egabit and You

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The following is important information for the 2022 mid-semester exam for COMP2300/6300. This information is required to complete some of the questions, please review this document prior to the exam (seriously, this is actually part of the exam, not practice questions).

Congratulations! You just got a job working on a new microcontroller board called the **megabit**.

The **megabit** is a *lot* like the micro:bit, except that it's really big and so it has room for a much larger LED display. (25 x 25 LEDs).

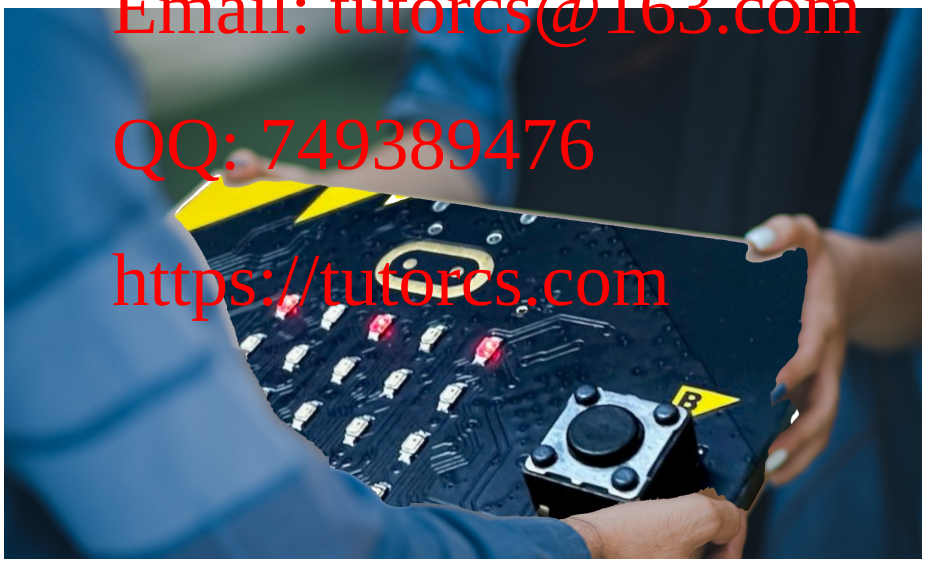

Figure 1: The megabit is just like the microbit, but it's huge. (incl. image by RoseBox on Unsplash)

The megabit display

Luckily fo[illegible]D display is very similar to the micro:bit's 5x5 LED disp[illegible] display is divided up into 25 sub-displays (each one is cal[illegible] is a 5x5 LED display that *can* be connected to exactly th[illegible]s on the micro:bit. The LEDs are laid out like this:

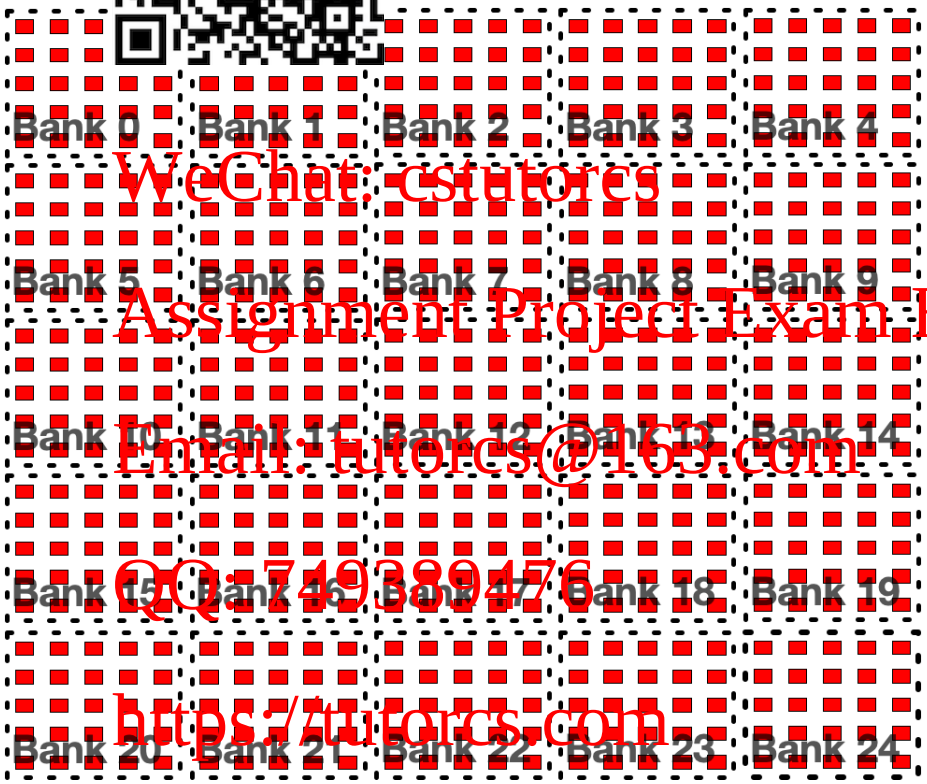

Figure 2: The megabit's 25 LED banks

The display bank control register

The megabit has one extra memory mapped register used to switch between LED banks so that you can address every LED on the display.

The *display bank control register* (DBCR), is located at `0x50000600` (no offset). Bits 0-24 of this register connect the LED GPIO pins to the rows and columns of the corresponding LED banks when they are set. Bits 25-31 of the register have no effect.

Multiple banks can be controlled at once (so that the same row and column will be connected in each bank). The configuration of the DBCR can be summarised

as follows:

Access	Value ID	Value	Description
RW			Bank i
	Disconnected	0	Bank is disconnected from GPIO
	Connected	1	Bank is connected to GPIO

Notes:

- Any GPIO pins that are high will be high on all connected banks.
- On banks that are not connected, all GPIO pins are low.
- The mapping between GPIO pins and the rows and columns of each bank is the same as on the microbit. To summarise:

Row	GPIO Pin	Column	GPIO Pin
Row 1	P0.21	Col 1	P0.28
Row 2	P0.22	Col 2	P0.11
Row 3	P0.15	Col 3	P0.31
Row 4	P0.24	Col 4	P1.05
Row 5	P0.19	Col 5	P0.30

And remember that to light an LED, the row must be high and column must be low.

Example:

1. Bits 0, 3 and 8 are set in the DBCR, all other bits are clear.
2. P0 DIR bit 21 and 28 have been set to OUT
3. P0 OUT bit 21 has been set to HIGH
4. The top left LED of banks 0, 3, and 8 will light up. All other LEDs are unlit.

Thinking time:

- How would you implement your assignment 1 on the megabit?
- What impact would the DBCR have on controlling the LEDs?
- Are there any smart ways you can think of to control the LEDs that would save time in certain circumstances?