MatrixPortal CircuitPython Animated Message Board

Created by Melissa LeBlanc-Williams

https://learn.adafruit.com/matrixportal-circuitpython-animated-message-board

Last updated on 2023-11-09 03:35:31 PM EST
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Overview

Perhaps you've seen those animated message board signs and perhaps you even wanted one. However, you may have noticed they tend to be fairly pricey and programming them can be complicated.

This project makes use of the powerful Adafruit MatrixPortal S3 and its large memory capacity to be able to pump out and blend graphics in real time using CircuitPython. It works by using CircuitPython's bitmaptools module along with displayio to blend, blit and buffer swap images and text together to produce smooth animations.

The code for this project is based on the OpenSign project, which was written for the Raspberry Pi, but the code was completely rewritten from scratch for this project to make use of strengths of CircuitPython. Certain features such as shadow and text stroke were omitted because of the lack of support at this time. Some library restructuring was also done to make it more expandable and avoid OpenSign's large library files for memory efficiency.

This project was featured on one of the livestreams for CircuitPython Day, which you can watch below.

Parts

This project requires the new MatrixPortal S3 for its speed and memory using four 16x32 RGB LED matrices.
1 x GPIO Ribbon Cable 2x8 IDC Cable - 16 pins 12" long
Needed for reaching the first panel

For the LED acrylic, you can either purchase a 12"x12" sheet and cut it down to a size yourself. It will need to be cut to 3 equal width pieces approximately 101.6mm (4 inches) wide and the lengths of the pieces should add up to 776mm (30.55 inches).

Black LED Diffusion Acrylic Panel 12" x 12" - 0.1" / 2.6mm thick
A nice whoppin' slab of some lovely black acrylic to add some extra diffusion to your LED Matrix project. This material is 2.6mm (0.1") thick and is made of special cast...
https://www.adafruit.com/product/4594

Or you can get 1 large piece from TAP Plastics custom cut to size.

Adafruit Matrix Portal S3 CircuitPython Powered Internet Display
Folks love our wide selection of RGB matrices and accessories for making custom colorful LED displays... and our RGB Matrix...
https://www.adafruit.com/product/5778

Medium 16x32 RGB LED matrix panel - 6mm Pitch
Bring a little bit of Times Square into your home with this 16 x 32 RGB LED matrix panel. These panels are normally used to make video walls, here in New York we see them on the sides...
https://www.adafruit.com/product/420

https://www.adafruit.com/product/4170

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### Optional Parts

To assemble, you will need some metal or nylon 10mm M2.5 screws and washers, M3 screws, and zip ties for wire management.

<table>
<thead>
<tr>
<th>Item</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x <strong>Black LED Acrylic</strong></td>
<td><a href="https://www.tap">https://www.tap</a> plastics.com/product/plastics/cut_to_size_plastic/black_led_sheet/668</td>
</tr>
<tr>
<td>1 x M2.5 Nylon Screws</td>
<td><a href="https://www.adafruit.com/product/3299">https://www.adafruit.com/product/3299</a></td>
</tr>
<tr>
<td>Black Nylon Machine Screw and Stand-off Set – M2.5 Thread</td>
<td></td>
</tr>
<tr>
<td>1 x M3 Nylon Screws</td>
<td><a href="https://www.adafruit.com/product/4685">https://www.adafruit.com/product/4685</a></td>
</tr>
<tr>
<td>Black Nylon Machine Screw and Stand-off Set - M3 Thread</td>
<td></td>
</tr>
<tr>
<td>1 x Assorted Zip Ties</td>
<td><a href="https://amzn.to/3OOQmif">https://amzn.to/3OOQmif</a></td>
</tr>
<tr>
<td>1000 Pcs Black Cable Zip Ties Assorted Sizes</td>
<td></td>
</tr>
<tr>
<td>1 x USB A to USB C Adapter</td>
<td><a href="https://www.adafruit.com/product/4175">https://www.adafruit.com/product/4175</a></td>
</tr>
<tr>
<td>Optional if you don't have a USB-C Port on your computer.</td>
<td></td>
</tr>
</tbody>
</table>

### Extra Power Parts

If you need more power than the USB port can provide, you will want these parts.

<table>
<thead>
<tr>
<th>Item</th>
<th>URL</th>
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</thead>
<tbody>
<tr>
<td>1 x <strong>2 in 1 USB-C OTG Splitter</strong></td>
<td><a href="https://amzn.to/3P59nhK">https://amzn.to/3P59nhK</a></td>
</tr>
<tr>
<td>Useful for providing more power than the USB port can supply</td>
<td></td>
</tr>
<tr>
<td>1 x <strong>5V 4 Amp Power Supply</strong></td>
<td><a href="https://www.adafruit.com/product/1466">https://www.adafruit.com/product/1466</a></td>
</tr>
<tr>
<td>5V 4A (4000mA) switching power supply</td>
<td></td>
</tr>
<tr>
<td>1 x <strong>2.1mm 5VDC Barrel Jack to USB-C Adapter</strong></td>
<td><a href="https://www.adafruit.com/product/4536">https://www.adafruit.com/product/4536</a></td>
</tr>
<tr>
<td>For connecting the Power Supply to USB-C</td>
<td></td>
</tr>
<tr>
<td>1 x <strong>USB Type A to Type C Cable</strong></td>
<td><a href="https://www.adafruit.com/product/4474">https://www.adafruit.com/product/4474</a></td>
</tr>
<tr>
<td>USB Type A to Type C Cable - approx 1 meter / 3 ft long</td>
<td></td>
</tr>
</tbody>
</table>
This project will be assembled with quite a few 3D printed parts, described below, but many of them are duplicates. The parts are available in either the STL (older) or 3MF (newer) format. Most slicers support both. You'll need to print multiples of some parts:

- 6 x Connector Bracket.stl
- 7 x Top or Bottom Panel.stl
- 1 x Top Panel with Cutout.stl
- 2 x Side Panel.stl
- 1 x MatrixPortal Mount.stl

### Slicer Settings

The specific setting values aren't critical with this case. Here are the settings used to print the case for this guide.
For the Connector Bracket and MatrixPortal Mount:

- 20% gyroid infill
- Supports on build plate enabled
- 0.3mm Layer Height

For the other parts:

- 20% gyroid infill
- 0.2mm Layer Height
- No Supports

Parts Details

Connector Bracket
Used to connect the matrices together, has a dovetail for the panels, and a zip tie slot.

Top or Bottom Panel
Dovetail panel for the top or bottom of the message board.
Top Panel with Cutout
Special version of the top panel with cutout holes for the MatrixPortal S3.

