Colored Images by Algorithmically Weaving RGB Strings

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Objective

- Creating an **open-source tool** to reconstruct an input image by generating continuous series of **RGB chords in a circle**.
- Developing a sense of achievement among students and educators by creating **big-scale exhibits**.

Introduction

The colored image in a computer screen is represented by set of pixels with **RGB shades** ranging from **0 to 255**. There are tools which reads these pixels and create a sequence of chords in a circle to construct the input image. For an example the CMSC text in Figure 1 is constructed by drawing **1500 continuous chords** in a circle with **150 points**.

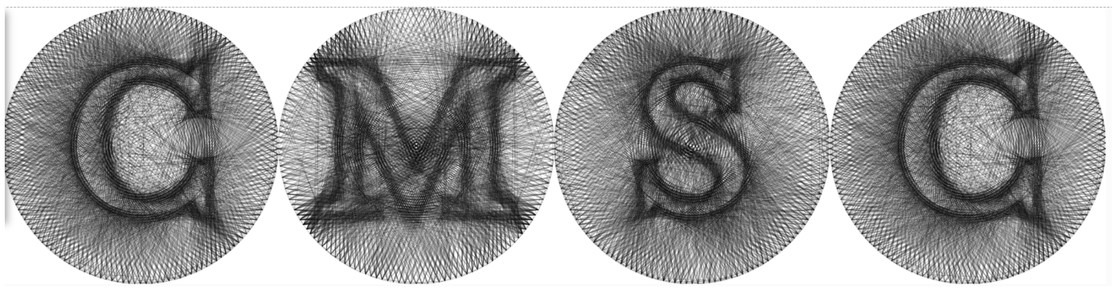
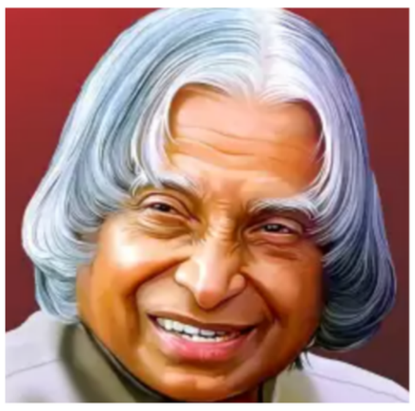
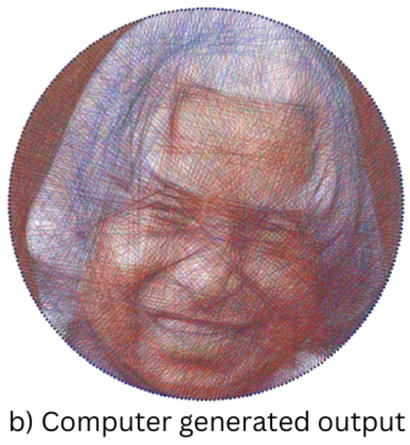


Figure 1: "CMSC" string art with 1500 straight lines and 150 points on a circle

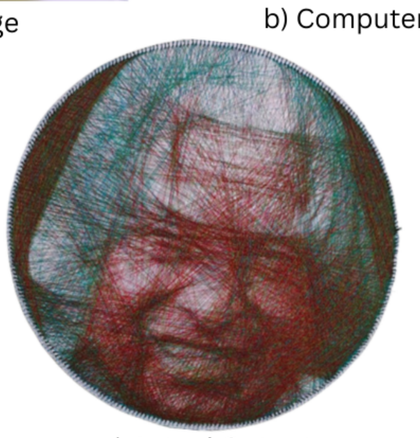
We extended this idea to create colored portraits by weaving RGB threads. Figure 2. shows the input image, computer generated image with **5000 chords** in a circle with **300 points** and the exhibit by weaving RGB threads.



a) Input image



b) Computer generated output



c) Actual Output

Figure 2: Color portrait of Dr. APJ Abdul kalam with 5000 RGB threads and 300 points on a circle

Algorithm

- The starting point is the top-most point in a circle (with N points), labeled as 0.
- Compute set of pixels for (N-1) lines to other points starting from the current point. Compute average RGB for each line and pick the highest.
- Update the RGB table of the input image by lowering the RGB value for the selected line and current point. Repeat the above step for finding the next line.

Experiences with Students and Teachers

The center has worked with **12,000+ educators** in India as a part of in-person capacity building workshops in India. Along with **computational thinking** and **CS Unplugged activities**, the workshops ends with a team effort of building **big-scale exhibits**. Also, as a part of induction program with various undergraduates, the students performed laborious task to create and install portraits (Figure 3). The primary goal of exhibit making is not to teach them the underlying algorithm but to realize the **sense-of-achievement** of accomplishing seemingly mammoth work by a team effort. The **open-source tool** let any interested educators create such exhibits in their own school and colleges.

Figure 3: 10 feet IITGN logo using 4000 straight lines and 300 points on a circle

References

[1] Vrellis, P. *"A new way to knit"*, 2016.

[2] Demoussel, B., Larboulette C., and Dattatreya R. *"A Greedy Algorithm for Generative String Art*, Bridges Conference, 2022.

[3] Kaleem, M.K., Dhanraj V., and Idrisi M.J. *"Generalisation of Line Drawing Algorithm–An effective approach to minimise the error in the existing Bresenham's Line Drawing Algorithm."*, International Conference on ESCI. IEEE, 2021.