Loop Patterns in Japan and Asia

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This art column is introducing Loop patterns applied to traditional and contemporary designs and objects in Japan and Asia. Loop patterns sometimes feature in Knot-Link patterns. The originally eternity, rebirth and dynamics of a loop pattern attracts human mind and then becomes happy-lucky symbol in religious worlds. Recently mysteriousness of loop or knot patterns are understood and are played with the sprit of the patterns by some challengers. The applications of the loop patterns are not only decorations or ornaments for clothing or constructions, but also brain training or stretching tools for education and welfare. At the last, it is mentioned that this loop pattern is very useful topic for understanding and exchanging the world-wide cultures between the different countries.
Key words: Traditional Designs, Contemporary Applications, Loop Pattern, Kolam

1. Introductions

Traditional loop patterns are featured in Kolam painting on the ground in South India and in Celtic knot designs in Ireland and other limited areas in the world [1]. These patterns have wonderful diversity and variety [2,3].

In Japan, loop patterns are not seen commonly in daily life; in Japanese culture, people do not create loop patterns for artistic drawings, although, there are limited examples of knot designs as decorations of strings or straps. At the present time, a few designers and the research group known as the International Kolam-knot Art and Science Forum (KASF) have issued a challenge to promote the use of loop patterns.

2. Loop Patterns in Clothing

As a general rule, clothing designs represent cultures in which they are produced. There have been a very few cultures that have featured in clothing with loop patterns; including the Alan Islands in Ireland with their Celtic knot knit-sweaters. Another example can be found in portraits of women in the European Renaissance period; a loop motif was painted in depictions of decorative costumes worn by some women portraits at the time. During the first KASF's tour of India to investigate the use of loop patterns in 2004 Dec.~2005 Jan., a familiar sight was an art known as Kolam drawn on the threshold ground of each house every morning. Additionally people-women didn't wear any saris featuring Kolam patterns. However, there seemed to be no taboo associated with clothing containing these patterns, as in fact, gifts of t-shirts highlighting Kolam patterns from KASF were very much welcomed by many people. These are shown in Fig. 1.

Japanese clothes such as the Kimono dress have rich decorative designs in pictorial pattern, but not loop patterns; this truism applied to the past as well as the present. One of seven principal Kimono patterns called Shippo, which refers four lucky orientations, consists of overlapping circles. This pattern is the same as some combined diagonal crossing patterns in tiles decorated with the Kolam patterns. It is said this pattern is a lucky symbol, although the designer would not have been explicitly conscious of creating loop patterns; rather, he/she would have been focused on creating a design with symmetry and repetitive patterns. The Shippo pattern resembles an Arabesque pattern.

In Fig. 2, Modern Fashion (2010–11 Autumn–Winter Paris Collections) adopting Knot patterns produced by a designer of ISSEY MIYAKE who was inspired with mathematic issue of knot-link patterns is shown. He designed the dresses, the knot-link itself of which enveloped (lapped) the eternity of human bodies or sprits and also their cosmos rather than only representing the infinity of human on the surface of the body. It looks like something transcending a Japanese Tasuki-gake, one narrow cloth of which arranges up the sleeves of the Kimono dress with a cross on the back.

Recently the hair style called Knot-hair or Celtic hair becomes popular in Japan.