Side Panel
Panel for each side of the message board. These attach to the matrix, but also slot into the Top and Bottom Panels.

MatrixPortal Mount
Mount to hold the MatrixPortal S3 so that it lines up with the cutout holes. This attaches on top of the Matrix and one of the connector brackets.

Install CircuitPython

CircuitPython() is a derivative of MicroPython() designed to simplify experimentation and education on low-cost microcontrollers. It makes it easier than ever to get prototyping by requiring no upfront desktop software downloads. Simply copy and edit files on the CIRCUITPY drive to iterate.
Set up CircuitPython Quick Start!

Follow this quick step-by-step for super-fast Python power :) 

This project requires version 9 or later of CircuitPython.

Download the latest version of CircuitPython for this board via circuitpython.org

Further Information

For more detailed info on installing CircuitPython, check out Installing CircuitPython.

Click the link above and download the latest UF2 file.

Download and save it to your desktop (or wherever is handy).
Plug your MatrixPortal S3 into your computer using a known-good USB cable.

A lot of people end up using charge-only USB cables and it is very frustrating! So make sure you have a USB cable you know is good for data sync.

Click the Reset button (indicated by the green arrow) on your board. When you see the NeoPixel RGB LED (indicated by the magenta arrow) turn purple, press it again. At that point, the NeoPixel should turn green. If it turns red, check the USB cable, try another USB port, etc.

If double-clicking doesn't work the first time, try again. Sometimes it can take a few tries to get the rhythm right!

You will see a new disk drive appear called MATRXS3BOOT.

Drag the adafruit_circuitpython_etc.uf2 file over to MATRXS3BOOT.

The LED will flash. Then, the MATRXS3BOOT drive will disappear and a new disk drive called CIRCUITPY will appear.

That's it, you're done! :}

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Code the Message Board

Once you've finished setting up your MatrixPortal S3 with CircuitPython, you can access the code, fonts, images and necessary libraries by downloading the Project Bundle.

To do this, click on the Download Project Bundle button in the window below. It will download as a zipped folder.

```python
# SPDX-FileCopyrightText: 2023 Melissa LeBlanc-Williams for Adafruit Industries
#
# SPDX-License-Identifier: MIT

import time
from adafruit_matrixportal.matrix import Matrix
from messageboard import MessageBoard
from messageboard.fontpool import FontPool
from messageboard.message import Message

matrix = Matrix(width=128, height=16, bit_depth=5)
messageboard = MessageBoard(matrix)
messageboard.set_background("images/background.bmp")
fontpool = FontPool()
fontpool.add_font("arial", "fonts/Arial-10.pcf")

# Create the message ahead of time
message = Message(fontpool.find_font("arial"), mask_color=0xFF00FF, opacity=0.8)
message.add_image("images/maskedstar.bmp")
message.add_text("Hello World!", color=0xFFFF00, x_offset=2, y_offset=2)

while True:
    # Animate the message
    messageboard.animate(message, "Scroll", "in_from_right")
    time.sleep(1)
    messageboard.animate(message, "Scroll", "out_to_left")
```

Upload the Code, Fonts, Images and Libraries to the MatrixPortal S3

After downloading the Project Bundle, plug your MatrixPortal S3 into the computer's USB port. You should see a new flash drive appear in the computer's File Explorer or Finder (depending on your operating system) called CIRCUITPY. Unzip the folder and copy the following items to the MatrixPortal S3's CIRCUITPY drive.

- lib folder
- fonts folder
- images folder
- code.py
- demo.py
Code Overview

The majority of this code is written as a library. There are a couple of demos, which will be covered in the Usage page, but the overview will go over the library part. The code relies heavily on the CircuitPython `bitmaptools` and `displayio` modules in order to do the graphics work. The library classes can be broken up into a couple of different categories. You can find more information about `displayio` in the CircuitPython Display Support Using displayio guide.
Main Classes

The main classes provide the primary functionality to the message board.

Double Buffering

Double Buffering is handled by the `DoubleBuffer` class. This class works by creating 2 sets of `displayio` Bitmaps, TileGrids, and Groups. It sets 1 of the bitmaps as the "active" buffer, meaning the buffer that is currently being drawn to. Once it is ready to display, the `show()` function is called, which will set the group of the active buffer to be displayed and then swap the buffers. By doing this, it avoids displaying small changes as they are drawn, which can lead to some flickering, and switches everything all at once. Both buffer bitmaps share the same shader, so it is best to keep consistent with the same bit depth of all bitmaps.

```python
import displayio

class DoubleBuffer:
    def __init__(self, display, width, height, shader=None, bit_depth=16):
        self._buffer_group = (displayio.Group(), displayio.Group())
        self._buffer = (
            displayio.Bitmap(width, height, 2**bit_depth - 1),
            displayio.Bitmap(width, height, 2**bit_depth - 1),
        )
        self._x_offset = display.width - width
        self._y_offset = display.height - height
        self.display = display
        self._active_buffer = 0  # The buffer we are updating

        if shader is None:
            shader = displayio.ColorConverter()

        buffer0_sprite = displayio.TileGrid(
            self._buffer[0],
            pixel_shader=shader,
            x=self._x_offset,
            y=self._y_offset,
        )
        self._buffer_group[0].append(buffer0_sprite)

        buffer1_sprite = displayio.TileGrid(
            self._buffer[1],
            pixel_shader=shader,
            x=self._x_offset,
            y=self._y_offset,
        )
        self._buffer_group[1].append(buffer1_sprite)

    def show(self, swap=True):
        self.display.root_group = self._buffer_group[self._active_buffer]
        if swap:
            self.swap()
```

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def swap(self):
    self._active_buffer = 0 if self._active_buffer else 1

@property
def active_buffer(self):
    return self._buffer[self._active_buffer]

@property
def shader(self):
    return self._buffer_group[0][0].pixel_shader

@shader.setter
def shader(self, shader):
    self._buffer_group[0][0].pixel_shader = shader
    self._buffer_group[1][0].pixel_shader = shader

