(december 2017)

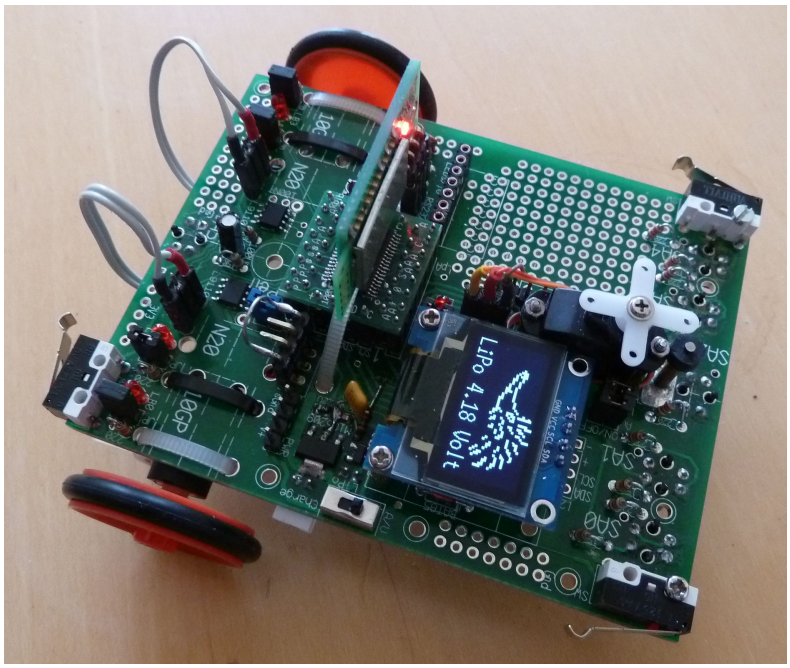
noForth website

MSP430G2955 on Cosey robot with noForth 2955

In this text we refer to these three documents:

- SLAS800.PDF "MSP430G2x55 mixed signal microcontroller"
- SLAU144J.PDF "MSP430x2xx Family User's Guide"

1. Cosey robot with noForth 2955



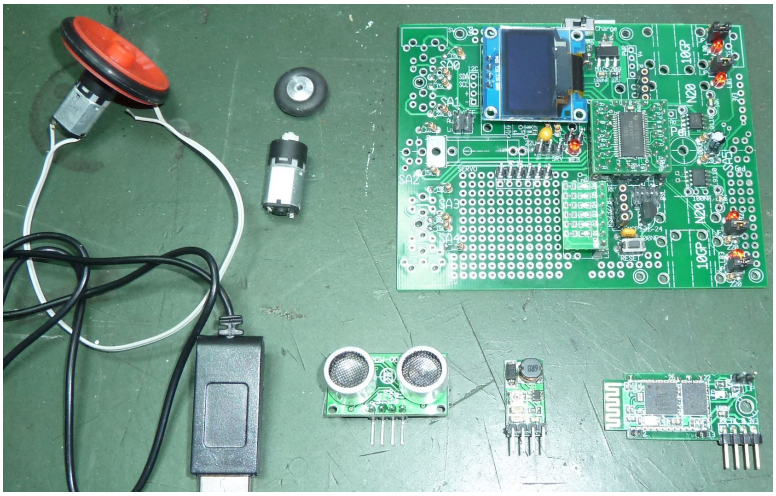
Cosey robot vsn-00, Core Sub-Architecture: MSP430
Parts: Two printed cirquits and all components,
Bluetooth module, Building instructions

- May be ordered at HCC Forth gg

RS232/USB driver

The USB chip on the mini-v3 board is the PL2303hx. This Prolific USB-chip needs a specific driver under Windows. Unzip this file and execute "PL2303_Prolific_DriverInstaller_v1.11.0.exe".
Windows 8 and higher no longer supports the PL2303hx USB-chip. If you have a modern Windows a communication module with an PL2303TA chip could be a solution.

The connector uses a MSP430F5529 Launchpad as programmer with a simple four wire cable. An other way is using MSPdebug and a MSP430G2 Launchpad.