3. Family Crests Consisting of Loops (Knots or Links)

In traditional and ceremonial Japanese dresses, family crests are dyed. Three are some loop patterns shown in Figs. 3, 4 and 5. One typical loop pattern among crests is Takara-musubi-mon (treasure-knot). This design consists of 2-4-2 dot array and only of one loop. At the present
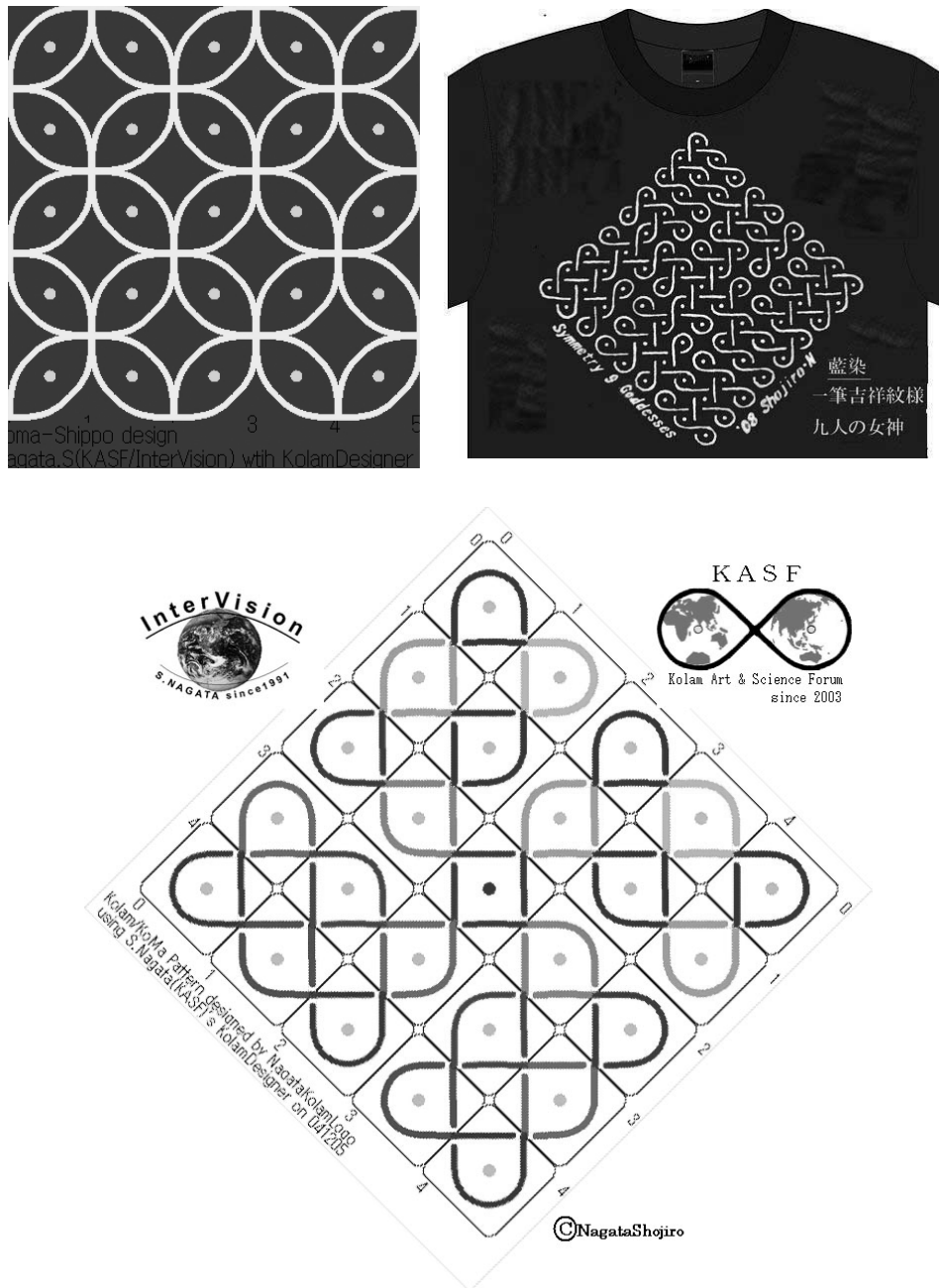
Fig. 1. Upper-Left: Traditional loop-possible pattern called Shippo motif for Kimono, This is one of the 17 groups of the symmetric wall-paper patterns. This consists of diagonal crossing lines. Upper-Right: Kolam knots applied to t-shirt dyed with indigo, which is Kolam-Knot patterns of 9 Goddesses with a single string pattern and consisting of nine 3 × 3 dot patterns. Each of them is also a single string and symmetric knot. Lower: Another Kolam printed in the present t-shirts for the KASF investigation tour. These were made by the author.

time it is not used actually (it is said that only some shrines use). However this pattern is very meaningful in Japanese since the old age as well as other Asian countries in the present time. Some other crest patterns consist of a loop. There are same constructions as Solomons Seal Knot or Rosette (Lotus Kolam). There are other patterns linked with 4 or 5 rings, or some petals (or leaves) like Lotus Kolam.

4. Knot Designs for Decorations of Strings or Straps in Japan and Other Asian Cultures

In Japan, knots of string (recently straps) are popular as well as in China, Taiwan, and Korea (Maedeub). They are called Asian knots generally. They are knot designs for decorations of strings or straps. Mizuhiki of Fig. 6 is a typical and traditional knot of a string, which usually is open at the terminals. Mizuhiki is a special string from paper. The figure shows an 8 crossing symmetric knot called Awabi musubi, one loop of which is wrapped around an envelopment.

