

Meeting Minutes – Group 5

Location: o B 6

24 March 2023, 12:00–13:30

Present

Mark Mizzi, Damjan Filipovic (Chair), Gabriel Apap

Discussion

1. Reading and approval of minutes from previous meeting
2. Matters arising from minutes
 - a) Mark clarifies that the queue interface is implemented in pure assembly, not inline assembly as indicated in point (4a).
 - b) He also points out that the functions cannot be called atomic, as the entire function body does not constitute a critical section.
 - c) It was noted that the use of C11 is not possible given the restriction on the compiler we have to use. The project will instead use the C90 standard.
 - d) It was noted that the points made in (7a) should be quantified and presented in the design brief.
3. Progress report from group members
 - a) Gabriel did not have time to look into the LCD driver. However, he helped Mark debug the code for driving the DAC. In addition, he worked on the amplifier circuit.
 - b) Damjan looked into implementing the keypad driver, and has started writing and experimenting with the code.
 - c) Mark has refined and debugged the code for driving the DAC, and has gotten it to fully work on the microcontroller. He has also added inter-symbol spacing.
4. Brief discussion of the LCD driver code.
 - a) Nothing to be said since research was not done.
5. Brief discussion about enabling/disabling the timer interrupt and the timer interrupt handlers.
 - a) It was pointed out that to implement intersymbol-spacing, the DAC interrupt must check the queue and start generating any new tone after a delay. This delay was implemented using the same timer interrupt mechanism used by the DAC interrupt itself.
 - b) Some minor changes to the code were also pointed out. In particular, the `timer_freq` parameter of the `timer_enable()` function was converted into a `float` to accomodate a wider range of frequencies. This is fine given that the function is not called frequently.
 - c) The team had trouble getting the timer code from the labs to work, so instead they opted for an alternative using the SysTick mechanism built into the ARM processor. A thin wrapper around SysTick was implemented, which provides the ability to adjust timer frequency, and change the handler invoked when the timer interrupt is triggered. In addition the timer interrupt can be turned on or off.

- d) One drawback of using SysTick is that there can only be one timer interrupt registered at a time. This means that the second design phase proposed in the design brief, where the keypad is driven using a timer interrupt cannot be implemented. It was decided to skip this design phase.
- e) The DAC interrupt code was migrated to ARM Compiler version 5. This involved converting the assembly written in GNU syntax to the legacy armasm syntax.
- 6. Brief discussion about the keypad and the persistent storage driver.
 - a) Damjan points out that we need to account for de-bouncing. De-bouncing involves waiting for the voltage to stabilize after a key has been pressed.
 - b) Gabriel points out that de-bouncing can be mitigated in hardware using a Schmidt trigger and capacitor circuit.
 - c) He also notes that it might be difficult to account for de-bouncing in software, as the bouncing effect is inconsistent.
 - d) It was noted that we need to find the delay taken for a de-bouncing circuit to switch off, as this affects the delay in between polling cycles (to avoid spurious key presses).
 - e) Nothing to be said about the persistent storage driver as no research was done. This research task will be postponed as it is not pertinent to the main functionality of the system.
- 7. Other matters.
 - a) Task Allocation.
 - i. The team is aiming to have core functionality finished by Thursday 30th March.
 - ii. If this goal is met by next meeting, the Easter holidays will be spent doing documentation and updating the design brief.
 - b) Keeping the design brief updated.
 - i. It was noted that the design brief should start being updated on a regular basis to reflect the progress that we are making.
 - ii. The design brief should focus on the current implementation, while describing any trade-offs made in changing the design of the system.
 - c) Brief discussion of Doxygen.

Actions

1. Documentation of DAC interrupt code and updating design brief.

Assigned to: **Mark Mizzi**
Deadline: **Next meeting**

2. Implementation of LCD output of symbols.

Assigned to: **Gabriel Apap**
Deadline: **Next meeting**

3. Implementation of the keypad code without support for de-bouncing.

Assigned to: **Damjan Filipovic**
Deadline: **Next meeting**