NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Supplementary Guidance

Major CA

- *General Guidelines*
- *Waveform Generator*

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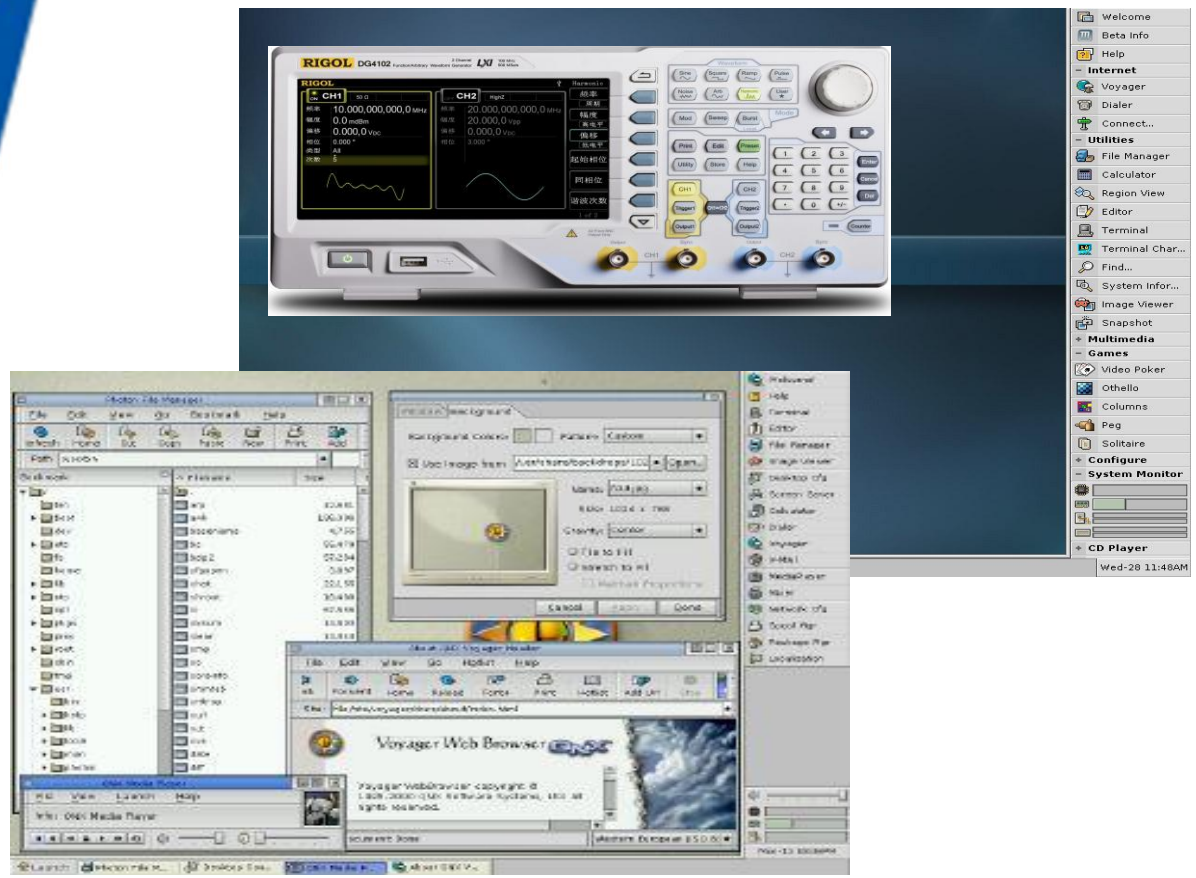


Group project

- Course Weightage: 3 x Minor CA
- Group Size: 6 members (typ.)
- Submission Dateline: Friday, 25 April 2025
- *You choose your own group members*

General Requirements

- Participation
  - Peer Assessment
- Programming, Debugging & Report preparation
- Group Submission
- Submit one program (executable + commented source code)
- Accompanying report
- **Report:**
- Hardcopy Report + Softcopy of files
  - Copy to Lab. Drive (Instructor PC)
    - One folder containing source & executables
    - Report, source code, executable.

Grading Scheme

- Report: 40%
  - Content as indicated in previous/subsequent slide
  - Credit given for quality of presentation
  - Precise procedure on running demo sequence

- Program: 60%
  - Functionality & comprehensiveness.
  - Programming techniques and range of functions used
    - Scope of functions, modularity, structure etc.
    - Novelty and comprehensive use of functions
  - “User Friendly”, innovative features/interpretation
    - Ease of use
    - Error checking
  - Robustness
    - Stable, does not crash or hang
  - Precise instructions and contextual messages
    - On screen help
    - Appropriate comments in program listing

Report Structure

- Full name of all members and a *group photograph* identifying individual members
- Description of the program and its use
  - Comment on any positive attributes of your program and its uniqueness
- Instructions for use
  - With screen shots of the computer display (as appropriate)
- Appendix:
  - Commented program listing with indentation
  - Flowchart

  - *Page limit of report 10 to 15 pages (not inclusive of appendices & program listing)*

A waveform generator is a classification of a signal generator used to generate electrical waveforms over a wide range of signals. Common types of waveforms outputs include sine wave, square wave, ramp or triangular wave, pulse wave, cardiac pattern wave, arbitrary waves.

Basic Requirements – Waveform Generator

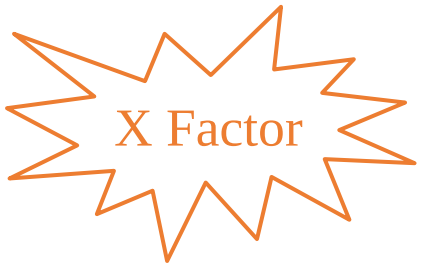
- Beat Generator
  - Generate a precise and regular D/A output to be displayed on the oscilloscope
    - software delay (or timer)
    - Design a visual & auditory queue on the screen
  - Accept rates in Hz. via the kbd (keyboard).
    - Use keyboard “arrow keys” to change settings.
    - Or type in data via kbd.
- Use of command line arguments for initial setup.
  - Open default setting file or store last setting.
- Explore option of an arbitrary waveform from disk
- Additional Requirements
  - The output must continue uninterrupted
    - whilst waiting for a new setting
    - Visual & auditory queue must be synchronised
  - Interesting “Graphics”
  - Deploy Real-time programming techniques (as appropriate)
    - Incl. Threads, timers, interrupts, mutex

- Write codes as modular subroutines
  - Do this now, as you learn how to perform multi-threaded processes

Additional Functionality

- Read/write data to file on hard-disk or portable drive.
  - Configuration, user settings etc.
- Responsiveness and logical operation of Program
- Synchronisation between sound & visual
- Accuracy of output waveform
  - Fastest Rate, accuracy
- Multi input/output modes
  - Use of full features of equipment, provided.
- Friendly and informative User Interface (UI)
  - Provide useful instruction when an input is incorrect

Demonstrate Programming Skills, Techniques & Cretivity



- Multi threaded processes or multi-processes
- Inter-process or inter-thread communication & synchronisation
  - Use threads & processes, as appropriate
- Use of alarms/signals etc.
- Trapping of Ctrl+ C
  - SIGINT signal
  - Orderly shutdown of program
    - Clear display and release resources.

Others

- Esthetically appealing report
  - With matching content
- Clean & clear screen display
- Comprehensive and appropriate comments
  - in program listing