Project Planning of Software for a Writing Robot

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Software Description

This software is aimed to generate a G-code to the writing robot for writing the text which is read from a file. The G-code will be executed by the writing robot and draw the text on the paper.

The text which needs to be ‘draw out’ is input to the software by saving as a file. The output G-code will be sent to the control unit of the writing robot (Arduino in this case) using a virtual RS232 serial port.

In this software, some font data and open-source libraries will be used, for example, an additional font file contains the pre-defined G code for each character will be required. The RS232 serial port communication will be handled by a RS232 library.

For the serial port communication, before sending more G-code, the software will wait until receiving the acknowledge signal from the Arduino.

The software interface with user will be a console window. The communication code and possible errors during the process will be displayed on this console window.

Function Declarations

int generateFontIndex(FILE *filepointer, int fontGcodeLineIndex[ ]);
Parameters:

filepointer: file pointer of the font g code file;
fontGcodeLineIndex: an array with size of 256 (equal to double size of ascii table), this stores the start line and end line number of each character G-code;
Return value: 1 for success, 0 for failed.

int WaitForWakeUp(void);
Parameters:

Return value: always 0.

int updateGcodeTargetPosition(int gcodeLineNum, int currentXOffset, int currentYOffset, char gCodeCommand[ ], int lastTimeReturnValue);
Parameters:

gcodeLineNum: current line number of fonts data;
currentXOffset: x axis start point of current character to the machine axes;
currentYOffset: y axis start point of current character to the machine axes;
gCodeCommand[ ]: return g code command for current step;

lastTimeReturnValue: determine if need to export Z axis move command;
Return value: 1 for no pen move up/down and head to next line, -1 for has pen move up/down and keep at same line, 0 for failed to execute

int WaitForReply(void);
Parameters:
Return value: always 0.

int updateCharactorOffsetPosition(int *tempOffsetX, int *tempOffsetY);
Parameters:
*tempOffsetX: the offset position X needs to update;
*tempOffsetY: the offset position Y needs to update;
Return value: 1 for success, 0 for failed.

