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Initial Project Planning Document – Drawing Robot Software

Outline of the Problem to be Solved

The problem is centred around the drawing robot and how to turn the plain text into the instructions that the robot can understand and perform. This requires that the code must be able to load and read all the data within the font file and then break it up into a list of instructions for each letter all able to be called back to later. Preferably the code will only have to do this step once instead of at the start of each run.

The program will then prompt the user to enter the text height in mm and check that it is within the 4 and 10 mm boundaries and then scale all the individual letter instructions to match the desired text height judging by the sample image of an output we have been given It looks to be a monospaced font meaning that all letters have the same horizontal length. This means that's the code checking when to go to the next line to be much simpler as it doesn't need to total the length for each letter just multiply the scaled length by the number of letters in the word

Next the program will have to read the text file that it is trying to write onto the paper and be able to group together letters in a word to ensure that the word being written will not be spread across two lines of the output. This will require the program to think ahead and monitor the current x pos of the robot and the final x pos after every word and make sure that if a word goes past the maximum width of 100mm the entire word will be placed onto the next line accounting for the current text height. If the word is too large to fit on one line it will write as many letters as possible on the current line and then continue onto the next line.

the program will then turn the instructions into gcode which the robot can understand and then output them to the Arduino to be executed, when all instructions have been sent the program should understand to tell the robot to raise the pen and return to 0,0 for the next text to be processed.

