()).
#EXTMEMOPTS = -Wl,-Tdata=0x801100,--defsym=__heap_end=0x80ffff

# 64 KB of external RAM, starting after internal RAM (ATmega128!),
# only used for heap (malloc()).
#EXTMEMOPTS = -Wl,--defsym=__heap_start=0x801100,--
defsym=__heap_end=0x80ffff

EXTMEMOPTS =
```

```
# Linker flags.
#  -Wl,...:     tell GCC to pass this to linker.
#    -Map:      create map file
#    --cref:    add cross reference to  map file
#LDFLAGS = -Wl,-Map=$(TARGET).map,--cref
LDFLAGS += $(EXTMEMOPTS)
LDFLAGS += $(PRINTF_LIB) $(SCANF_LIB) $(MATH_LIB)




# Programming support using avrdude. Settings and variables.

# Programming hardware: alf avr910 avrisp bascom bsd
# dt006 pavr picoweb pony-stk200 sp12 stk200 stk500
#
# Type: avrdude -c ?
# to get a full listing.
#
# AVRDUDE_PROGRAMMER = pony-stk200
AVRDUDE_PROGRAMMER = avrispmkII

# com1 = serial port. Use lpt1 to connect to parallel port.
AVRDUDE_PORT = usb

AVRDUDE_WRITE_FLASH = -U flash:w:$(TARGET).hex
#AVRDUDE_WRITE_EEPROM = -U eeprom:w:$(TARGET).eep


# Uncomment the following if you want avrdude's erase cycle counter.
# Note that this counter needs to be initialized first using -Yn,
# see avrdude manual.
#AVRDUDE_ERASE_COUNTER = -y

# Uncomment the following if you do /not/ wish a verification to be
# performed after programming the device.
#AVRDUDE_NO_VERIFY = -V

# Increase verbosity level.  Please use this when submitting bug
# reports about avrdude. See
<http://savannah.nongnu.org/projects/avrdude>
# to submit bug reports.
#AVRDUDE_VERBOSE = -v -v

AVRDUDE_FLAGS = -p $(MCU) -P $(AVRDUDE_PORT) -c $(AVRDUDE_PROGRAMMER)
AVRDUDE_FLAGS += $(AVRDUDE_NO_VERIFY)
AVRDUDE_FLAGS += $(AVRDUDE_VERBOSE)
AVRDUDE_FLAGS += $(AVRDUDE_ERASE_COUNTER)
```

```
# ----------------------------------------------------------------------
------

# Define directories, if needed.
DIRAVR = D:/Programme/WinAVR_20100110
DIRAVRBIN = $(DIRAVR)/bin
DIRAVRUTILS = $(DIRAVR)/utils/bin
DIRINC = .
DIRLIB = $(DIRAVR)/avr/lib


# Define programs and commands.
SHELL = sh
CC = avr-gcc
OBJCOPY = avr-objcopy
OBJDUMP = avr-objdump
SIZE = avr-size
NM = avr-nm
AVRDUDE = avrdude
REMOVE = rm -f
COPY = cp




# Define Messages
# English
MSG_ERRORS_NONE = Errors: none
MSG_BEGIN = -------- begin --------
MSG_END = --------  end  --------
MSG_SIZE_BEFORE = Size before:
MSG_SIZE_AFTER = Size after:
MSG_COFF = Converting to AVR COFF:
MSG_EXTENDED_COFF = Converting to AVR Extended COFF:
MSG_FLASH = Creating load file for Flash:
MSG_EEPROM = Creating load file for EEPROM:
MSG_EXTENDED_LISTING = Creating Extended Listing:
MSG_SYMBOL_TABLE = Creating Symbol Table:
MSG_LINKING = Linking:
MSG_COMPILING = Compiling:
MSG_ASSEMBLING = Assembling:
MSG_CLEANING = Cleaning project:




# Define all object files.
OBJ = $(SRC:.c=.o) $(ASRC:.S=.o)

# Define all listing files.
LST = $(ASRC:.S=.lst) $(SRC:.c=.lst)
```

```
# Compiler flags to generate dependency files.
GENDEPFLAGS = -Wp,-M,-MP,-MT,$(*F).o,-MF,.dep/$(@F).d


# Combine all necessary flags and optional flags.
# Add target processor to flags.
ALL_CFLAGS = -mmcu=$(MCU) -I. $(CFLAGS) $(GENDEPFLAGS)
ALL_ASFLAGS = -mmcu=$(MCU) -I. -x assembler-with-cpp $(ASFLAGS)




# Default target.
all: begin gccversion sizebefore build sizeafter finished end

build: elf hex

elf: $(TARGET).elf
hex: $(TARGET).hex
eep: $(TARGET).eep
lss: $(TARGET).lss
sym: $(TARGET).sym



