Arduino

Arduino/AVR GDB Cheat Sheet

List of common GDB commands for debugging AVR code.

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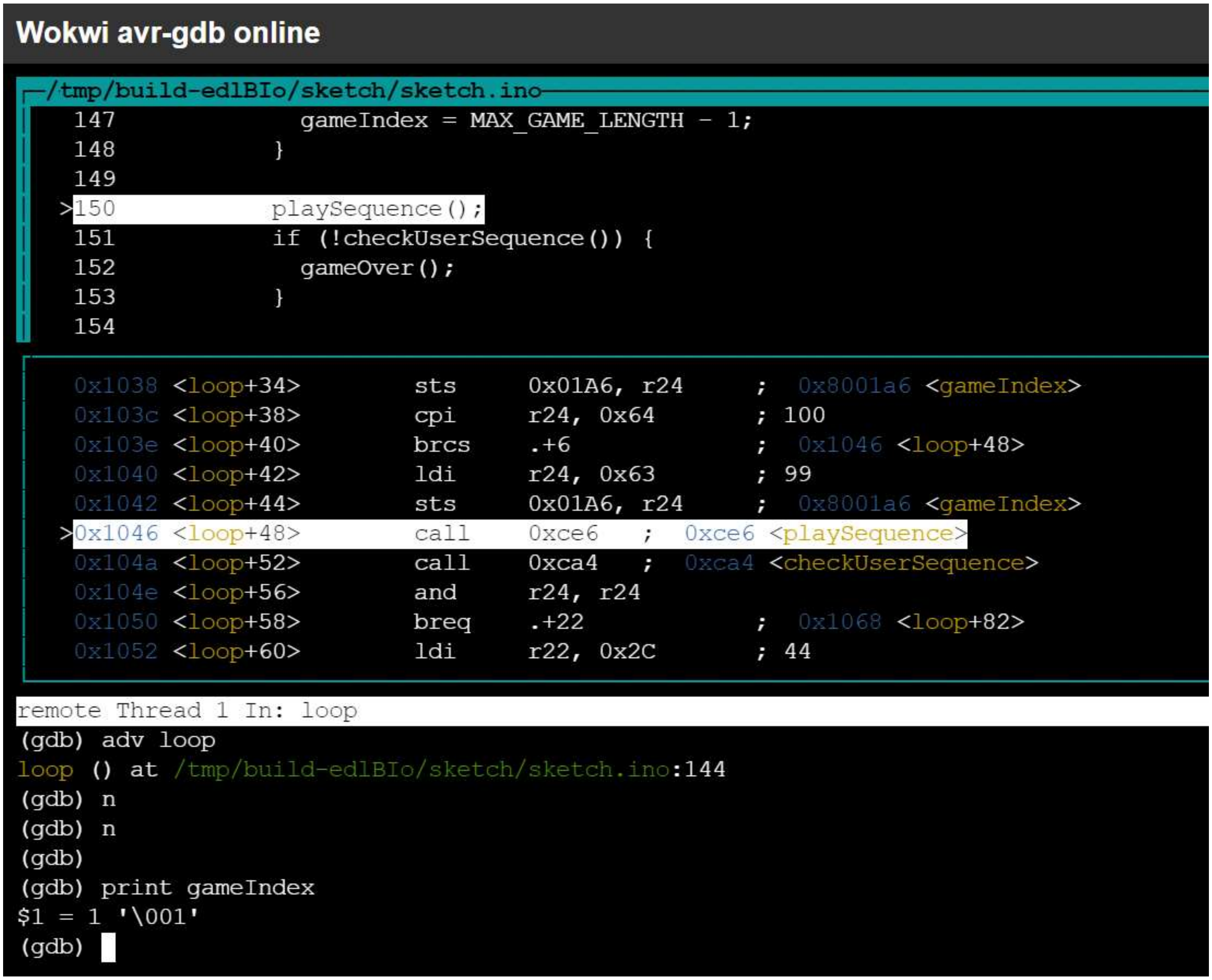
Feb 17, 2021 • 4 min read