Message

A Message is simply a class that uses a bitmap which contains one or more labels or images placed onto it. When displayed, it acts as the foreground which can be animated on the sign. The message's bitmap buffer is automatically enlarged as content is added to it so that it only takes up as much space as it needs. The mask_color and opacity can be set to control how it is blended into the background.

```
# SPDX-FileCopyrightText: 2023 Melissa LeBlanc-Williams for Adafruit Industries
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import bitmaptools
import displayio
import adafruit_imageload
from adafruit_display_text import bitmap_label

class Message:
    def __init__(self, font, opacity=1.0, mask_color=0xFF00FF, blendmode=bitmaptools.BlendMode.Normal):
        self._current_font = font
        self._current_color = 0xFF0000
        self._buffer = displayio.Bitmap(0, 0, 65535)
        self._cursor = [0, 0]
        self.opacity = opacity
        self._blendmode = blendmode
        self._mask_color = 0
        self.mask_color = mask_color
        self._width = 0
        self._height = 0

    def _enlarge_buffer(self, width, height):
        """Resize the message buffer to grow as necessary"""
        new_width = self._width
        if self._cursor[0] + width >= self._width:
            new_width = self._cursor[0] + width

        new_height = self._height
        if self._cursor[1] + height >= self._height:
```
new_height = self._cursor[1] + height

if new_width > self._width or new_height > self._height:
    new_buffer = displayio.Bitmap(new_width, new_height, 65535)
    if self._mask_color is not None:
        bitmaptools.fill_region(
            new_buffer, 0, 0, new_width, new_height, self._mask_color
        )
    bitmaptools.blit(new_buffer, self._buffer, 0, 0)
    self._buffer = new_buffer
    self._width = new_width
    self._height = new_height

def _add_bitmap(self, bitmap, x_offset=0, y_offset=0):
    new_width, new_height = (
        self._cursor[0] + bitmap.width + x_offset,
        self._cursor[1] + bitmap.height + y_offset,
    )
    # Resize the buffer if necessary
    self._enlarge_buffer(new_width, new_height)
    # Blit the image into the buffer
    source_left, source_top = 0, 0
    if self._cursor[0] + x_offset < 0:
        source_left = 0 - (self._cursor[0] + x_offset)
        x_offset = 0
    if self._cursor[1] + y_offset < 0:
        source_top = 0 - (self._cursor[1] + y_offset)
        y_offset = 0
    bitmaptools.blit(
        self._buffer,
        bitmap,
        self._cursor[0] + x_offset,
        self._cursor[1] + y_offset,
        x1=source_left,
        y1=source_top,
    )
    # Move the cursor
    self._cursor[0] += bitmap.width + x_offset

def add_text(
    self,
    text,
    color=None,
    font=None,
    x_offset=0,
    y_offset=0,
):
    if font is None:
        font = self._current_font
    if color is None:
        color = self._current_color
    color_565value = displayio.ColorConverter().convert(color)
    # Create a bitmap label and add it to the buffer
    bmp_label = bitmap_label.Label(font, text=text)
    color_overlay = displayio.Bitmap(
        bmp_label.bitmap.width, bmp_label.bitmap.height, 65535
    )
    color_overlay.fill(color_565value)
    mask_overlay = displayio.Bitmap(
        bmp_label.bitmap.width, bmp_label.bitmap.height, 65535
    )
    mask_overlay.fill(self._mask_color)
    bitmaptools.blit(color_overlay, bmp_label.bitmap, 0, 0, skip_source_index=1)
    bitmaptools.blit(
        colorOverlay, mask_overlay, 0, 0, skip_dest_index=color_565value
    )
    bmp_label = None

    self._add_bitmap(color_overlay, x_offset, y_offset)
def add_image(self, image, x_offset=0, y_offset=0):
    # Load the image with imageload and add it to the buffer
    bmp_image, _ = adafruit_imageload.load(image)
    self._add_bitmap(bmp_image, x_offset, y_offset)

def clear(self):
    """Clear the canvas content, but retain all of the style settings""
    self._buffer = displayio.Bitmap(0, 0, 65535)
    self._cursor = [0, 0]
    self._width = 0
    self._height = 0

@property
def buffer(self):
    """Return the current buffer""
    if self._width == 0 or self._height == 0:
        raise RuntimeError("No content in the message")
    return self._buffer

@property
def mask_color(self):
    """Get or Set the mask color""
    return self._mask_color

@mask_color.setter
def mask_color(self, value):
    self._mask_color = displayio.ColorConverter().convert(value)

@property
def blendmode(self):
    """Get or Set the blendmode""
    return self._blendmode

@blendmode.setter
def blendmode(self, value):
    if value in bitmaptools.BlendMode:
        self._blendmode = value

Font Pool

The **FontPool** class is a simple font loader and dictionary that holds the loaded fonts so that they don't need to be duplicated for multiple messages.
MessageBoard

The **MessageBoard** class is the main container class and as the name implies, it controls the message board. The message board allows setting what the current background should be and will be used when the animate command is used. The `animate()` function is used to dynamically load and run an animation, which will perform an action on the text until it reaches the end of the function. The `_draw()` function is a callback that is passed into the animation class when it is instantiated and is the function primarily responsible for drawing each frame of the animation.

```
# SPDX-FileCopyrightText: 2023 Melissa LeBlanc-Williams for Adafruit Industries
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# SPDX-License-Identifier: MIT

import bitmaptools
import displayio
import adafruit_imageload
from .doublebuffer import DoubleBuffer
from .message import Message

class MessageBoard:
    def __init__(self, matrix):
        self.fonts = {}
        self.display = matrix.display
        self._buffer_width = self.display.width * 2
        self._buffer_height = self.display.height * 2
        self._dbl_buf = DoubleBuffer(
            self.display, self._buffer_width, self._buffer_height
        )
        self._background = None
        self.set_background()  # Set to black
        self._position = (0, 0)

    def set_background(self, file_or_color=0x000000):
        """The background image to a bitmap file."""
        if isinstance(file_or_color, str):  # its a filename:
            background, bg_shader = adafruit_imageload.load(file_or_color)
            self._dbl_buf.shader = bg_shader
            self._background = background
        elif isinstance(file_or_color, int):
            # Make a background color fill
            bg_shader = displayio.ColorConverter(
                input_colorspace=displayio.Colorspace.RGB565
            )
            background = displayio.Bitmap(
                self.display.width, self.display.height, 65535
            )
            background.fill(displayio.ColorConverter().convert(file_or_color))
            self._dbl_buf.shader = bg_shader
            self._background = background
        else:
            raise RuntimeError("Unknown type of background")
```
def animate(self, message, animation_class, animation_function, **kwargs):
    anim_class = __import__(
        f"{self.__module__}.animations.{animation_class.lower()}"
    )
    anim_class = getattr(anim_class, "animations")
    anim_class = getattr(anim_class, animation_class)
    animation = anim_class(self.display, self._draw, self._position)
    # Instantiate the class
    # Call the animation function and pass kwargs along with the message
    anim_func = getattr(animation, animation_function)
    anim_func(message, **kwargs)

def set_message_position(self, x, y):
    """Set the position of the message on the display""
    self._position = (x, y)

def _draw(
    self,
    image,
    x,
    y,
    opacity=None,
    mask_color=0xFF00FF,
    blendmode=bitmaptools.BlendMode.Normal,
    post_draw_position=None,
):
    """Draws a message to the buffer taking its current settings into account.
    It also sets the current position and performs a swap."
    self._position = (x, y)
    buffer_x_offset = self._buffer_width - self.display.width
    buffer_y_offset = self._buffer_height - self.display.height