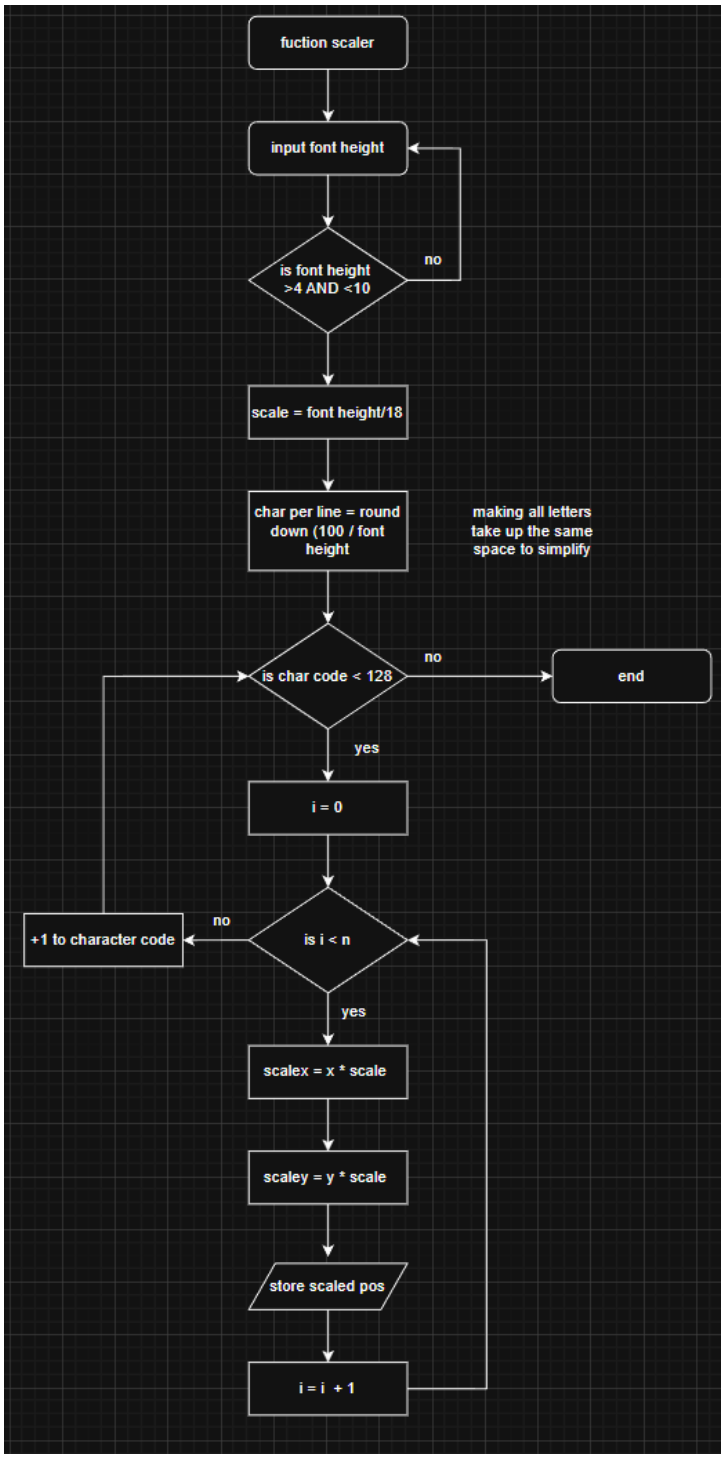
Key Data Items

Name	Data type	Rationale
Stroke{x}	struct	Stores the pen x and y pos before and after scaling for each letter aswell as the position of the pen for each stroke x and each letter
Letter{x}	struct	Stores the instructions for one character. It contains an array of stroke structures and the number of strokes for each character
___pos	integer	Used in multiple loops to progress though a task
Font height	float	The user may enter a decimal for the font height if it is require
Current word	list	Contains a list of the letters in the current word trying to be drawn

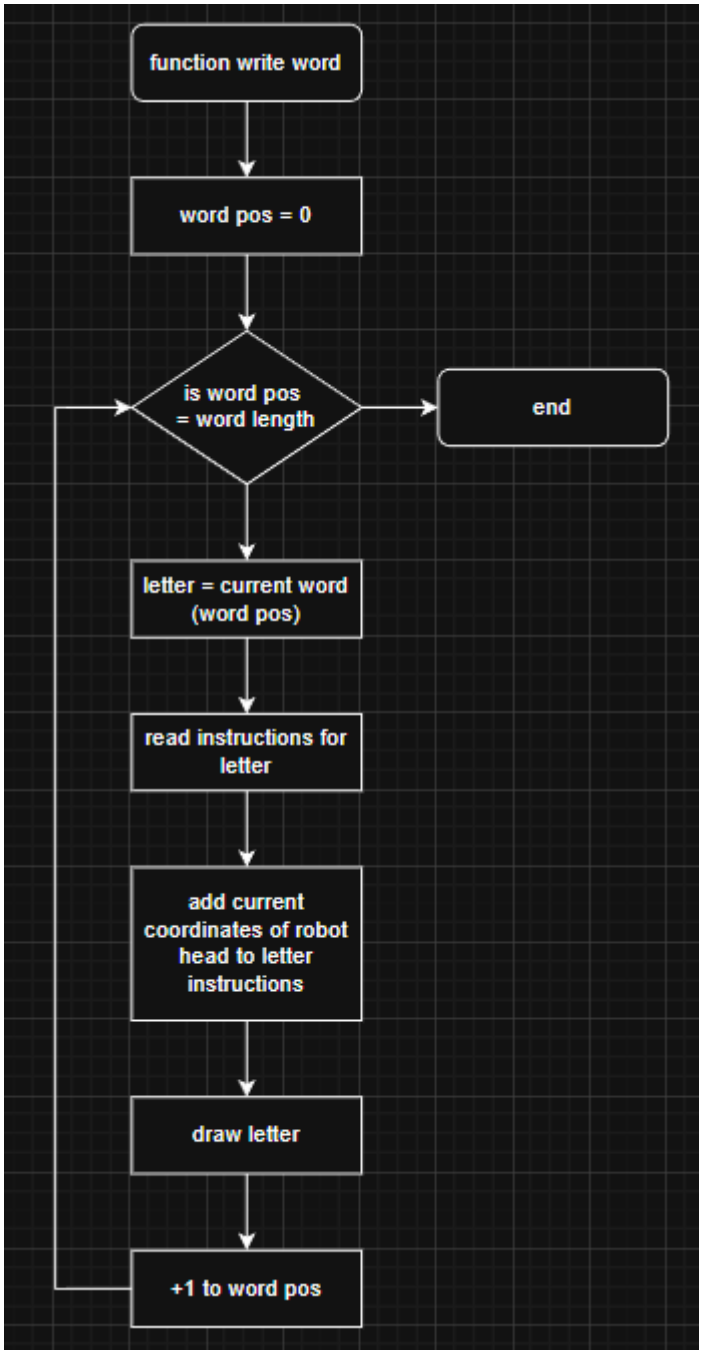
Extend table as required

Function Declarations

Under my current interpretation of the task I will only be using two functions
The scaler function that will be called early on and will prompt for the text size and scale each instruction to fit the text height.



And the write word function which will be called to interpret the current word, read the instructions for each letter and then add the current position on the pen to each letter and then draw each letter.