One special knot design is Takara-musubi-mon in Japan (Fig. 3). It is also known as a happy (lucky) symbol in Korea, China, Mongolia, Bhutan and Tibet in Figs. 7, 8, 9 and 10 respectively. They might have the common

Fig. 2. Upper: A Japanese Tasuki-gake, one narrow cloth (white in the photo) of which arranges up the sleeves of the Kimono dress with a cross on the back. Lower: Modern Fashion adopting Knot patterns produced by a designer of ISSEY MIYAKE inspired with mathematic issue of knot-link patterns (2010–11 Autumn–Winter Paris Collections). Mathematic society introduced it in the following webs (all web 2015.8.10) (http://mathsoc.jp/publicity/news20100313.html; http://www.ams.org/news?news_id=653; http://www.apparel-web.com/feature/2010aw/paris/ isseymiyake.html; http://fashionbeyondfashion.wordpress.com/2010/04/15/issey-miyake-when-fashion-meets-mathematics/).
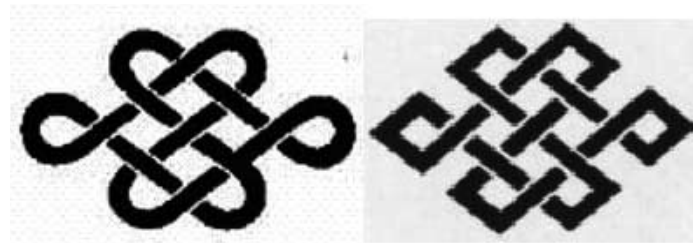
Fig. 3. Takara musubi mon, Hishigata Takara musubi.

Fig. 4. Musubi Wa Chigai, Musubi Yotume Hishi, Mituyose Hitotu musubi.
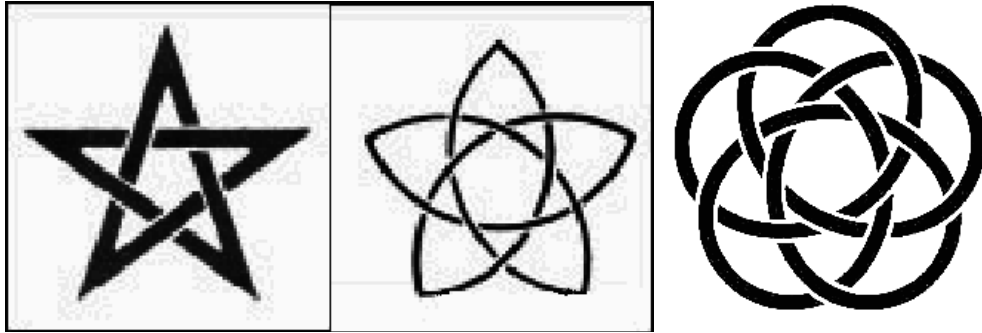
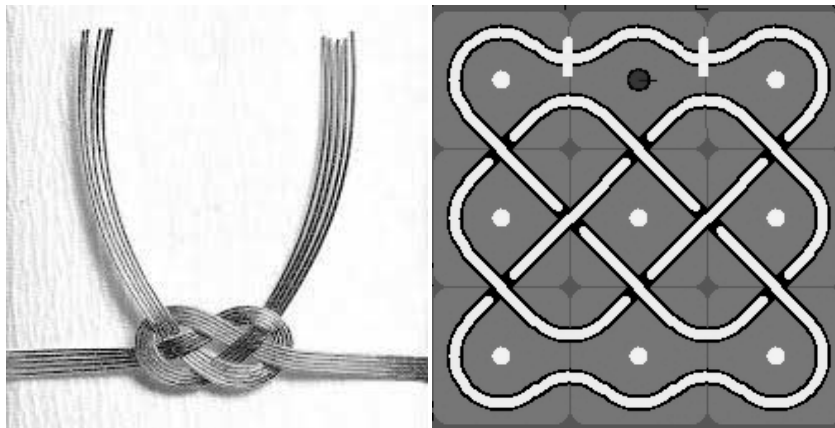Fig. 5. Seimei kikyo like Solomons Seal, Kamashiki Kikyo, Kagome-me musubi.

Fig. 6. Mizuhiki knot for wrapping an envelope. The same Kolam pattern as Mizuhiki knot in topology.