    # Image can be a message in which case its properties will be used
    if isinstance(image, Message):
        if opacity is None:
            opacity = image.opacity
        mask_color = image.mask_color
        blendmode = image.blendmode
        image = image.buffer
    if opacity is None:
        opacity = 1.0
    if mask_color > 65535:
        mask_color = displayio.ColorConverter().convert(mask_color)

    # Blit the background
    bitmaptools.blit(
        self._dbl_buf.active_buffer,
        self._background,
        buffer_x_offset,
        buffer_y_offset,
    )

    # If the image is wider than the display buffer, we need to shrink it
    while x + buffer_x_offset < 0:
        new_image = displayio.Bitmap(
            image.width - self.display.width, image.height, 65535
        )
        bitmaptools.blit(
            new_image,
            image,
            0,
            0,
            x1=self.display.width,
        )
Animation Classes

All of the animation classes are built on top of the base Animation class, which includes any functions that are shared with the different categories.
import time

class Animation:
    def __init__(self, display, draw_callback, starting_position=(0, 0)):
        self._display = display
        self._position = starting_position
        self._draw = draw_callback

@staticmethod
def _wait(start_time, duration):
    """Uses time.monotonic() to wait from the start time for a specified duration"""
    while time.monotonic() < (start_time + duration):
        pass
    return time.monotonic()

def _get_centered_position(self, message):
    return int(self._display.width / 2 - message.buffer.width / 2), int(
        self._display.height / 2 - message.buffer.height / 2
    )

Scroll Animations

The Scroll animation class contains 8 different main animation functions plus 1 generic animation function, which the main functions call. The 8 functions include a scroll in and scroll out function for each of the 4 directions. Functions beginning with out_to cause the content to scroll offscreen and functions beginning with in_from cause the content to scroll towards the center of the screen.

The generic scroll_from_to() function allows for scrolling from one coordinate to another. It could be used to make text scroll at a diagonal angle.

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import time
from . import Animation

class Scroll(Animation):
    def scroll_from_to(self, message, duration, start_x, start_y, end_x, end_y):
        """Scroll the message from one position to another over a certain period of time.

        :param message: The message to animate.
        :param float duration: The period of time to perform the animation over in seconds.
        :param int start_x: The Starting X Position
        :param int start_y: The Starting Y Position
        :param int end_x: The Ending X Position
        :param int end_y: The Ending Y Position
        :type message: Message
        """
        steps = max(abs(end_x - start_x), abs(end_y - start_y))
        if not steps:
            return
        increment_x = (end_x - start_x) / steps
increment_y = (end_y - start_y) / steps
for i in range(steps + 1):
    start_time = time.monotonic()
    current_x = start_x + round(i * increment_x)
    current_y = start_y + round(i * increment_y)
    self._draw(message, current_x, current_y)
    if i <= steps:
        self._wait(start_time, duration / steps)

def out_to_left(self, message, duration=1):
    """Scroll a message off the display from its current position towards the
    left
    over a certain period of time.
    :param message: The message to animate.
    :param float duration: (optional) The period of time to perform the
    animation over in seconds. (default=1)
    :type message: Message
    """
    current_x, current_y = self._position
    self.scroll_from_to(message, duration, current_x, current_y, 0 - message.buffer.width, current_y)

def in_from_left(self, message, duration=1, x=0):
    """Scroll a message in from the left side of the display over a certain
    period of time. The final position is centered.
    :param message: The message to animate.
    :param float duration: (optional) The period of time to perform the
    animation over in seconds. (default=1)
    :param int x: (optional) The amount of x-offset from the center position (default=0)
    :type message: Message
    """
    center_x, center_y = self._get_centered_position(message)
    self.scroll_from_to(message, duration, 0 - message.buffer.width, center_y, center_x + x, center_y)

def in_from_right(self, message, duration=1, x=0):
    """Scroll a message in from the right side of the display over a certain
    period of time. The final position is centered.
    :param message: The message to animate.
    :param float duration: (optional) The period of time to perform the
    animation over in seconds. (default=1)
    :param int x: (optional) The amount of x-offset from the center position (default=0)
    :type message: Message
    """
    center_x, center_y = self._get_centered_position(message)
    self.scroll_from_to(message, duration, self._display.width - 1, center_y, center_x + x, center_y)

def in_from_top(self, message, duration=1, y=0):
def scroll_from_to(self, message, duration, start_x, start_y, end_x, end_y):
    center_x, center_y = self._get_centered_position(message)
    self.scroll_from_to(message, duration, start_x, start_y, end_x, end_y)

def in_from_bottom(self, message, duration=1, y=0):
    center_x, center_y = self._get_centered_position(message)
    self.scroll_from_to(message, duration, center_x, self._display.height - 1, center_x, center_y + y)

def out_to_right(self, message, duration=1):
    current_x, current_y = self._position
    self.scroll_from_to(message, duration, current_x, current_y, self._display.width - 1, current_y)

def out_to_top(self, message, duration=1):
    self.scroll_from_to(message, duration, current_x, current_y, self._display.width - 1, self._display.height - 1)
animation over in seconds. (default=1)
:type message: Message

```python
    current_x, current_y = self._position
    self.scroll_from_to(
        message, duration, current_x, current_y, current_x, 0 - message.buffer.height,
    )

def out_to_bottom(self, message, duration=1):
    """Scroll a message off the display from its current position towards the bottom over a certain period of time."
    :param message: The message to animate.
    :param float duration: (optional) The period of time to perform the animation over in seconds. (default=1)
    :type message: Message

    current_x, current_y = self._position
    self.scroll_from_to(
        message, duration, current_x, current_y, current_x, self._display.height - 1
    )
```

## Loop Animations

The `Loop` animation class contains functions which are similar to the scroll animations, except they cause the content to wrap back in from the opposite side. There are 4 functions for each of the directions.

```python
# SPDX-FileCopyrightText: 2023 Melissa LeBlanc-Williams for Adafruit Industries
# SPDX-License-Identifier: MIT

import time
import displayio
import bitmaptools
from . import Animation

class Loop(Animation):
    def _create_loop_image(self, image, x_offset, y_offset, mask_color):
        """Attach a copy of an image by a certain offset so it can be looped."""
        loop_image = displayio.Bitmap(
            image.width + x_offset, image.height + y_offset, 65535
        )
        loop_image.fill(mask_color)
        bitmaptools.blit(loop_image, image, 0, 0)
        bitmaptools.blit(loop_image, image, x_offset, y_offset)
        return loop_image
```
def left(self, message, duration=1, count=1):
    """Loop a message towards the left side of the display over a certain
    period of time by a
certain number of times. The message will re-enter from the right and end
up back a the
starting position.

