LegOS, an alternative.

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1 Introduction.

Just as Linux is an alternative operating system on x86 based machines (amongst others) opposed to Windows, LegOS is an alternative for Lego Mindstorms own operating system. Using the latter has many advantages and only a few disadvantages. But: it is not for the bleeding hearts and artists. To set up a good programming environment you will need two packages: emulegos and legos. Either of them will run perfectly without the other, but it is much easier to use the emulator to develop and test your code before using the RCX itself. On the web you might encounter another O.S. like this: BrickOS. This is the new name for LegOS, but at this point little information can be found on BrickOS, so we will stick to LegOS in this document.

2 Requirements.

Essentially, all you need is a PC that runs Linux to run the emulator. To use the RCX you will need to enable serial support in your kernel and you will have to get your hands on an RCX.

3 Advantages.

When you use LegOS on your RCX you will have the following advantages over the legacy OS:
- Your code will be compiled and executed as native (machine) code, which is much faster than interpreted code and requires less memory.
- You will have 32k of memory available (not just 32 variables).
- You can use normal C to program your RCX (arrays and stuff are available).
- Good multitasking support (priority-based and preemptive).
- Process synchronisation support.
- More hardware control like: CPU power saving, complete LCD control and raw mode IR.

4 Disadvantages.

- The system is not as stable as it could be.
- The user must have C programming knowledge.
- There is no graphical interface, but Linux users are used to this.

5 Extensions.

These things will be implemented in later versions:
- C++ support (possibly even STL).

- IR networking for multiple PCs and RCXs: UDP networking, host programming library and 4x faster task downloads.
- ECM against standard RCX communication.

6 Concrete.

With the LegOS operating system it is possible to implement your own neural network or genetic algorithm, which is quite impossible when using the legacy OS.

7 Installation.

The installation of LegOS itself is very easy when running Debian, just install the package. The installation of the EmuLegOS package is slightly more difficult, so for Debian (and maybe other distributions) a README is included at the end of this document. When using an other distribution than Debian, it might be wise to check if there is a package available before installing it this way.

8 Programming.

After having set up the programming environments, read:
/usr/doc/legos/README.Debian to get started with LegOS, for EmuLegOS read the README in the root of your installation directory. Comparing the files /usr/doc/legos/examples/demo/rover.c and 'EmuLegOS root dir'/examples/rover/rover.c is also educational if you don't have the patience to read the documentation.

9 EmuLegOS README.

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                       How to get EmuLegOS to work.
                    Jeroen Laros, February 19, 2003.

This document describes how to get EmuLegOS 1.2.5 to work. The reason for this
is because the standard installation doesn't seem to work, at least not under
Debian 2.2 and 3.0. This archive contains three files: makefile.nolnp.patch,
makefile.lnp.patch and this README.

Make sure tcl8.0-dev and tk8.0-dev (and all their dependencies) are installed.

download:
  http://belnet.dl.sourceforge.net/sourceforge/emulegos/emuLegOS1.2.5.0.tar.gz
tar -xzvf emuLegOS1.2.5.0.tar.gz
mv makefile.*lnp.patch emulegos
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cd emulegos
cp makefile makefile.orig

Without LNP support:
  patch makefile makefile.nolnp.patch

With LNP support:
  patch makefile makefile.lnp.patch
  mkdir host
  cd host
  download: http://legos.sourceforge.net/files/linux/LNPD/lnpd+liblnp.tgz
  tar -xzvf lnpd+liblnp.tgz
  cd lnpd+liblnp/liblnp
  patch stub.c ../../../lnp_patch/stub.c.patch
  export LNP_ROOT=~/emulegos/host/lnpd+liblnp/
  cd ../../..

cd examples/rover/
export EMULEGOS_ROOT=~/emulegos/
make
./rover

Notes:
- The shell is assumed to be bash.
- It is assumed that the sources will be installed in ~.
- The makefile patches are needed for Debian in any case. If it still doesn’t
  compile, try omitting these patches.
- The ’export EMULEGOS_ROOT’ (and LNP_ROOT if you use it) need to be set each
  time you log in (you might want do do this in your .bashrc or something).
- For more information on LNP try:
  http://www.cs.uit.no/~kennethj/Master/Master.html
- To make your own projects, read: ~/emulegos/README
- The rover example with and without LNP support has been tested on a Debian
  2.2 and 3.0 system.
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