Fig. 7. Korea (Bobe-muni).

Fig. 8. China (Pan-chang jie).

origin from India and transmitted along religious roots. They have the same motif as Takara musubi, and there are some variations in the orientation, shapes of the curve and the crossing. Takara musubi knot is based on 2×3 lattice Kolam pattern for drawing a single loop, which is the same as Rolfsen 7_4 of knots, and the both sides of the middle are extended to 2-4-2 dot array.

Gift Siromoney introduced that "some of the geometric patterns and yantra or Tantric designs that are used in Kolam are quite ancient. There is a common design some-

times referred to as Mittai pottalam (Fig. 11 left). It is drawn with one unending line. An angular version of the same design (Fig. 11 center-left) is used in Tibetan Tantric Buddhism and is called the "knot of eternity" or the "knot of meditation". It is shown prominently on the Bodhi leaf carried by Garuda (the large bird-like creature in Hinduism or Buddhism) (Fig. 11 center-right). Today the dots pulli are used as an integral part of the kolam but similar designs carved on the walls of temple gopurams do not show the dots. Such an example (Fig. 11 right) can be
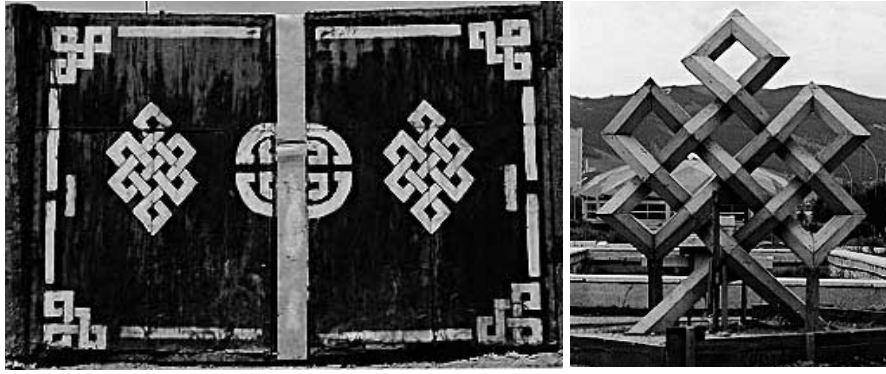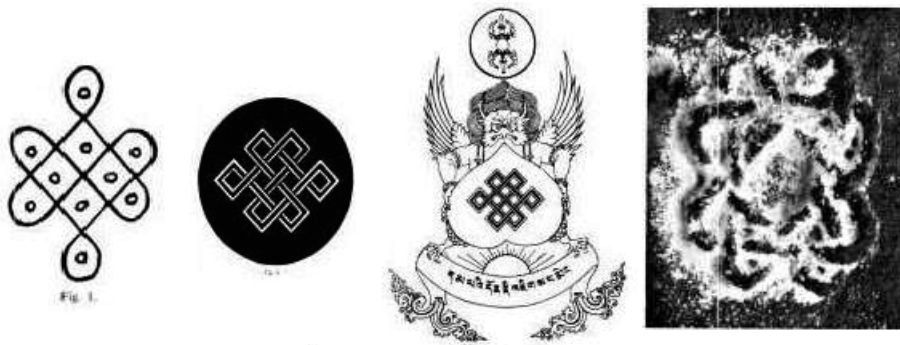
Fig. 9. Mongol (Olzii hee).

Fig. 10. Tibet (Pelbeu Losar), and Bhutan (unshown, but the same figure reported in Web (http://www.ceda.org/kamon/kamonabout.htm (in Japanese)).

Fig. 11. India (Mittai pottalam).

seen on the gopura walls of Acharapa kkam village about 100 kms south of Madras. One can be certain now that the pulli is a clever device for assisting the artist to draw the design easily. The pulli pattern is used as a skeletal frame-work by which village women are able to memorize the design" (http://www.cmi.ac.in/gift/Kolam/kola_pattern.htm).

On some reach results, the author could not found any loop patterns in Ainu culture (indigenous people live in a north half of Japan Islands in the old age and live in Hokkaido Island in the present) and Ryukyu culture (south islands) including Japanese ancient culture. There is possibility to find them in future.

5. Applications of Knot or Loop Designs to Constructions, Roads and Floors

Kolam patterns are drawn front of each house on roads and especially in full width of the streets in the Pongal festival in Tamil Nadu, South India. But they don't make any permanent decorations.