    :param message: The message to animate.
    :param float count: (optional) The number of times to loop. (default=1)
    :param float duration: (optional) The period of time to perform the
animation
    over. (default=1)
    :type message: Message
    """
    current_x, current_y = self._position
distance = max(message.buffer.width, self._display.width)
loop_image = self._create_loop_image(
    message.buffer, distance, 0, message.mask_color
)
for _ in range(count):
    for _ in range(distance):
        start_time = time.monotonic()
        current_x -= 1
        if current_x < 0 - message.buffer.width:
            current_x += distance
        self._draw(
            loop_image,
            current_x,
            current_y,
            message.opacity,
        )
        self._wait(start_time, duration / distance / count)

def right(self, message, duration=1, count=1):
    """Loop a message towards the right side of the display over a certain
    period of time by a
certain number of times. The message will re-enter from the left and end up
back a the
starting position.

    :param message: The message to animate.
    :param float count: (optional) The number of times to loop. (default=1)
    :param float duration: (optional) The period of time to perform the
animation
    over. (default=1)
    :type message: Message
    """
    current_x, current_y = self._position
distance = max(message.buffer.width, self._display.width)
loop_image = self._create_loop_image(
    message.buffer, distance, 0, message.mask_color
)
for _ in range(count):
    for _ in range(distance):
        start_time = time.monotonic()
        current_x += 1
        if current_x > 0:
            current_x -= distance
        self._draw(
            loop_image,
            current_x,
            current_y,
            message.opacity,
        )
        self._wait(start_time, duration / distance / count)

def up(self, message, duration=0.5, count=1):
    """Loop a message towards the top side of the display over a certain period
of time by a
certain number of times. The message will re-enter from the bottom and end
up back at the
starting position.

:param message: The message to animate.
:param float count: (optional) The number of times to loop. (default=1)
:param float duration: (optional) The period of time to perform the
animation
:type message: Message

```python
current_x, current_y = self._position
distance = max(message.buffer.height, self._display.height)
loop_image = self._create_loop_image(
    message.buffer, 0, distance, message.mask_color
)
for _ in range(count):
    for _ in range(distance):
        start_time = time.monotonic()
        current_y -= 1
        if current_y < 0 - message.buffer.height:
            current_y += distance
        self._draw(
            loop_image,
            current_x,
            current_y,
            message.opacity,
        )
        self._wait(start_time, duration / distance / count)
```

```python
def down(self, message, duration=0.5, count=1):
    """Loop a message towards the bottom side of the display over a certain
    period of time by a
certain number of times. The message will re-enter from the top and end up
    back at the
    starting position.
    
    :param message: The message to animate.
    :param float count: (optional) The number of times to loop. (default=1)
    :param float duration: (optional) The period of time to perform the
    animation
    :type message: Message
    """
    current_x, current_y = self._position
distance = max(message.buffer.height, self._display.height)
loop_image = self._create_loop_image(
    message.buffer, 0, distance, message.mask_color
)
for _ in range(count):
    for _ in range(distance):
        start_time = time.monotonic()
        current_y += 1
        if current_y > 0:
            current_y -= distance
        self._draw(
            loop_image,
            current_x,
            current_y,
            message.opacity,
        )
        self._wait(start_time, duration / distance / count)
```
Split Animations

The **Split** animation class contains 4 functions as well. There are out functions and in functions, that cause the content to split out and join in respectively, for both the horizontal and vertical directions.

```python
import time
import displayio
import bitmaptools
from . import Animation

class Split(Animation):
    def out_horizontally(self, message, duration=0.5):
        """Show the effect of a message splitting horizontally over a certain period of time.

        :param message: The message to animate.
        :param float duration: (optional) The period of time to perform the animation over. (default=0.5)
        :type message: Message
        ""
        current_x, current_y = self._position
        image = message.buffer
        left_image = displayio.Bitmap(image.width // 2, image.height, 65535)
        bitmaptools.blit(
            left_image, image, 0, 0, x1=0, y1=0, x2=image.width // 2,
            y2=image.height
        )
        right_image = displayio.Bitmap(image.width // 2, image.height, 65535)
        bitmaptools.blit(
            right_image, image, 0, 0, x1=image.width // 2, 
            y1=0, 
            x2=image.width, 
            y2=image.height,
        )
        distance = self._display.width // 2
        for i in range(distance + 1):
            start_time = time.monotonic()
            effect_buffer = displayio.Bitmap(
                self._display.width + image.width, image.height, 65535
            )
            effect_buffer.fill(message.mask_color)
            bitmaptools.blit(effect_buffer, left_image, distance - i, 0)
            bitmaptools.blit(
                effect_buffer, right_image, distance + image.width // 2 + i, 0
            )
            self._draw(
                effect_buffer, 
                current_x - self._display.width // 2, 
                current_y, 
                message.opacity,
            )
```
def out_vertically(self, message, duration=0.5):
    """Show the effect of a message splitting vertically over a certain period of time.

    :param message: The message to animate.
    :param float duration: (optional) The period of time to perform the animation over. (default=0.5)
    :type message: Message
    ""
    current_x, current_y = self._position
    image = message.buffer

    top_image = displayio.Bitmap(image.width, image.height // 2, 65535)
    bitmaptools.blit(
        top_image, image, 0, 0, x1=0, y1=0, x2=image.width, y2=image.height // 2
    )

    bottom_image = displayio.Bitmap(image.width, image.height // 2, 65535)
    bitmaptools.blit(
        bottom_image,
        image,
        0,
        0,
        x1=0,
        y1=image.height // 2,
        x2=image.width,
        y2=image.height,
    )

    distance = self._display.height // 2
    effect_buffer_width = self._display.width
    if current_x < 0:
        effect_buffer_width -= current_x
    for i in range(distance + 1):
        start_time = time.monotonic()
        effect_buffer = displayio.Bitmap(
            effect_buffer_width, self._display.height + image.height, 65535
        )
        effect_buffer.fill(message.mask_color)
        bitmaptools.blit(effect_buffer, top_image, 0, distance - i)
        bitmaptools.blit(
            effect_buffer, bottom_image, 0, distance + image.height // 2 + i + 1
        )

        self._draw(
            effect_buffer,
            current_x,
            current_y - self._display.height // 2,
            message.opacity,
            post_draw_position=(current_x, current_y - self._display.height // 2),
        )
        self._wait(start_time, duration / distance)

def in_horizontally(self, message, duration=0.5):
    """Show the effect of a split message joining horizontally over a certain period of time.