# Eye candy.
# AVR Studio 3.x does not check make's exit code but relies on
# the following magic strings to be generated by the compile job.
begin:
    @echo
    @echo $(MSG_BEGIN)

finished:
    @echo $(MSG_ERRORS_NONE)

end:
    @echo $(MSG_END)
    @echo


# Display size of file.
HEXSIZE = $(SIZE) --target=$(FORMAT) $(TARGET).hex
ELFSIZE = $(SIZE) -A $(TARGET).elf
sizebefore:
    @if [ -f $(TARGET).elf ]; then echo; echo $(MSG_SIZE_BEFORE);
$(ELFSIZE); echo; fi

sizeafter:
```

```
    @if [ -f $(TARGET).elf ]; then echo; echo $(MSG_SIZE_AFTER);
$(ELFSIZE); echo; fi



# Display compiler version information.
gccversion :
    @$(CC) --version



# Program the device.
program: $(TARGET).hex $(TARGET).eep
    $(AVRDUDE) $(AVRDUDE_FLAGS) $(AVRDUDE_WRITE_FLASH)
$(AVRDUDE_WRITE_EEPROM)




# Convert ELF to COFF for use in debugging / simulating in AVR Studio
or VMLAB.
COFFCONVERT=$(OBJCOPY) --debugging \
--change-section-address .data-0x800000 \
--change-section-address .bss-0x800000 \
--change-section-address .noinit-0x800000 \
--change-section-address .eeprom-0x810000


coff: $(TARGET).elf
    @echo
    @echo $(MSG_COFF) $(TARGET).cof
    $(COFFCONVERT) -O coff-avr $< $(TARGET).cof


extcoff: $(TARGET).elf
    @echo
    @echo $(MSG_EXTENDED_COFF) $(TARGET).cof
    $(COFFCONVERT) -O coff-ext-avr $< $(TARGET).cof



# Create final output files (.hex, .eep) from ELF output file.
%.hex: %.elf
    @echo
    @echo $(MSG_FLASH) $@
    $(OBJCOPY) -O $(FORMAT) -R .eeprom $< $@

%.eep: %.elf
    @echo
    @echo $(MSG_EEPROM) $@
    -$(OBJCOPY) -j .eeprom --set-section-flags=.eeprom="alloc,load" \
```

```
    --change-section-lma .eeprom=0 -O $(FORMAT) $< $@

# Create extended listing file from ELF output file.
%.lss: %.elf
    @echo
    @echo $(MSG_EXTENDED_LISTING) $@
    $(OBJDUMP) -h -S $< > $@

# Create a symbol table from ELF output file.
%.sym: %.elf
    @echo
    @echo $(MSG_SYMBOL_TABLE) $@
    $(NM) -n $< > $@



# Link: create ELF output file from object files.
.SECONDARY : $(TARGET).elf
.PRECIOUS : $(OBJ)
%.elf: $(OBJ)
    @echo
    @echo $(MSG_LINKING) $@
    $(CC) $(ALL_CFLAGS) $(OBJ) --output $@ $(LDFLAGS)


# Compile: create object files from C source files.
%.o : %.c
    @echo
    @echo $(MSG_COMPILING) $<
    $(CC) -c $(ALL_CFLAGS) $< -o $@


# Compile: create assembler files from C source files.
%.s : %.c
    $(CC) -S $(ALL_CFLAGS) $< -o $@


# Assemble: create object files from assembler source files.
%.o : %.S
    @echo
    @echo $(MSG_ASSEMBLING) $<
    $(CC) -c $(ALL_ASFLAGS) $< -o $@



# Target: clean project.
clean: begin clean_list finished end

clean_list :
    @echo
    @echo $(MSG_CLEANING)
```

```
    $(REMOVE) $(TARGET).hex
    $(REMOVE) $(TARGET).eep
    $(REMOVE) $(TARGET).obj
    $(REMOVE) $(TARGET).cof
    $(REMOVE) $(TARGET).elf
    $(REMOVE) $(TARGET).map
    $(REMOVE) $(TARGET).obj
    $(REMOVE) $(TARGET).a90
    $(REMOVE) $(TARGET).sym
    $(REMOVE) $(TARGET).lnk
    $(REMOVE) $(TARGET).lss
    $(REMOVE) $(OBJ)
    $(REMOVE) $(LST)
    $(REMOVE) $(SRC:.c=.s)
    $(REMOVE) $(SRC:.c=.d)
    $(REMOVE) .dep/*



# Include the dependency files.
-include $(shell mkdir .dep 2>/dev/null) $(wildcard .dep/*)


# Listing of phony targets.
.PHONY : all begin finish end sizebefore sizeafter gccversion \
build elf hex eep lss sym coff extcoff \
clean clean_list program
```