The author found very few decorations with a motif of loop patterns in Japan, which are shown in Figs. 12 and 13. The design of Fig. 14 was proposed by the author in the Forum on the Look of a Local Street of Fujisawa on 2012 Nov., which was based on the Kolam patterns of Fig. 26 lower or Fig. 30.

Fig. 12. Left: The underground passage of Sannomiya city, Hyogo prof. Right: The carpet of the internal (No. 1) terminal floor of Tokyo Haneda airport. There is free style lines and only one loop in this area.

Fig. 13. Left: The Saba-Kaido (Mackerel road) front of the Museum, Obama city, Fukui pref. Right: Neyagawa city, Osaka. These tiles consist of the same two-quarter-circles, but in different arrangements to form two different patterns (refer Fig. 24).
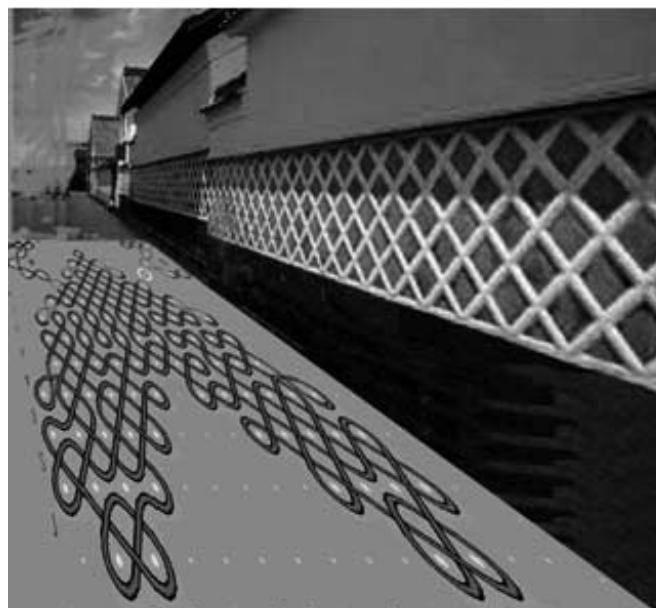