    :param message: The message to animate.
    :param float duration: (optional) The period of time to perform the animation over. (default=0.5)
    :type message: Message
    """
```python
current_x = int(self._display.width / 2 - message.buffer.width / 2)
current_y = int(self._display.height / 2 - message.buffer.height / 2)
image = message.buffer
left_image = displayio.Bitmap(image.width // 2, image.height, 65535)
bitmaptools.blit(
    left_image, image, 0, 0, x1=0, y1=0, x2=image.width // 2,
y2=image.height
)

right_image = displayio.Bitmap(image.width // 2, image.height, 65535)
bitmaptools.blit(
    right_image, image, 0, 0, x1=image.width // 2,
y1=0, x2=image.width, y2=image.height
)

distance = self._display.width // 2
effect_buffer = displayio.Bitmap(
    self._display.width + image.width, image.height, 65535
)
effect_buffer.fill(message.mask_color)
for i in range(distance + 1):
    start_time = time.monotonic()
    bitmaptools.blit(effect_buffer, left_image, i, 0)
    bitmaptools.blit(
        effect_buffer, right_image, self._display.width + image.width // 2 - i + 1, 0,
    )
self._draw(
    effect_buffer, current_x - self._display.width // 2, current_y, message.opacity,
    post_draw_position=(current_x, current_y),
)
self._wait(start_time, duration / distance)

def in_vertically(self, message, duration=0.5):
    """Show the effect of a split message joining vertically
    over a certain period of time.
    ""
    :param message: The message to animate.
    :param float duration: (optional) The period of time to perform the
    animation over. (default=0.5)
    :type message: Message
```
The `Static` animation class is more of a miscellaneous collection of functions that don't provide any motion. It includes functions to `show`, `hide`, `blink`, `flash`, `fade_in`, and `fade_out` content. The static class will always display the message at the position of the last message to be displayed and default to (0,0).

```python
import time
from . import Animation

class Static(Animation):
    def show(self, message):
        """Show the message at its current position.

        :param message: The message to show.
        :type message: Message
        """
        x, y = self._position
        self._draw(message, x, y)

    def hide(self, message):
        """Hide the message at its current position.

        :param message: The message to hide.
        :type message: Message
        """
        x, y = self._position
```
def blink(self, message, count=3, duration=1):
    """Blink the foreground on and off a certain number of times over a certain period of time.

    :param message: The message to animate.
    :param float count: (optional) The number of times to blink. (default=3)
    :param float duration: (optional) The period of time to perform the animation over. (default=1)
    :type message: Message
    """
    delay = duration / count / 2
    for _ in range(count):
        start_time = time.monotonic()
        self.hide(message)
        start_time = self._wait(start_time, delay)
        self.show(message)
        self._wait(start_time, delay)

def flash(self, message, count=3, duration=1):
    """Fade the foreground in and out a certain number of times over a certain period of time.

    :param message: The message to animate.
    :param float count: (optional) The number of times to flash. (default=3)
    :param float duration: (optional) The period of time to perform the animation over. (default=1)
    :type message: Message
    """
    delay = duration / count / 2
    steps = 50 // count
    for _ in range(count):
        self.fade_out(message, duration=delay, steps=steps)
        self.fade_in(message, duration=delay, steps=steps)

def fade_in(self, message, duration=1, steps=50):
    """Fade the foreground in over a certain period of time by a certain number of steps. More steps is smoother, but too high of a number may slow down the animation too much.

    :param message: The message to animate.
    :param float duration: (optional) The period of time to perform the animation over. (default=1)
    :param float steps: (optional) The number of steps to perform the animation. (default=50)
    :type message: Message
    """
    current_x = int(self._display.width / 2 - message.buffer.width / 2)
    current_y = int(self._display.height / 2 - message.buffer.height / 2)
    delay = duration / (steps + 1)
    for opacity in range(steps + 1):
        start_time = time.monotonic()
        self._draw(message, current_x, current_y, opacity=opacity / steps)
        self._wait(start_time, delay)

def fade_out(self, message, duration=1, steps=50):
    """Fade the foreground out over a certain period of time by a certain number of steps. More steps is smoother, but too high of a number may slow down the animation too much.

    :param message: The message to animate.
    :param float duration: (optional) The period of time to perform the animation over. (default=1)
    :param float steps: (optional) The number of steps to perform the animation
    :type message: Message
    """
animation. (default=50)
:type message: Message
  
  delay = duration / (steps + 1)
  for opacity in range(steps + 1):
    start_time = time.monotonic()
    self._draw(
      message,
      self._position[0],
      self._position[1],
      opacity=(steps - opacity) / steps,
    )
    self._wait(start_time, delay)

Assembly

Assembly of the matrixPortal is fairly straightforward and the only tools you will need are a screwdriver or two and some flush cutters. You may wish to clean up the 3D prints prior to starting assembly.
MatrixPortal Mount Subassembly

For mounting the MatrixPortal S3, you will need:

MatrixPortal S3
MatrixPortal Mount
2 x M2.5 x 10mm Screws
2 x M2.5 Hex Nut

Insert the MatrixPortal so that the 2x10 IDC connector goes into the rectangle. It should be inserted from the side with the raised arms so that the holes line up. Insert the M2.5 screws through the MatrixPortal and out the holes in the mount.
Attach the M2.5 Hex Nuts and tighten snugly.

Connect the Matrices

For this part, start with four 16x32 matrices.
You will want to lay them out side-by-side so that the input connector is to the right and the text appears upside down.

For connecting the matrices, you will need:

6 x Connector Bracket
10 x M3 x 10mm Screws
Starting from the left, place a connector so that it sits on the alignment peg and is aligned to the screw holes. Install 2 screws to hold it in place. The screws should be snug, but not overtightened.

Do the same for the other left connector bracket and both middle connector brackets.
For the two right connector brackets, only install a screw in the right hole. The holes without screws will be used for the MatrixPortal S3 Mount.

Now you should have all 6 connector brackets attached with the exception of the right two brackets missing their left screw.

To connect the MatrixPortal Mount Subassembly, two of the screws can be anywhere from 10mm to 16mm. You will need the following:

MatrixPortal Mount Subassembly
2 x M3 x 10mm Screws
2 x M3 x 10mm-16mm Screws
Place the MatrixPortal Mount Subassembly so that the 2 raised arms go into the holes without the screws.

Install the shorter screws into the part of the subassembly that covers the center holes of the matrix.

