Project Title: Multifunctional Digital Clock	
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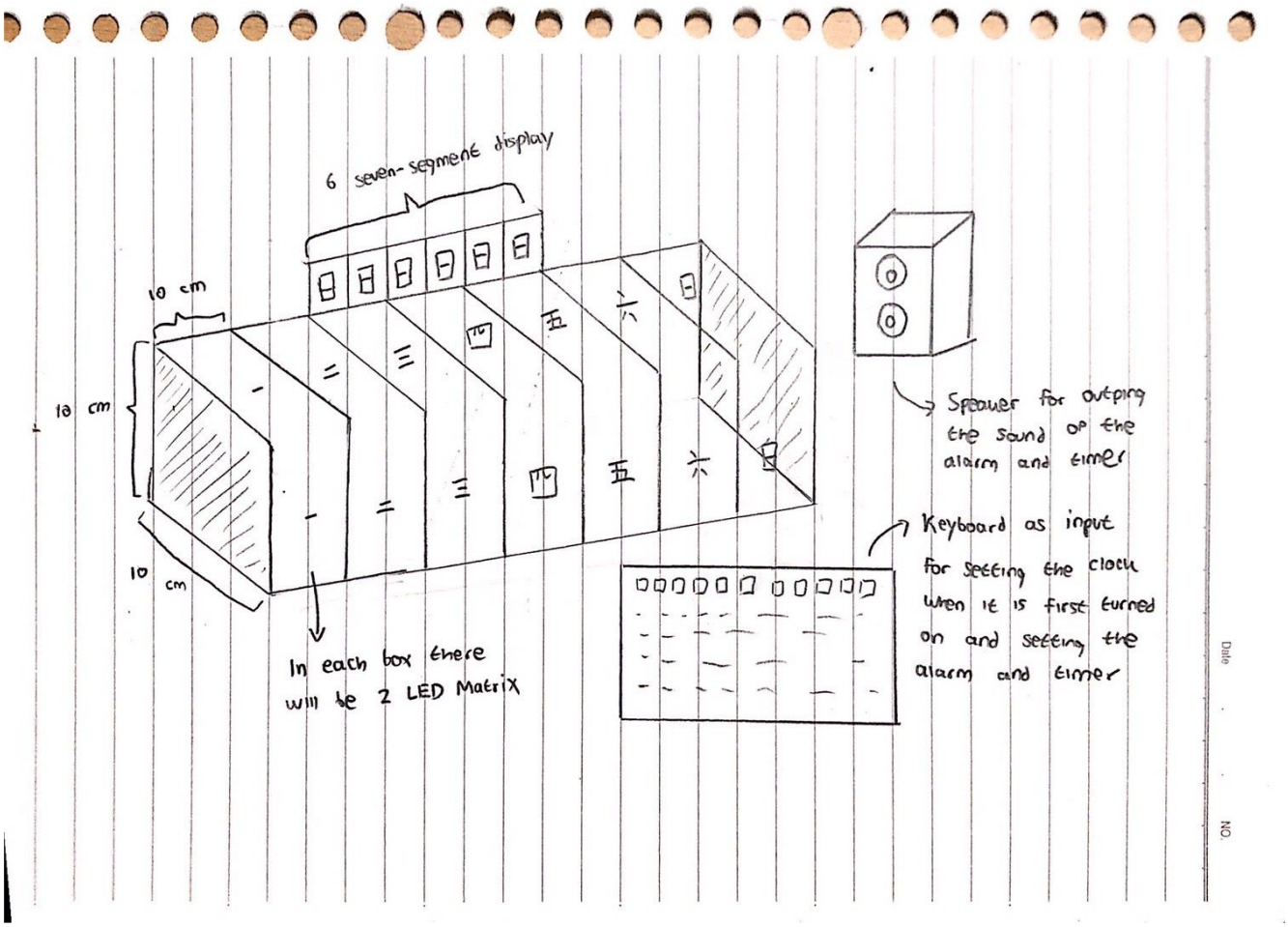
Project Description:

1. 概念圖、功能描述與使用到的I/O Devices或額外的機構設計

- **概念圖:**



We plan to make a multifunctional digital clock that has several functions, including a regular clock that can show the date, day, and time, an alarm clock, and a timer. For the regular clock, the date and time will be shown on the 6 seven-segment display. The display will switch between date and time every few seconds. As for the day, the corresponding box of the day which has two LED matrix arrays installed inside will light up (Example: today is Sunday, the box 日 will light up).

Our design uses corrugated plastic boards as the main material for the foundation of the box, and each small box of the days will have two LED matrix arrays installed inside. We used an 8x8 LED matrix array, one to be installed facing upwards on the bottom part of the box and the other one to be installed facing forward at the back of the box.

For the inputs, we need to have a keyboard to set the clock after being reset or when it is first turned on, also to set the alarm and timer, and to switch between the three modes. As for the output, we also need to have a speaker to output the sound of the alarm and timer.

- **功能描述:**

The Digital Clock has three modes:

1. Clock: Tells the user the current time, date, and what day it is today.

Uses an external seven-segment display to display the current time and date and uses 7 different LED matrices to show what day it is today. If it is the first time that the machine is turned on (or after being reset), then it will let the user input the current time and date.

2. Alarm: Lets the user input targeted time and date, if the current time is equal to the targeted time and date, it will make all the LED matrices blink and output a sound.

Uses the keyboard to input the targeted time and date, after it is confirmed by the user, the machine will go back to display the current clock. When the targeted time and date are equal to the current time and date, the machine will output a sound and make the LED matrices blink.

3. Timer: Counts down with the exact 0.1-timestep from user's input until 00:00.

Uses the external seven segment display to display the time inputted by the user and show the timer counting down from the inputted time until it reaches 00:00. After reaching the 00:00 mark, it will make the LED matrices blink and output a sound.

使用到的I/O Devices:

1. Keyboard
2. Seven Segment Display
3. LED Matrix Array
4. Speaker
5. Cables

2. 規劃工作項目、進度與分工

No.	Item Name	Quantity	Price/Quantity (NTD)	Total Price (NTD)
1.	External LED Matrix Array 8*8	14	80	1120
2.	External Seven Segment Display	6	25	150
3.	Corrugated Plastic Board	3	39	117
4.	Hot Glue Gun and its refill	1	120	120
	TOTAL	-	-	1507

3. 可能遭遇之困難與預期解決方法或備案

- Connecting the external devices to the FPGA board:

  Since we are using 6 external seven-segment displays and 14 LED matrices, it will be challenging to connect all those devices to the FPGA board. A solution that we can think of is by searching for more information and tutorials online.

- Making an algorithm for the machine:

  Currently, we roughly have an idea on how to implement the counters and use it to tell the current time, date, and day. We also have several ideas on how to control the external seven-segment displays and LED matrices, but we don’t know how it would turn out until we started making the code, so there's a high chance that we will encounter a problem. A solution that we can think of is just by searching for information and solutions online.

- Job Descriptions:

劉家成	莊晴雯
- Buying the materials needed - Designing the clock - Designing the alarm - Other additional work needed to be done	- Buying the materials needed - Designing the hardware of the clock - Designing the timer - Other additional work needed to be done

- Timeline of Work

From	**To**	**Description**
5 December 2020	5 December 2020	Buying the materials
6 December 2020	10 December 2020	Designing the hardware
11 December 2020	11 January 2021	Coding and other additional work needed to be done