Fig. 14. A sample design of a street, which has a traditional lattice wall called Namako-kabe and a "Sweet-heart" loop pattern made from Kolam tiles, proposed by the author in the Forum on the Look of a Local Street of Fujisawa on 2012 Nov. Refer the Kolam of Figs. 26 lower and 30.
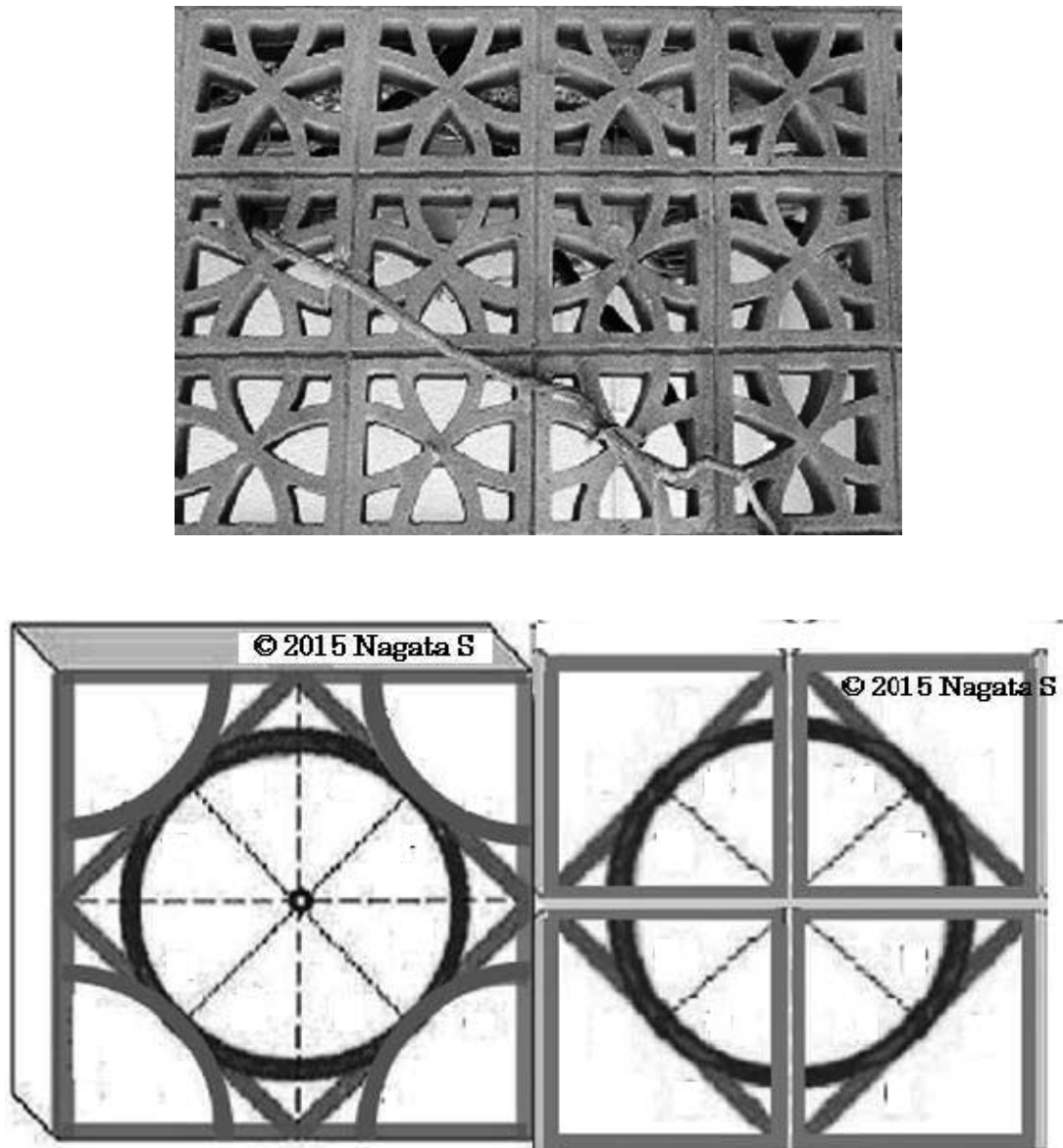
Fig. 15. Upper: The wall made from 4-leave blocks and showing Shippo motif like Fig. 1 left. Lower: The patterns of the universal design-Kolam blocks, which enable arcs of a circle, crossing lines and/or two-point connecting arc-lines, called Shonan-Kissyo Block (Left: a block of I type, picture-renewable-pattern, Right: 4 blocks of II type, picture-renewable pattern).
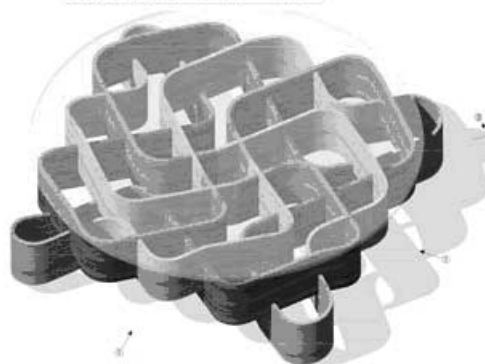

Fig. 16. A table consists of a transparent faceplate and a combinative wooden chair proposed by Yanagisawa. The chair is made from some pieces forming a loop of Kolam (http://q-labo.info/work/000050.php).

Fig. 17. Some loop designs in desks made in Bali Island, where Hindu related with India is popular in the major religious of Muslim in Indonesia. Photos by the author.
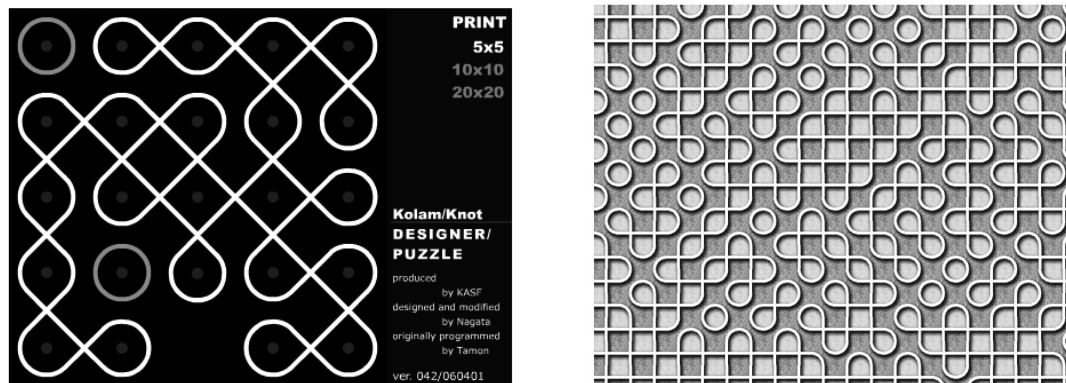

Fig. 18. Left: The first on-line Kolam software by KASF (http://intervision.aadau.net/; http://intervision.aadau.net/dp.htm). Right: On-mouse Kolam creator developed by Prof. T. Yanagisawa of Meijo University (http://q-labo.info/kolam_carpet_test/11/onmouse_change.html).