Install the longer screws into the holes above the connector bracket.
Top and Bottom Panel Assembly

Start with the panel with the cutout holes. You will also need 7 panels without holes further down.

With the front side of the matrices facing towards you, place the panel so that it's almost in its final place and slide the right side onto the connector bracket. You may need to flex the panel a bit to get it past the buttons.
Continue sliding the panel to the right until the panel's left side is able to clear the connector bracket underneath it and slide it onto its respective bracket.

Go ahead and center it so that the holes all line up.
The regular panels are easier to slide on from one end or the other until they sit flush in the middle.

When sliding them on, be sure that the lip of the panel faces the same direction as the one with cutout holes.

Continue sliding on the remainder of the panels until all 8 are on the message board.
Side Panels and Front LED Acrylic

To install the sides, you will need the following:

- 2 x Side Panels
- 4 x 10mm Screws
- LED Acrylic Piece or Pieces

Start by connecting one side. To get it past the alignment peg, you may need to flex parts slightly. Install 2 screws once it is in place.
Slide any acrylic pieces you have into the message board from the side without a panel. The acrylic should be installed with the shiny side facing towards the matrices and the matte side facing towards the outside.

Install the second side panel. It's easiest to get it over the alignment peg first and then get the acrylic into the slot. Install 2 more screws.
Wiring

For the wiring, you will be using 3 of the shorter ribbon cables and 2 of the power cables that came with the matrices.

Start by connecting the 4 panels together using the 3 shorter ribbon cables.
When connecting the wires to the MatrixPortal S3, place the flatter sides of the spade connectors together and insert them into the 5V screw terminal. Make sure the screw is fairly tight.

Connect the ground wires to the other terminal.
Connect the 4 power plugs to the power inlet of each panel. You may have to try a few different ends until you find one that reaches the furthest plug well enough.
Connect the longer black ribbon cable between the MatrixPortal and the input of the right-most panel.

Wire Management

The connector brackets have built-in zip tie holders designed to fit zip with a width of about 3mm or smaller.
When zipping down wires using the connectors, leave the zip tie loose for now. You will be feeding a larger zip tie between the smaller ones.

Place a second zip tie across from the first, even if you aren't holding any wires in place.
You will want to carefully fold the cable back and forth until it sits neatly between the 2 connectors.

Take a larger zip tie (8 inches or longer) and loosely connect it between the smaller zip ties so that it looks a bit like a chain.
Tighten the smaller zip ties first.

Then tighten the larger zip tie, which will hold the ribbon cable in place.

Clip off the ends of the zip ties with flush cutters.

Do this for the other sets of connectors.
You may want to carefully fold and secure the ribbon cable around the MatrixPortal so that it doesn't stick out the back.

You can also use the arms of the MatrixPortal Mount for securing wires.

That's it! You should now be done.

Usage

Basic Usage

To create a message and display it, you can use the following minimal example:
import time
from adafruit_matrixportal.matrix import Matrix
from messageboard import MessageBoard
from messageboard.fontpool import FontPool
from messageboard.message import Message

matrix = Matrix(width=128, height=16, bit_depth=5)
messageboard = MessageBoard(matrix)
fontpool = FontPool()

message = Message(fontpool.find_font("terminal"))
message.add_text("Hello World")
messageboard.animate(message, "Static", "show")
time.sleep(5)

You will need to import Matrix, MessageBoard, FontPool, and Message. Matrix uses the MatrixPortal library. See the Creating MatrixPortal Projects with CircuitPython guide() for more details on that library. The matrix object is the only thing needed to pass in to create a MessageBoard object.

When FontPool is initialized, the terminal font is automatically added in, so that’s available without doing anything further.

Finally, a message is created using the terminal font. The text “Hello World” is added, and the show animation is called. The message displays for 5 seconds before finishing the code.

Animations

There are quite a few animations available. To call an animation function, the animate function of the messageboard object is called, along with the Class name and function name of the animation. For instance, looking at the basic usage, the show function of the Static class is called. Here is a list of animations included:

Static Animations

Static animations keep a message in its last position, which is why this group is called static. These are used to show or hide text in various ways. If you would like to set the position manually, you can call messageboard.set_message_position(x, y) before animating the text.
Call `messageboard.animate(message, "Static", "show")` to show a message at its current position instantly.

Call `messageboard.animate(message, "Static", "hide")` to hide a message instantly.

Call `messageboard.animate(message, "Static", "blink", count=3, duration=1)` to blink a message on and off a certain number of times expressed by count (default of 3) over the duration time (default of 1 second).
Call `messageboard.animate(message, "Static", "fade_in", duration=1)` to fade a message in over the duration time (default of 1 second).

Call `messageboard.animate(message, "Static", "fade_out", duration=1)` to fade a message in over the duration time (default of 1 second).

Call `messageboard.animate(message, "Static", "flash", count=3, duration=1)` to fade a message in and out a certain number of times expressed by count (default of 3) over the duration time (default of 1 second).

Scroll Animations

Scroll animations scroll the text into or out of frame.
Call `messageboard.animate(message, "Scroll", "in_from_left", duration=1)` to scroll a message into frame from the left over the duration time (default of 1 second).

Call `messageboard.animate(message, "Scroll", "in_from_right", duration=1)` to scroll a message into frame from the right over the duration time (default of 1 second).

Call `messageboard.animate(message, "Scroll", "in_from_top", duration=1)` to scroll a message into frame from the top over the duration time (default of 1 second).
Call `messageboard.animate(message, "Scroll", "in_from_bottom", duration=1)` to scroll a message into frame from the bottom over the duration time (default of 1 second).

Call `messageboard.animate(message, "Scroll", "out_to_left", duration=1)` to scroll a message out of frame to the left over the duration time (default of 1 second).

Call `messageboard.animate(message, "Scroll", "out_to_right", duration=1)` to scroll a message out of frame to the right over the duration time (default of 1 second).
Call `messageboard.animate(message, "Scroll", "out_to_top", duration=1)` to scroll a message out of frame towards the top over the duration time (default of 1 second).

Call `messageboard.animate(message, "Scroll", "out_to_from", duration=1)` to scroll a message out of frame towards the bottom over the duration time (default of 1 second).

### Loop Animations

Similar to the scroll animations, but the message wraps around to the other side of the message board.

Call `messageboard.animate(message, "Loop", "left", duration=1, count=1)` to loop a message out of frame to the left and back in from the right a certain number of times expressed by count (default of 1) over the duration time (default of 1 second).
Call `messageboard.animate(message, "Loop", "right", duration=1, count=1)` to loop a message out of frame to the right and back in from the left a certain number of times expressed by count (default of 1) over the duration time (default of 1 second).

