Forth Mini Multi Tool for your Embedded Experiments

http://www.forth-ev.de/wiki/doku.php/projects:mmt4ue2:start?&#forth_minimultitool_for_your_embedded_experiments
v1 2014_11_06 - for the pictures follow the link to the German version for now

This project had been started by Jürgen and a TI Launched. He has put a lot of energy into it all to design, fund and coordinate. Thank you!

Using these notes you can follow the project. And help it succeed. Write to me ...

The MMT4ue2

Very briefly, one can say: "...take the MMT for a test run " or "take your T42" (as in "tea for two";-)

So, what is this all about now?

Jürgen's vision of a small, versatile, handy and affordable tool, which allows you to test and try out hardware; it led him to have a small board designed by Ralf Lieb. It is equipped with a micro-controller unit (MCU) from TI, the MSP430G2553. My own experience with the 4e4th Forth for this MCU then brought us to work together on this project. For him and others interested then emerged this collaboration that he called internally, "his Swiss army knife" for electronics. A kind of combination tool for the usual in modeling: small, light, compact, versatile, virtually in a backpack and go to all sorts of useful, and expandable. And low cost, easy to build.

Design of the electronic Mini Multi Tool

Juergen rummaged in his experience and created a list of tasks which tool should perform. One could also say, it is a collection of common fundamental tasks of MCUs, formulated as exercises (examples) and these were then programmed as simple examples. Either to work independantly controlled via switches or with a PC via a USBtoTTL cable, opening up for modifications. All tools required are on-Board. Well documented, so that the background can be well understood. It was surprisingly easy to forge such a small tool using Forth.
These were created in this MCU as 4 digital and 2 analog inputs, 4 digital outputs, 1 PWM output and one frequency output (square amming the chipwave 1: 1). The whole thing was started on a TI MSP LaunchPad which is used as well for programming the Flash. But this was not the end of it. Jürgen had a minimalist board this in mind as well.

Device pinout: MSP430G2553 20-Pin PDIP
(TOP VIEW)

```
VCC ----------------- [01 20] ---------------------- VSS
(LED1 LP) AD0 P1.0 -- [02 19] - P2.6 OUT2 ------------
RXD P1.1 -----------  [03 18] - P2.7 OUT 3 ------------
TXD P1.2 ------------ [04 17] - test -----------------
----------- S2 P1.3 - [05 16] - S1 RST --------------
.......... AD4 P1.4 - [06 15] - S3 P1.7 --------- SPI *
_-_-_-_-_- FRQ P1.5 - [07 14] - P1.6 PWM LED 2-LP SPI *
---------- IN0 P2.0 - [08 13] - P2.5 OUT1 -------------
---------- IN1 P2.1 - [09 12] - P2.4 OUT0 -------------
---------- IN2 P2.2 - [10 11] - P2.3 IN3 --------------
```

* SPI optional for RAM/Flash extension

The two MiniPCBs

They are described very quickly: You actually consists of MCU, whose pins were taken to the outside of the board, so solder connections can be made easily and changed again and again.

Or two pin headers can be soldered in to plug the whole thing into a breadboard (see picture). And combinations are possible. On this board there are only the minimum necessary components for the operation of the MCU for this MultiTool.The whole system is assembled quickly, reusable; and as it is extremely low cost, it can also be installed, another one built and used as intelligent IO, or tested to death during experimenting.

Left half: The MCU board, top and bottom. Right half: The complementary experimental PCB to add additional parts.

The Tools

(to be added soon)

Here you can see already a little bit about what is happening.
Warning: The video clip there are around 50MB.
Dancing servos using set signals

The Manual

(Tbd)

Source Code

Can you join in already now? Of course you can. The source code is not fully finished yet, but if you want to you can look at the code and run it. There is certainly still be minor changes.
Or other ideas later.

And it is already clear that this will make a 4e4th-update necessary. Because the Mini Multi Tool was started under 4e4th-rev034, there are some inconsistencies with the 4e4th IDE. In this new IDE there is already the debug version in use.

The starter package to get involved is still quite rudimentary. But do not bother, it works out :-)

Updates

I hope there will be even more professional successors of our very first improvised prototypes.
I would then like to introduce here.
- MSP430 VFX Forth lite standalone version
- 430eForth version
- ? amforth

And of course versions with more powerful MCUs and as result still further programming examples on just such a minimalist boards.

Have fun, Michael

Links

Basic experiments with MCUs
4e4th and 4e4th IDE
VFX Forth cross compilers Lite by MPE

The two main drivers of this project:
Michael Kalus mik.kalus@gmail.com **Jürgen Pintaske** juergen@exemark.com, and not to forget **Ralf Lieb** who designed the boards and **EuroTech** who manufactured them for us foc.
And thanks to others who helped. **Pick up your free boards at electronica, 11 - 14 November.**