Currently the code that reads the font file and outputs the structures for the letter instructions will be run separately and then saved to be accessible by the scaler function to improve performance.

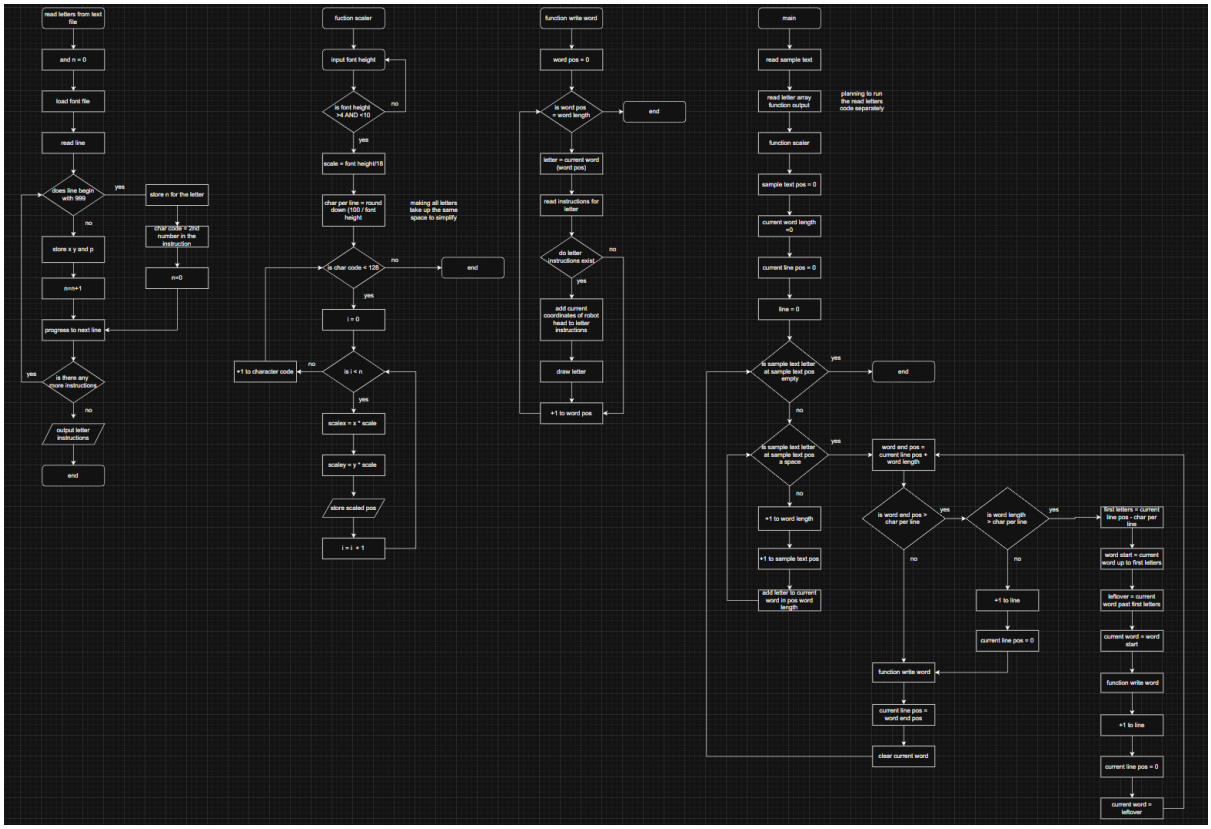
Testing Information

Function	Test Case	Test Data	Expected Output
scaler	Wrong font height	0 , 4 , 10 , 99	0 and 99 will prompt for a new font height 4 and 10 will be accepted as the value for the scaler to use
main	Empty sample text		Program should draw nothing
main	Word length > line length	Antidisestablishmentarianism, {word with length = char per line},	Words with length longer than the max length per line should write as far as they can on the current line then continue on the next until the word is complete.
Write word	Unreadable character	hÆllo , hello	The program will skip the character if it cannot find the instructions to write it

Extend table as required. Note that 'Function' includes main()

Flowchart(s)

May be included as separate pdf



AI Statement

I used AI to recommend a data type for storing the instructions for each letter, I attached it the font file and a brief description of the task and how I was planning to approach it using an array however was worried about the number of dimensions. The AI recommended instead using a set of structs which after looking into I decided would be much simpler and easier to use.