Wokwi avr-gdb online

```
/tmp/build-edlBIo/sketch/sketch.ino
                gameIndex = MAX_GAME_LENGTH - 1;
              }

>             playSequence();
              if (!checkUserSequence()) {
                gameOver();
              }


 0x1038 <loop+34>        sts     0x01A6, r24      ;  0x8001a6 <gameIndex>
 0x103c <loop+38>        cpi     r24, 0x64        ; 100
 0x103e <loop+40>        brcs    .+6              ;  0x1046 <loop+48>
 0x1040 <loop+42>        ldi     r24, 0x63        ; 99
 0x1042 <loop+44>        sts     0x01A6, r24      ;  0x8001a6 <gameIndex>
>0x1046 <loop+48>        call    0xce6    ;  0xce6 <playSequence>
 0x104a <loop+52>        call    0xca4    ;  0xca4 <checkUserSequence>
 0x104e <loop+56>        and     r24, r24
 0x1050 <loop+58>        breq    .+22             ;  0x1068 <loop+82>
 0x1052 <loop+60>        ldi     r22, 0x2C        ; 44

remote Thread 1 In: loop
(gdb) adv loop
loop () at /tmp/build-edlBIo/sketch/sketch.ino:144
(gdb) n
(gdb) n
(gdb)
(gdb) print gameIndex
$1 = 1 '\001'
(gdb)
```

Program Execution

COMMAND	SHORT FORM	DESCRIPTION
continue	c	Run the program
advance setup	adv setup	Run the program and stop at the beginning of `setup()` *
next	n	Execute the next line of code (step over)
step	s	Step into the next line of code
finish	fin	Run the program until the current function returns (step out)
nexti	n	Execute the next instruction (step over)
stepi	si	Step into next instruction
until	u	Like `next`, but doesn't go back in loops
Ctrl+C		Break the program at the current instruction

* The `advance` command will also stop if the current function returns

Breakpoints

COMMAND	SHORT FORM	DESCRIPTION
info breakpoints	i b	Display a list of all the breakpoints
break loop	b loop	Set a breakpoint at the beginning of `loop()`
break 42	b 42	Set a breakpoint in line 42
break *0x156	b *0x156	Set a breakpoint at program address 0x156
tbreak loop	tb loop	Set a one-time (temporary) breakpoint in `loop()`
clear loop	cl loop	Delete any breakpoints on `loop()`
clear 42	cl 42	Delete any breakpoints on line 42
delete 1	d 1	Delete breakpoint number 1
disable	dis	Disable all breakpoints

COMMAND	SHORT FORM	DESCRIPTION
disable 1	dis 1	Disable breakpoint number 1
enable	en	Enable all breakpoints
enable 1	en 1	Enable breakpoint number 1
enable once 1	en once 1	Enable breakpoint number 1 for a single hit

Call Stack

COMMAND	SHORT FORM	DESCRIPTION
backtrace	bt	Display a backtrace of the current call stack
backtrace -full	bt -fu	Display backtrace including local variables
info args	i ar	Dump the arguments of the current function
info locals	i lo	Dump local variables and their values
info registers	i r	Dump MCU registers
faas info args	fa i ar	Dump the arguments of all functions in the call stack
frame 2	f 2	Select frame number 2
up		Go one stack frame up (e.g. calling function)
down	do	Go one stack frame down

Inspecting Code

COMMAND	SHORT FORM	DESCRIPTION
list loop	l loop	Show the source code of `loop()`
disassemble	disas	Disassemble the current program location
disassemble/s	disas/s	Disassemble including source code
disassemble/r	disas/r	Disassemble including opcodes (in hex)
disassemble loop	disas loop	Disassemble the `loop()` function

Inspecting Data

COMMAND	SHORT FORM	DESCRIPTION
print $pc	p $pc	Print the value of PC (Program Counter)
print $r0	p $r0	Print the value of the R0 register
print i	p i	Print the value of the variable i
print PORTB	p PORTB	Print the value of the I/O register PORTB
dprint loop,"Loop\n"	dp ...	Print "Loop" every time `loop()` starts
dprint loop,"%d\n",i	dp ...	Print the value of `i` every time `loop()` starts
x/16b $sp		Dump 16 memory bytes starting at $sp (stack pointer)
x/10w 0x800200		Dump 10 dwords starting at data space address 0x200
x/s 0x800151		Dump a string from the data space address 0x151
display someVar	disp someVar	Display the value of `someVar` whenever the program
info display	i di	List active auto-display (watch) expressions
delete display 1	d d 1	Delete auto-display expression number 1