Parts of the Cosey robot

i/o port connections on Cosey robot

Port 1		Port 2	
Digital i/o, BSL		Digital i/o, BSL, analog	
P1.0	Switch left	P2.0	Analog 0
P1.1	Bootloader TX	P2.1	Analog 1
P1.2	Motor A	P2.2	Bootloader RX
P1.3	Switch right	P2.3	Analog 3
P1.4	Switch back	P2.4	Analog 4
P1.5	Motor A	P2.5	IO4
P1.6	Motor B	P2.6	Servo
P1.7	Motor B	P2.7	IO5
Port 3		**Port 4**	
Digital i/o, UART, analog		Digital i/o, analog	
P3.0	Analog 5	P4.0	IO2
P3.1	SDA	P4.1	IO3
P3.2	SCL	P4.2	IO1
P3.3	IO0	P4.3	LiPo analog in
P3.4	Uart TX	P4.4	Analog 13
P3.5	Uart RX	P4.5	Led 3
P3.6	Led 1	P4.6	Led 2
P3.7	Led 0	P4.7	Shutdown

Connectors on Cosey robot

```
Charge      = LiPo charge connector
LiPo        = One cell Lipo battery connector
PWR         = V+ & GND
BOOST       = Optional voltage doubler for DC motors
A0          = Analog power on/off for sensor
5 x JP      = Led output connectors
BSL         = MSP programming connector
RS232       = Bluetooth/RS232 connector
LEDS/IO     = Ledboard or I/O connector
RS232/BT    = Bluetooth transceiver connector
SRV         = Servo connector
VL53L0X     = Lidar connector
ON/OFF      = Front sensor power on/off
OLED        = SSD1306 oled display connector
```

Hardware on Cosey robot

- Five Red leds
- Three switches
- Six floor sensors
- Two DC motors
- One micro servo
- One Lidar or US-sensor
- LiPo battery measurement cirquit
- 128 kByte FRAM or EEPROM
- Reset switch

2. MSP430G2955 i/o ports

Port addresses

The MSP430G2955 port registers are memory mapped. An overview:

Label	P1	P2	P3	P4	Function
PxIN	20	28	18	1C	In
PxOUT	21	29	19	1D	Out
PxDIR	22	2A	1A	1E	Direction
PxIFG	23	2B			Interrupt flag
PxIES	24	2C			Interrupt edge on
PxIE	25	2D			Interrupt on
PxSEL	26	2E	1B	1F	Select
PxREN	27	2F	10	11	Resistor on/off
PxSEL2	41	42	43	44	Select 2

See: SLAS800.PDF under "peripheral file map", from page 16-18.

PxDir, PxREN and PxOUT

The three registers PxDIR, PxREN and PxOUT are used to configure an i/o pin:

PxDIR	PxREN	PxOUT	Pin configuration
0	0	x	Floating input
0	1	0	Input with resistor to GND
0	1	1	Input with resistor to VCC
1	x	x	Output

More info in SLAU144J.PDF page 328-329.
Texas Instruments recommends to configure unconnected i/o pins as Output.

PxSEL and PxSEL2

The registers PxSEL and PxSEL2 are to assign a special function to an i/o pin.
In this way, for example, the ADC or UART can be activated.
More info: SLAS800.PDF page 43-63: Port Pin Functions.

PxSEL2	PxSEL	i/o-function
0	0	Normal i/o
0	1	Basic extra function
1	0	Controller specific!
1	1	Second extra function

3. MSP430G2955 RAM & ROM

```
RAM         1100 - 20FF
FlashROM    2100 - FFFF
```

4. MSP430G2955 Interrupt vectors

```
FFDE    End of free Flash

FFE0    Timer A1 CCR1 CCR2
FFE2    Timer A1 CCR0
FFE4    P1
FFE6    P2
FFE8    ...
FFEA    ADC
FFEC    USCI B0 TX
FFEE    USCI B0 RX

FFF0    TIMER A0 CCR1 CCR2
FFF2    TIMER A0 CCR0
FFF4    WATCHDOG
FFF6    COMPARATOR
FFF8    TIMER B0 CCR1 CCR2
FFFA    TIMER B0 CCR0
FFFC    NMI
FFFE    RESET
```

See SLAS800.PDF page 9 for details.

5. Processor registers in noForth

All processor registers (R0..R15) have their own name in noForth assembler:

`PC  RP (SP in TI texts!) SR CG`	MSP430 system registers
`SP  IP  TOS  DOX  NXT`	noForth system registers
`W   DAY SUN  MOON`	Registers, locally used by noForth
`XX  YY  ZZ`	Unused (free) registers