User manual

COMP2121 Project

A Monorail Emulator

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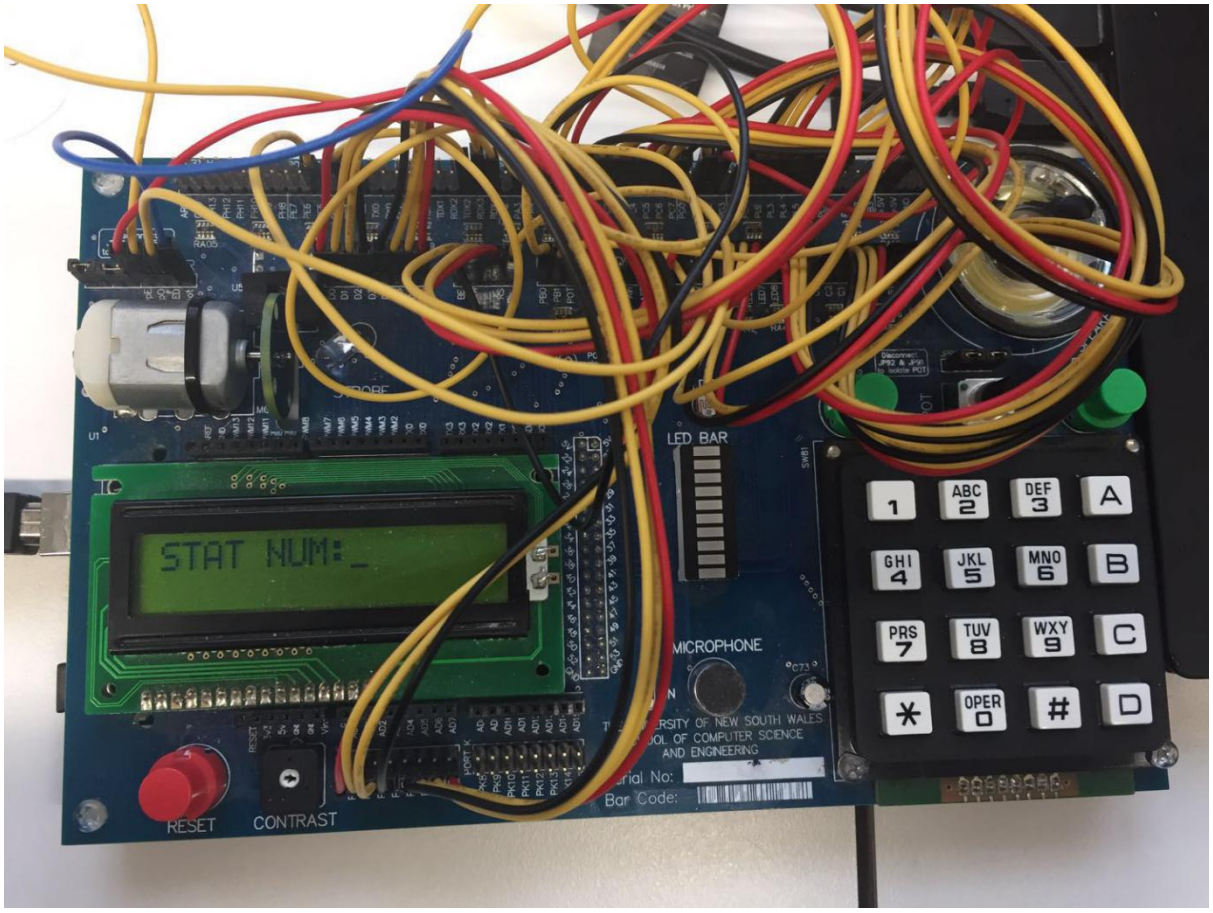
Board setup



The table below shows the general port connections.