Call `messageboard.animate(message, "Loop", "up", duration=1, count=1)` to loop a message out of frame to the top and back in from the bottom a certain number of times expressed by count (default of 1) over the duration time (default of 1 second).

Call `messageboard.animate(message, "Loop", "down", duration=1, count=1)` to loop a message out of frame to the bottom and back in from the top a certain number of times expressed by count (default of 1) over the duration time (default of 1 second).

Split Animations

These animations are for splitting up or joining together the message either horizontally or vertically.
Call `messageboard.animate(message, "Split", "out_horizontally", duration=0.5)` to split a message out of frame horizontally over the duration time (default of 0.5 seconds).

Call `messageboard.animate(message, "Split", "in_horizontally", duration=0.5)` to join a message into frame horizontally over the duration time (default of 0.5 seconds).

Call `messageboard.animate(message, "Split", "out_vertically", duration=0.5)` to split a message out of frame vertically over the duration time (default of 0.5 seconds).
Call `messageboard.animate(message, "Split", "in_vertically", duration=0.5)` to join a message into frame vertically over the duration time (default of 0.5 seconds).

Examples

There are a couple of examples that demonstrate how to use the included messageboard library.

code.py

The one included in code.py is only slightly more complicated than the basic usage code. It also loads the Arial font, a background, and an image.

```python
import time
from adafruit_matrixportal.matrix import Matrix
from messageboard import MessageBoard
from messageboard.fontpool import FontPool
from messageboard.message import Message

matrix = Matrix(width=128, height=16, bit_depth=5)
messageboard = MessageBoard(matrix)
messageboard.set_background("images/background.bmp")
fontpool = FontPool()
fontpool.add_font("arial", "fonts/Arial-10.pcf")

# Create the message ahead of time
message = Message(fontpool.find_font("arial"), mask_color=0xFF00FF, opacity=0.8)
message.add_image("images/maskedstar.bmp")
message.add_text("Hello World!", color=0xFFF000, x_offset=2, y_offset=2)

while True:
    # Animate the message
    messageboard.animate(message, "Scroll", "in_from_right")
    time.sleep(1)
    messageboard.animate(message, "Scroll", "out_to_left")
```

Here is that example code in its entirety:
import time
from adafruit_matrixportal.matrix import Matrix
from messageboard import MessageBoard
from messageboard.fontpool import FontPool
from messageboard.message import Message

matrix = Matrix(width=128, height=16, bit_depth=5)
messageboard = MessageBoard(matrix)
messageboard.set_background("images/background.bmp")
fontpool = FontPool()
fontpool.add_font("arial", "fonts/Arial-10.pcf")

# Create the message ahead of time
message = Message(fontpool.find_font("arial"), mask_color=0xFF00FF, opacity=0.8)
message.add_image("images/maskedstar.bmp")
message.add_text("Hello World!", color=0xFFFF00, x_offset=2, y_offset=2)

while True:
    # Animate the message
    messageboard.animate(message, "Scroll", "in_from_right")
    time.sleep(1)
    messageboard.animate(message, "Scroll", "out_to_left")

demo.py

The demo.py example is a little more complex and shows some of the capabilities using four different messages. Like the previous example, it starts off with the same imports and sets up the messageboard with a background image.

After that, a FontPool object is created and two fonts are added to it, which will be reused.

fontpool = FontPool()
fontpool.add_font("comic", "fonts/Comic-10.pcf")
fontpool.add_font("dejavu", "fonts/DejaVuSans-10.pcf")

Next, the messages are set up. Note that the first message doesn't have any content added to it at this time because the intent is to change it inside the main loop.

message1 = Message(fontpool.find_font("dejavu"))
message2 = Message(fontpool.find_font("comic"), mask_color=0x00FF00)
print("add blinka")
In the main loop, message1 has content added and is animated. To demonstrate how the messages can be dynamically changed, this is show three more times. This would be useful for updating the message with the current time or from data on the internet.

Here is the animation of the remaining messages. For message2, use of an alternate mask color is demonstrated and for message3, the background is changed to green prior to displaying the message and changed back to the image after.

Here is that example code in its entirety:
import time
from adafruit_matrixportal.matrix import Matrix
from messageboard import MessageBoard
from messageboard.fontpool import FontPool
from messageboard.message import Message

matrix = Matrix(width=128, height=16, bit_depth=5)
messageboard = MessageBoard(matrix)
messageboard.set_background("images/background.bmp")

fontpool = FontPool()
fontpool.add_font("comic", "fonts/Comic-10.pcf")
fontpool.add_font("dejavu", "fonts/DejaVuSans-10.pcf")

message1 = Message(fontpool.find_font("dejavu"))
message2 = Message(fontpool.find_font("comic"), mask_color=0x00FF00)

print("add blinka")
message2.add_image("images/maskedblinka.bmp")
print("add text")
message2.add_text("CircuitPython", color=0xFFFF00, y_offset=-2)

message3 = Message(fontpool.find_font("dejavu"))
message3.add_text("circuitpython.com", color=0xFF0000)

message4 = Message(fontpool.find_font("arial"))
message4.add_text("Buy Electronics", color=0xFFFFFFFF)

while True:
    # Set message 1 content and animate
    message1.clear()
    message1.add_text("Scroll Text In", color=0xFF0000)
    messageboard.animate(message1, "Scroll", "in_from_left")
    time.sleep(1)

    # Change message 1 content and animate
    message1.clear()
    message1.add_text("Change Messages")
    messageboard.animate(message1, "Static", "show")
    time.sleep(1)

    # Change message 1 content again and animate
    message1.clear()
    message1.add_text("And Scroll Out")
    messageboard.animate(message1, "Static", "show")
    messageboard.animate(message1, "Scroll", "out_to_right")
    time.sleep(1)

    # Change message 1 content a final time and animate
    message1.clear()
    message1.add_text("Or more effects like looping ", color=0xFFFF00)
    messageboard.animate(message1, "Split", "in_vertically")
    messageboard.animate(message1, "Loop", "left")
    messageboard.animate(message1, "Static", "flash", count=3)
    messageboard.animate(message1, "Split", "out_vertically")
    time.sleep(1)

    messageboard.animate(message2, "Static", "fade_in")
    time.sleep(1)
    messageboard.animate(message2, "Static", "fade_out")

    messageboard.set_background(0x00FF00)
    messageboard.animate(message3, "Scroll", "in_from_top")
    time.sleep(1)
    messageboard.animate(message3, "Scroll", "out_to_bottom")

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messageboard.animate(message4, "Scroll", "in_from_right")

time.sleep(1)