**Previous version: 1.1**

**Current Version: 1.2 8/18/2020**

**OVERALL CHANGES**

Version 1.1 required the user to drag and drop 24-bit bitmap files into the /Input folder for picture processing. It then required the user to tweak the source.c file to adjust the # of pictures to be shown on the LED Matrix.

Now with version 1.2, the user does not have to get involved with the source.c file to tweak the # of pictures to be displayed. The user only has to drag and drop black/white pictures of around 30x24 pixels in the /Input folder and then execute the execute\_all.sh bash script to program pictures in the LED Matrix.

**CHANGES FOR BMPREADCLASS.H**

**Main objective:**

1) Generate a single header.h file (export.h) instead of generating multiple header files (export1.h, export2.h, export3.h….export100000.h and so on) and save picture hex data for all pictures in a single header file.

2) create a function called generate\_runpictureprogram\_function() that automatically generates a function in the header.h file that will call other functions to display pictures. This way, the user does not need to tweak the source.c file to accommodate different number of pictures.

3) Code cleanup

**Changes:**

* Modified VOID exporttofile function to generate only 1 header file instead of multiple header files. This single header file will contain all hex data for all pictures.
* Added functions for better program control:
  + closeoutputfile() -> only closes the output file (export.h file)
  + closeinputfiles() -> only closes the input files (Import\*\*\*.bmp files)
  + createexportfile() -> only creates the (export.h file)
  + generate\_runpictureprogram\_function() -> dynamically generated function
* Code cleanup of the bmpreadclass.h file to eliminate dead code.

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**CHANGES FOR MAIN.CPP**

**Main objective:**

1. Code cleanup to accommodate new functions from bmpreadclass.h and new code logic due to changes in bmpreadclass.h.
2. Moved the displaypicture() function to an external header file called displaypicture.h to reduce the size of the main.cpp file and to add/delete functionality in future versions.

**Changes:**

* Use of newly added functions:
  + closeoutputfile() -> only closes the output file (export.h file)
  + closeinputfiles() -> only closes the input files (Import\*\*\*.bmp files)
  + createexportfile() -> only creates the (export.h file)
  + generate\_runpictureprogram\_function() -> dynamically generated function
  + Elimination of code logic (switch case statement) that generates export file names (e.g. Export001.h, Export002.h……). Export file names has been changed to export.h and no additional header files will be created.
  + Code cleanup of the main.cpp file to eliminate dead code.

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**NEW FILES:**

* export.h -> file gets code written based on the # of pictures available in the Import folder
* displaypicture.h -> moving forward, all related picture functions will be added here!

**MAKEFILE CHANGES:**

* Changes were made to the make files just to help with compilation and cleanup of old files when re-compiling and re-running the executable file/s.

**BASH SCRIPT CHANGES:**

* A single line changed to delete a “export.h” header file from the Export folder instead of all the files within the Export folder.

ROOMS FOR IMPROVEMENT:

1. The CPP program only accepts low resolution pictures in black and white. This functionality is very limited and the CPP program should also be able to accept full color pictures of around 1500x1800 pixels in width and height for processing and image conversion.
2. The ATMEGA32 microcontroller is limited to displaying 14 pictures in total! The flash size is 32 kb and is very limited. The project cannot escalate correctly if a bigger LED Matrix with higher resolution is built. At this point, changing the platform can be beneficial for better performance and storage capacity.
3. The LED Matrix can display scrolling text, but only if the source.c file is modified. A bash script can be created where the user is prompted to enter a text message to be displayed on the Matrix instead of exposing the user to the raw code. This text message can be saved in a file, opened with CPP, have the contents read, saved in flash memory and then called.