Devices	Pin
LCD	PF0 – PF7 => D0 – D7 PE5 => BL PA4 => BE PA5 => RW PA6 => E PA7 => RS
PB0 & PB1	RDX3 => PB1 PDX4 => PB0
MOTOR	PE2 – Mot TDX2 – OpO PA3 – LED +5V – OpE
LED	PC0 – PC7 => LED2 – LED9 PG2 – PG3 => LED0 – LED1
KEYPAD	PL0 – PL3 => C3 – C0 PL4 – PL7 => R3 – R0

Operating instructions

Step 1: Enter the number of stations

The LCD screen will display as follow:

STAT NUM:

This step is to get the number of stations, and the maximum number of stations is 10. You can press the number keys to enter the number you like. In this step, other keys like A, B, C, D and * will not work if you press them, this is to prevent you from inputting wrong data structures.

Number of stations	
Button	Function
0-9	Enter number of stations
#	Finish inputting and store the number of stations
A	Will not work
B	Will not work
C	Will not work
D	Will not work
*	Will not work

When you enter a correct number and press hash, the number of stations will be stored and the program will lead you to the next step. And it is clear that it will be an error input if you enter some values like 0, 1 or numbers larger than 10, which is need to be handled. If you enter 0 or 1, maximum number 10 will be stored. If the number you entered is larger than 10 and is a multiple of 10, like 20 or 30, the number of stations will be considered as 10. Otherwise, the last digit will be regarded as the input(for example, 6 will be recorded if you enter 16) and error inputs will be handled in the same way if it is 0 or 1. Also, if you don’t enter anything and press key #, the number of stations will also be considered as 10.

The maximum digit can be entered is 7, after the 7th digit is entered, you can't enter anything and what you need to do is to press key # to store your input and move to the next step.

Step 2: Enter the name of each station

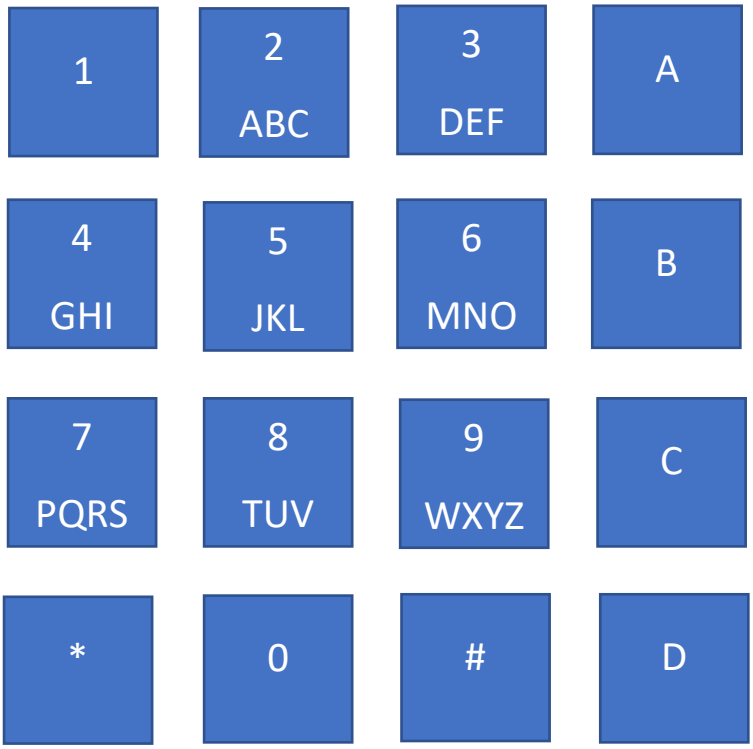
The LCD screen will display as follow:

S1

This step is to get the names of all stations, a station name can be a combination of characters and white spaces, and the maximum number of characters is 10.

Keys A, B, C, D are to represent the characters on the number keys, before you enter the character you want, you need to press the related character key first, then press the number key contains the character you want. For example, if you want to enter "D", you need to press key A first, then press key 3, as a result, "D" will be displayed on the screen and stored. Similarly, if you want "Z", you need to press key D first, then press key 9. If you want to enter the white space, just press key *. In this step, key D will only work for characters on key 7 and key 9, and pressing number keys 2-9 without pressing character keys first will not work. Also key 0 and key 1 will not work in this step. This is to prevent you from inputting wrong data structures.

