Software Setup for developing realtime application with LEGO mindstorms NXT

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Before you begin

- Please make sure that your environment satisfies the following requirements!
  - You have a notebook PC in which Microsoft Windows is installed.
  - Supported windows version : XP / Vista / 7 / 8
  - You have the broadband internet connection (Some of the software to be installed is several hundreds Mbytes in its size.)
  - At least one USB 2.0 port available.
- If you are prepared, let's start!
  - Open the following internet web site. http://lejos-osek.sourceforge.net/index.htm

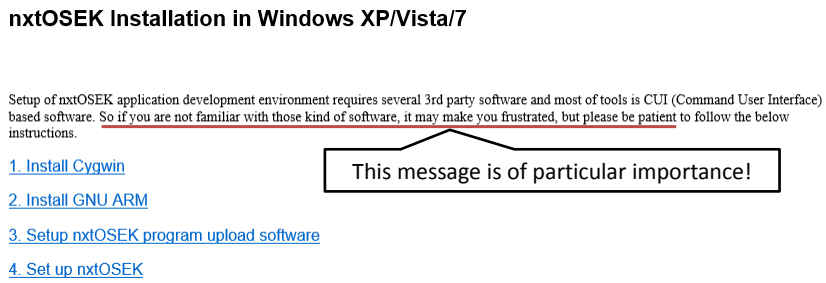
Entering nxtOSEK website

- Click "installation" link on the left of the screen

- You'll then encounter the following screen. Click "Installation in Windows" link and proceed.

Follow the instructions given in the page

- What you have to do is simply follow the installation procedure from 1 to 4 one-by-one as designated on the webpage.



- Several cautions should be given to you on the 1st (cygwin installation) and the 3rd (program uploader setup) steps.

Tips in Installing cygwin

- There might be several steps which require your thoughts and decision while installing cygwin.
- Read the following Q's and A's carefully before you proceed. Steps which are not mentioned below, just follow the web instruction.

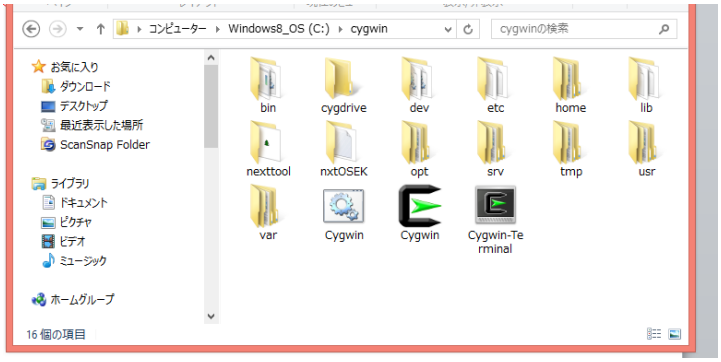
1. Which version of cygwin binaries should I choose ?
   - You will be prompted to select 32bit / 64bit binaries of cygwin to install your PC. Choose 32 bit version even if your PC has 64bit OS installed.
2. Where do I setup the binaries ?
   - I recommend you to install cygwin in the default location (c:¥cygwin). We can't support you during class if you have altered this installation location.
   - Never use folder names which contain white space and/or multibyte characters.
3. Utility versions are different from the screenshots !
   - You might encounter newer binaries during the installation of cygwin (as compared to the screenshots provided in the webpage.)
   - Never mind! Install the latest available for download.
4. What should I do at the end of installation ?
   - Please don't forget to create shortcut of cygwin shell on the desktop.

Choice of uploader and installing nxtOSEK

- In step 3, you have to choose one program uploader from the table.
  - Out legos are equipped with John Hansen's Enhanced NXT firmware.
  - You should then follow the instructions described under "Set up nxtOSEK program upload software for the Enhanced NXT firmware" and install the following 2 utilities. You don't need to download Enhanced Firmware.
    - LEGO MINDSTORMS USB FANTOM Driver
    - John Hansen's NeXTTool. Extract the archive to c:¥cygwin¥nexttool. (if cygwin is installed in the default location)
- The final step is to install "nxtOSEK".
  - First, go back to the top page of nxtOSEK website (displayed in page 3 of this handout) and click "Downloads" link.
  - Click "nxtOSEK 2.18" link on the top of the page and choose to download "nxtOSEK-v218.zip" from the source-forge web site.
  - Save it to an appropriate location of your hard drive and extract it.
  - Copy nxtOSEK folder to c:¥cygwin.

If your installations are going properly…

- Your “c:¥cygwin” folder now should look like this.



- Check the existence of nexttool and nxtOSEK folders here.
- If they can’t be seen here, you did something wrong during the procedure.

Choice of uploader and installing nxtOSEK

- In addition to 4-step installation of nxtOSEK, we have to set up sg.exe utility.
  - Show “nxtOSEK installation” page as partly shown in the bottom of p.3 of this handout by clicking “back” button several times in your web browser.

