Installation instructions for xkl on Windows

Prerequisites

The installation of xkl on Windows requires the Cygwin software package to be installed on Windows. Installation instructions can be found at https://x.cygwin.com/docs/ug/cygwin-x-ug.pdf; during the installation procedure select the **lynx** package for installation.

After the installation procedure is complete, open a Cygwin terminal from your Desktop or Start Menu. From the terminal:

- install the **apt-cyg** utility using lynx, by running the commands:
  ```
  lynx -source rawgit.com/transcode-open/apt-cyg/master/apt-cyg > apt-cyg
  install apt-cyg /bin
  ```
  (detailed installation instructions are available at https://github.com/transcode-open/apt-cyg)

- use apt-cyg to install the packages required by xkl by running the following command:
  ```
  apt-cyg install wget cygwin-devel gcc-core libXmu-devel libXmu6
  libXmuu1 libXt-devel libXt6 make makedepend motif libXm-devel xorg-
  server xinit libguile2.2_1 libgc1 libltdl7 libmpc3 libisl23 libX11-
  devel xorgproto binutils libSM-devel libICE-devel libXpm-devel
  mingw64-x86_64-runtime libXm4 xterm libfontconfig1 libXpm4
  libXinerama1 libXft2 libXaw7 libICE6 libSM6 libXrender1 libjpeg8 sox
  libsox3 libFLAC8 libgsm1 libid3tag0 libmad0 libogg0 libmp3lame0
  libopus0 libopusfile0 libsndfile1 libtwolame0 libvorbis0
  libvorbisenc2 libvorbisfile3 libwavpack1 libgomp1 libguile3.0_1-
  3.0.8-1 libcrypt2-4.4.4-1 libunistring2-0.9.10-1 libX11_6-1.8.1-1
  libxcb1-1.15-1 libXau6-1.0.11-1 libXdmcp6-1.1.4-1 libxcb-xfixes0-
  1.15-1 libxcb-util1-0.4.0-1 libxcb-image0-0.4.1-1 libxcb-icccm4-
  0.4.2-1 libxcb-ewmh2-0.4.2-1 libxcb-composite0-1.15-1 libtirpc3-
  1.3.3-1 libpixman1_0-0.42.2-1 libXfont2_2-2.0.6-1 libfontenc1-1.1.7-1
  libfreetype6-2.12.1-1 libgssapi_krb5_2-1.15.2-2 libxcb-shm0-1.15-1
  libbrotlidec1-1.0.9-2 libpng16-1.6.37-1 libk5crypto3-1.15.2-2
  libkrb5_3-1.15.2-2 libkrb5support0-1.15.2-2 libcom_err2-1.44.5-1
  libbrotlicommon1-1.0.9-2
  ```

- run again the Cygwin installer, select all pending libraries and install them.

Installation procedure

- Copy the source folder ***xkl_windows*** to ***C:\cygwin64\home\<username>*** (where <username> is the windows user name used during the Cygwin installation).
- Open a Cygwin Terminal and issue the `ls` command: the ***xkl_windows*** folder should show up in the terminal.
- Move into the folder with the command:
  ```
  cd xkl_windows
  ```
- Execute the following commands:
  ```
  make clean
  make
  ```

Running xkl

- Start the Xserver. This can be done in several ways:
  - by selecting the Xwin Server icon in the Windows Start menu,
  - by opening a Cygwin terminal and running the commands:
    ```
    xinit -- -multiwindow
    export DISPLAY=:0.0
    ```
  - by running the script ***xserver_init_script*** provided along with the source code, that executes the same commands. Copy the file in the ***xkl_windows*** folder and run the command
    ```
    ./xserver_init_script
    ```

- The above commands will open an xterm shell. In this shell move into the folder containing the xkl executable with the command:
  ```
  cd xkl_windows/xkl
  ```
- You can now start xkl with the command:
  ```
  ./xkl-3.2
  ```
  but it is preferable to open it by directly providing an input .wav file (see *Notes and caveats* for the reason) by typing (e.g. for the file ***heavens.wav***, available in the ***WAVEFORMS*** subfolder)
  ```
  ./xkl-3.2 ../WAVEFORMS/heavens.wav
  ```

Notes and caveats
- The above procedure has been tested under Windows 11, but it should work on earlier Windows versions.
- Some of the windows are hidden at random when xkl is opened without providing an input file, and when it happens windows stay hidden even when a file is opened. However, the issue does not seem to appear when an input file is provided at launch.
- .wav files generated by most acquisition programs (e.g. Audacity) adopt MS headers, while xkl requires Klatt headers. MS .wav files can be converted by using the ***ms2kl*** program, that is generated during the compilation in the ***xkl_windows/utils*** folder. Just copy the MS .wav file (e.g. ***test.wav***) in the ***utils*** folder, and in a Cygwin terminal type the commands
  ```
  cd xkl_windows/utils
  ./ms2kl test.wav
  ```
  that will generate in the same folder a new .wav file named ***test_kl.wav*** that can be opened with xkl.
- The play function uses the ***sox*** tool and two scripts in the ***utils*** subfolder. This is transparent to the user, provided that the internal folder structure under ***xkl_windows*** is not changed, and the application is launched in a Cygwin terminal or xterm shell from the directory ***xkl_windows/xkl***.
- The record function also uses the ***sox*** tool and two scripts in the ***utils*** subfolder. When a recording is started, the user is required to provide a file name that is used to save the recorded waveform in the ***xkl*** folder using the Microsoft (MS) .wav format. A version of the waveform is also saved in the Klatt format with the same name extended with the suffix _kl, and automatically opened in ***xkl.***