Names of stations	
Button	Function
2-9	Enter characters
#	Finish inputting and store the name of station
A	Represents the first character on the number key
B	Represents the second character on the number key
C	Represents the third character on the number key
D	Represents the 4th character on the number key
*	White space
0/1	Will not work



When you enter the name of a station and press hash, it will be stored and you can enter the name of the next station. If the length of the name is less than 10, we will use white spaces to make up the rest characters. As what is said above, the maximum number of characters of any name is 10. After entering the 10th character, you can't enter anything and what you need to do is to press key #.

After storing the name of the last station, the program will lead you to the next step.

Step 3: Enter the travel time from one station to another

The LCD screen will display as follow:

S1 TO S2

This step is to get the time for the monorail to travel from one station to the next station without stopping, and the maximum time is 10 seconds. You can press the number keys to enter the number you like. In this step, other keys

like A, B, C, D and * will not work if you press them, this is to prevent you from inputting wrong data structures.

Travel time from one station to another	
Button	Function
0-9	Enter number of stations
#	Finish inputting and store the number of stations
A	Will not work
B	Will not work
C	Will not work
D	Will not work
*	Will not work

When you enter a correct number and press hash, the travel time from this station to the next will be stored and you can then enter the next travel time. And it is clear that it will be an error input if you enter some values like 0 or numbers larger than 10, which is need to be handled. If you enter 0, maximum time 10 seconds will be stored. If the number you entered is larger than 10 and is a multiple of 10, like 20 or 30, the travel time will be considered as 10 seconds. Otherwise, the last digit will be regarded as the input(for example, 6 will be recorded if you enter 16) and error input will be handled in the same way if it is 0. Also, if you don't enter anything and press key #, the travel time will also be considered as 10 seconds.

The maximum digit can be entered is 7, after the 7^{th} digit is entered, you can't enter anything and what you need to do is to press key # to store your input and input for the next station or move to the next step.

After storing all the travel time, the program will lead you to the next step.

Step 4: Enter the stop time

The LCD screen will display as follow:

STOP TIME:

This step is to get the stop time of the monorail at any station, and the minimum stop time is 2 seconds while the maximum time is 5 seconds. You can press the number keys to enter the number you like. In this step, other keys like A, B, C, D and * will not work if you press them, this is to prevent you from inputting wrong data structures.

Stop time at any stations	
Button	Function
0-9	Enter number of stations
#	Finish inputting and store the number of stations
A	Will not work
B	Will not work
C	Will not work
D	Will not work
*	Will not work

When you enter a correct number and press hash, the travel time from this station to the next will be stored and the program will lead you to the next step. And it is clear that it will be an error input if you enter some values like 0, 1 or numbers larger than 5, which is need to be handled. If you enter 0 or 1, minimum time 2 seconds will be stored. If the number you entered is larger than 5, maximum time 5 seconds will be stored. If you enter more than 2 digits, the last digit will be regarded as the input(for example, 6 will be recorded if you enter 16) and error input will be handled in the same way if it is 0, 1 or numbers larger than 5. Also, if you don't enter anything and press key #, the travel time will also be considered as 2 seconds.

The maximum digit can be entered is 6, after the 6^{th} digit is entered, you can't enter anything and what you need to do is to press key # to store your input and move to the next step.

Step 5: Wait for a few seconds and the monorail starts to travel

The LCD screen will display as follow:

OK WAIT

NEXT STATION

After waiting for 5 seconds, the motor will start spinning with a speed of 60 round per second which represents that the monorail start to travel. During this step, the screen will always display the name of the next station and, with that certain travel time.

PB0 and PB1 are to simulate if a tourist wants to get off or get on at the next station. If you press one of them, the monorail will stop at the next station with the stop time you entered.

Key # is to simulate if the monorail stops half way between two stations. When you press key #, the monorail will stop or it will start travel again.

Moreover, whenever the monorail stops, the motor will also stop and two LEDs will blink at a frequency of 3 Hz. When the monorail is traveling, the two LEDS will be off.

Reference and other features:

I used some words in the project specification. Also I want to clarify about how I handle the error input, I emailed Hui before about if my solution is OK and he said that was fine.