Note: Since nxtOSEK v2.12, sg.exe binary file (an OSEK OIL parser/code generator) has been removed from nxtOSEK.
For more detailed information, please check Downloads page.

Then, click this link.

  - Then you see the following screen. Click the link on the bottom of the box.

Note: sg.exe is removed from nxtOSEK (March 01, 2010)

To keep the terms of Sourceforge.net, I have decided to remove sg.exe binary file (an OSEK OIL parser and code generator) from nxtOSEK. sg.exe which was included in nxtOSEK is same as sg.exe in TOPPERS/OSEK 1.1 at TOPPERS project where outside of Sourceforge.net. TOPPERS/OSEK 1.1 can be downloaded from :
osek_os-1.1.lzh
osek_os-1.1.lzh is compressed as LZH format and it needs to use a lzh supported file extractor, for example, 7-zip which would work in Windows XP/Vista and Linux/Unix.

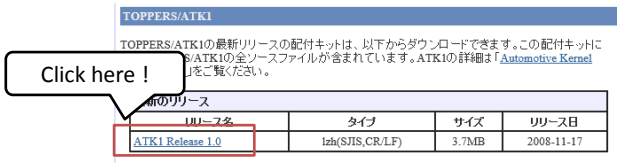
To use sg.exe in osek_os-1.1.lzh for nxtOSEK:
- Extract osek-os-1.1.lzh
- Copy extracted /toppers_osek/sg/sg.exe to nxtOSEK/toppers_osek/sg directory

Click here !

Note that nxtOSEK ver2.18 supports OSEK COM features and it requires sg.exe in the latest TOPPERS ATK1 (January, 2013)

Grabbing sg.exe

- Then you will see the screen containing the image below. Click the link "ATK1 Release 1.0" in the table.



  - Save the file anywhere you like and extract it.
  - Then a new folder "atk1-1.0" will appear. Change current folder by following the path ./atk1-1.0/toppers_atk1/sg and copy sg.exe there to c:/cygwin/nxtOSEK/toppers_osek/sg directory.
- You should then go back to nxtOSEK installation and edit the file c:/cygwin/nxtOSEK/ecrobot/tool_gcc.mak as instructed in the webpage to suit to your installation.

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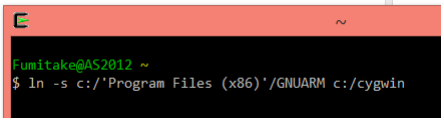
Setup the software link.

- Execute cygwin shell by double-clicking the shortcut icon.
- When cygwin shell window is raised, type the following command in the captured image as it is with your keyboard (This is called CUI operation. CUI is an acronym of "Character User Interface.)



- Then type cd c:/cygwin and press enter. After that, type ls and press enter.
- If you can see a GNUARM in the list, the ln –s command has executed successfully.

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Check software installation.

- If it is all OK, let's try to make an nxtOSEK application here.
- Type in the following command on the cygwin bash shell.
  - cd /cygdrive/c/cygwin/nxtOSEK/samples_c/helloworld
  - make all
- A number of echo backs will be displayed, but don't worry. You have to troubleshoot something only when the procedure stops with "Error" in the display.
- The make utility compiles all source files, link necessary libraries and generate program which can only be executed in LEGO. If "make all" finishes successfully, you can see following files generated under "helloworld" directory.

```
Fumitake@AS2012 /cygdrive/c/cygwin/nxtOSEK/samples_c/helloworld
$ ls
appflash.sh     helloworld_OSEK.rxe      helloworld_OSEK_rom.elf  kernel_cfg.c
biosflash.sh    helloworld_OSEK_ram.bin  helloworld_OSEK_rom.map  kernel_id.h
build           helloworld_OSEK_ram.elf  helloworld_OSEK_rxe.elf  Makefile
helloworld.c    helloworld_OSEK_ram.map  helloworld_OSEK_rxe.map  ramboot.sh
helloworld.oil  helloworld_OSEK_rom.bin  implementation.oil       rxeflash.sh
```

- This kind of software development environment is called "cross development."

You can use eclipse to build nxtOSEK applications.

- nxtOSEK application development can be done with Integrated Development Environment (IDE for short) software called Eclipse, if you have successfully installed necessary software as instructed in the previous pages.
- We have successfully tested the latest version of Eclipse (version 4.3: Kepler) and Eclipse IDE for C/C++ Developers.
- SPIED 2013 attendants are strongly encouraged to setup Eclipse and Eclipse C/C++ IDE in their computer.
- Please visit the homepage http://www.eclipse.org/downloads/ to get the latest version. Both are available from this download page.

Looking forward to seeing you in Yamaguchi in August.