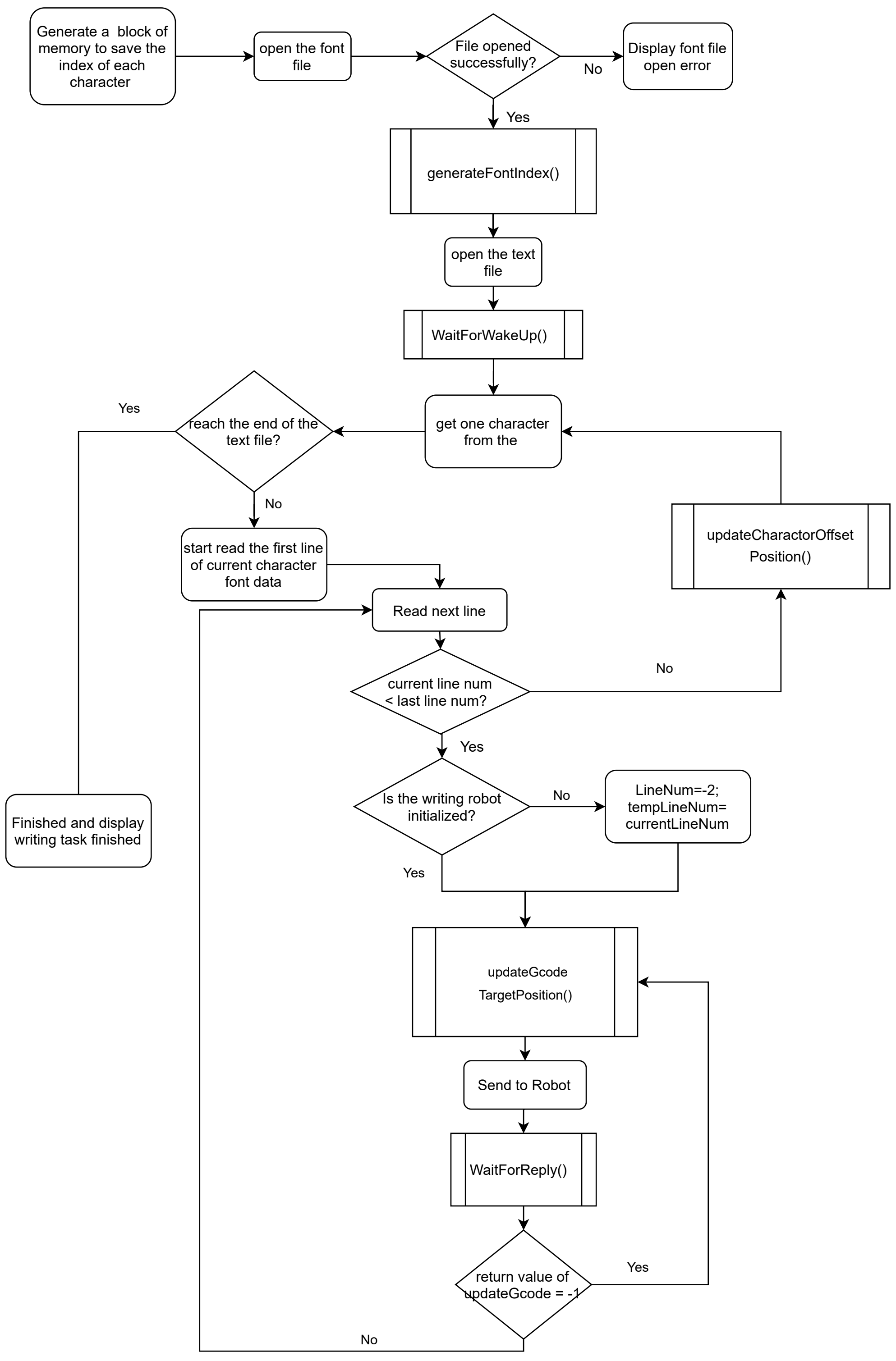
Key Data Items

Name	Data type	Rationale
fontFilePointer	FILE *	File pointer for font data
fontDataIndex[256]	int	An array with size of 256, start line num is fontDataIndex [2*(int) character], end line is fontDataIndex [2*(int) character + 1].
textFilePointer	FILE *	File pointer for text file
positionXOffset	Int	The x offset of current character
positionYOffset	int	The y offset of current character
currentFontDataLine	int	The line number of current executing code

Test Information

Function	Test Case	Test Data	Expected Output
generateFontIndex	Load font data	Font data file path, empty array.	Return 1, with the font index loaded
updateGcodeTargetPosition	Initilaize the start of whole code	gcodeLineNum = -2, offset x and y both = 0, lastTimeReturn Value = 1;	Return -1, with the char array become ‘F 1000’.
updateGcodeTargetPosition	Test the output of Char H’s third line	gcodeLineNum = fontDataIndex [2*(int) ‘H’ + 2], offset x and y both = 0, lastTimeReturn Value = 1;	Return -1, with the char array become ‘S 1000’.
updateGcodeTargetPosition	Test the output of Char H’s third line after pen move down	gcodeLineNum = fontDataIndex [2*(int) ‘H’ + 2], offset x and y both = 0, lastTimeReturn Value = -1;	Return 1, with the char array become ‘G1 X0 Y18’.
updateCharactorOffsetPosition	Move one width	tempOffsetX = 0, tempOffsetY = 0;	Return 1, tempOffsetX = _CHAR_WIDTH, tempOffsetY = 0;
updateCharactorOffsetPosition	Shift to next line	tempOffsetX = _MAX_WIDTH, tempOffsetY = 0;	Return 1, tempOffsetX = 0, tempOffsetY = _LINE_HEIGHT;

Flowcharts


Generate a block of memory to save the index of each character
open the font file
File opened successfully?
No
Display font file open error
Yes
generateFontIndex()
open the text file
WaitForWakeUp()
get one character from the
reach the end of the text file?
Yes
No
Finished and display writing task finished
start read the first line of current character font data
Read next line
current line num < last line num?
No
updateCharactorOffset Position()
Yes
Is the writing robot initialized?
No
LineNum=-2; tempLineNum= currentLineNum
Yes
updateGcode TargetPosition()
Send to Robot
WaitForReply()
return value of updateGcode = -1
Yes
No