Modifying Data

COMMAND	SHORT FORM	DESCRIPTION
set i = 0	s i=0	Change the value of variable `i` to 0
set $pc = 0	s $pc=0	Jump to the beginning of the program
set $r12 = 0x55	s $r12=0x55	Set r12 to 0x55
set PORTB = 0xff	s PORTB=0xff	Set PORTB (I/O register) to 0xff
set {int}0x800200 = 50	s ...	Set an integer at dataspace address 0x200 to 50

Text User Interface (TUI)

COMMAND	SHORT FORM	DESCRIPTION

COMMAND SHORT FORM DESCRIPTION

COMMAND	SHORT FORM	DESCRIPTION
tui enable	tu e	Enable the TUI mode (also Ctrl X+A)
tui disable	tu d	Disable the TUI mode (also Ctrl X+A)
tui reg all	tu r a	Display registers window
layout asm	la a	Switch to Assembly view
layout src	la sr	Switch to Source Code view
layout split	la sp	Switch to Split (Assembly + Source Code) view
update	upd	Show the current line in the Source Code window
Ctrl+L		Redraw the screen

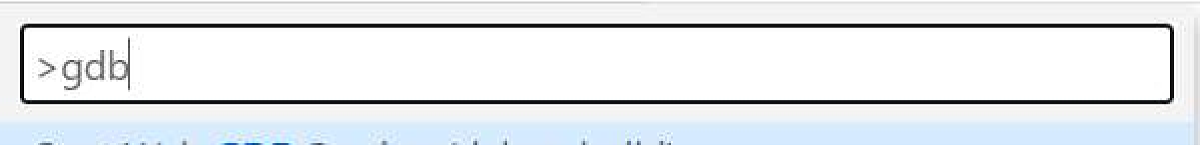
Other commands

COMMAND	SHORT FORM	DESCRIPTION
(empty line)		Repeat the previous command
help continue	h c	Show help about the "continue" command
help break	h b	Show help about the "break" command
help breakpoints	h breakpoints	Display a list of all breakpoint-related commands
quit	q	Exit GDB (in Wokwi Web GDB, GDB will restart)

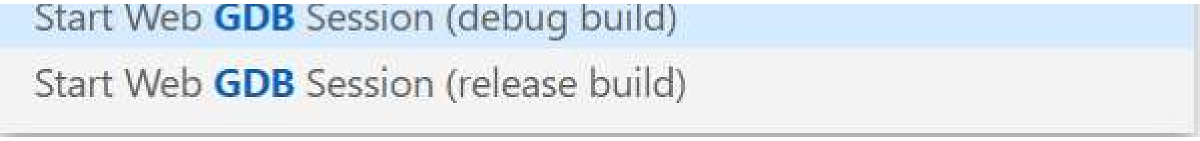
Using GDB with the Wokwi Simulator

You can use the Wokwi simulator to play around with GDB and debug your Arduino code.

To start a GDB session, open any project on Wokwi (e.g. this Simon game), click on the code editor, and press F1. In the prompt that opens, type "GDB":



>gdb


Start Web GDB Session (debug build)
Start Web GDB Session (release build)

Then choose one of the options to launch GDB in a new browser tab. In general, the "debug build" is recommended for optimal debugging experience, but some libraries (e.g. FastLED) may not function correctly without the compiler optimizations.

I suggest to start with the "debug build", and switch to the "release build" only if the program doesn't work correctly.

The Web GDB app takes about 30 seconds to start for the first time, and should load within a few seconds after the first time.

When GDB is ready, it should print something like:

```
0x00000000 in __vectors ()
(gdb)
```

At this point, you can write `continue` to start running the program, `advance setup` to run the program and stop at the beginning of the `setup()` function, or any other command from the GDB cheat sheet above.

P.S. if you are curious, here's how I got GDB to run in the browser.

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