ENGG2800 Team Project 1

Semester 2, 2012

Product Specification – A Clockwork Orange

Ver. 1.1 SW July 2012

Summary: Your team has been commissioned to design, build and document an electronic clock with control software and firmware to comply with the following specifications. There are levels of performance set, which determine capping of final grades.

Component	Functionality and physical requirement
Clock and display	An analog (traditional clock face with rotating indication of time) clock face implemented with discrete or a matrix of light emitting diodes (LEDs) is to be built. The driving of the display and derivation of the time of day is to be implemented on a microcontroller of the Atmel 8-bit AVR family, able to be programmed using the STK-500 development board. Display schemes and techniques are free for your determination. LEDs may be surface mounted devices (SMD), conventional leaded devices or a pre-assembled matrix. However, no matrix driver IC's or second embedded controllers are permitted. Conventional multiplexing IC's or digital logic gates are permitted. The display should be intuitive to an adult observer and a 25 word explanation of the display scheme, if required, is allowed at the demonstration.
Power	Power for the device will be using a conventional wall mount 12V DC transformer and rectifier. No internal batteries are required unless real time clocks (RTCs) are used, where a single 3 volt watch battery of any size and capacity is permitted. A single on-off switch is required which may be mounted on the PCB in an accessible location.
Interface and control	*No user controls apart from an on-off switch are to be present on the clock*. All control and setting will be using either a PC screen-optical interface and GUI and/or a supplied IR remote transmitter. Details of each approach follow.
PC application	An application, which enables intuitive setting of time of day and one alarm, is to be implemented. The application will be a graphic user interface (GUI) - a command line interface is not acceptable. The application will be capable of running on the TP1 lab computers. It may also be functional on other systems including Mac OS X and Linux which are acceptable for demonstration of your product. The development of the executable will be through either Python (all libraries permitted) or any PC compatible C or C++ compiler and development environment. It is a requirement that the software can be installed from a single disc such that there is no additional library or driver requirement for the target PC.

PC screen-optical interface	An optical interface is to be developed which permits time, alarm and control data to be loaded onto the clock through proximity to a predetermined location on the display screen. The clock can physically touch the screen but no electrically conductive or radio link is permitted. The optical carrier may be visible or infra-red or a combination.
IR remote	A generic IR remote device (ABC T2-Rev “A”, Oatley Electronics) is provided as the additional means of controlling your clock. No modifications to this device are permitted. Testing and research into the protocol used by this device is expected and encouraged.
Physical enclosure	A defined red acrylic front panel and stand is provided. Four countersunk M3 holes are present for mounting of at least one PCB to the rear of the panel. M3 standoffs can be used for stacking of “daughter” boards if required. A dimensioned drawing of the panel is provided. Self-adhesive feet are also supplied via the electronics workshop. No component is to protrude past the edges of the display panel. It is expected that a DC power socket will be mounted on the PCB in a suitable position.
Construction	The design and assembly should be to a standard suitable for consumer electronics. Specifically, it should be safe with no electrical or mechanical hazards. It should be robust and continue to function despite a 20 cm vertical drop test. It should be assembled using industry standard soldering, which will be inspected and marked. PCB layout will be expected to comply with rules of component dress and ease of diagnosis and repair.
Alarm/s	In combination with an optical display, an audible alarm is permitted. A piezo element or moving-coil speaker is permitted. There is no restriction on the nature of the tones used.
Auto-dimming	If implemented, the auto-dimming feature will reduce the intensity of the LED display when the environment is darkened and restore brightness in normal lab lighting. This function will be tested by placing the device in the standard “black box” to be located in the lab and checking for observable intensity changes.
Year, month and day setting	Using the same LEDs or additional LEDs, an interpretable display of the year, month and day will be shown. This does not necessarily require all three parameters to be displayed at once. Consecutive display and simple, intuitive encoding is acceptable. Display of this feature is initiated via PC or IR remote.
Calendar sync	An alarm (one minute prior) for one event scheduled on a shared Google calendar is to be demonstrated. A recurring event will be scheduled during the semester and changed prior to demonstration day.
Weather forecast	A simple indication of the following day’s weather is to be implemented. The LEDs are to be used as graphic elements (no text) and the nature of the display is free. Update of the forecast is to be via the optical interface. “Fine”, “Cloudy” or “Rainy” are the only required predictions which are to be derived from any web source accessible from the laboratory.