For houses in Okinawa, wind-through walls are made from some blocks, and the block-walls have some repeating patterns, and rarely a motif (Fig. 15 upper). The author designed the pattern of the universal design-Kolam block (Fig. 15 lower), which enables arcs of a circle, crossing lines and/or two-point connection lines.

6. Applications to Furniture (Wooden Craft)

Figure 16 shows a table design consisting of a transparent faceplate and a combinative wooden chair proposed by Yanagisawa. The chair is made from some pieces forming a loop of Kolam. The actual wood-products with loop pattern motifs made in Bali Island are shown in Fig. 17.

7. Interactive Kolam Creators (Computer Graphic Designers)

KASF members have developed the following interactive Kolam creator-soft wares shown in Figs. 18–22. Some ones are available on-line on the web page. These software applications were developed at the first as the tool to study features of Kolam and then to create easily many variable Kolam patterns.

8. Welfare Applications and Educational Toy Tools

A Kolam pattern was analyzed to be digitalized with some codes and to be made with six primitive patterns. These results made two types of cube blocks available for creating Kolam patterns shown in Fig. 23 [2, 3, 4-1, 4-2].

Nagata-type is a universal designed block with the primitive colored Braille (swelled) dot and line patterns and also non-repulsion magnets on each of six faces. This project was cooperated with a member of KASF, Prof. T. Robinson of Department of Mathematics, Madras Christian College, Chennai in India, and was introduced in the 12th World Conference in Malaysia, 2006 by International Council for Education of People with Visual Impairment (ICEVI), during the second KASF investigation tour in Malaysia, where Kolam is popular by Tamil people, This

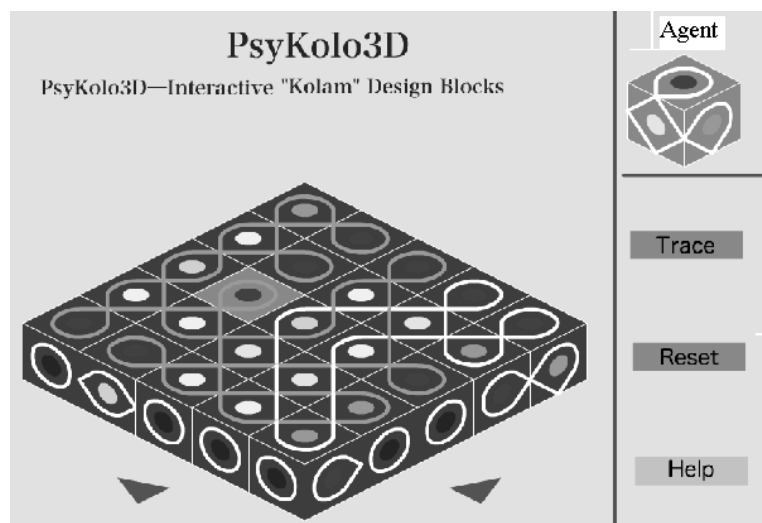Fig. 19. On Mouse Kolam creator including Off-click expanded from Yanagisawa's work by the author (http://www.cityfujisawa.ne.jp/~intvsn/OnMouseKolam/OnMouseKOLAM.htm).

Fig. 20. 3D CG Kolam creator on the surface of cube blocks with animation (http://www.scipress.org/journals/forma/pdf/2201/22010113.pdf; http://www.scipress.org/journals/forma/figs/2201/psykolo3d7306e.swf).

project was also introduced in the Asahi-Shinbun news paper on 2011 May 26 (http://www.osaka-ikuseikai.or.jp/sonota/file/vector/vector391.pdf).

Figure 24 introduces two-face tile, consisting of crossing lines and two-quadrant arcs for two-point connection lines respectively.

9. Training Recognition Function of Brain and Stretching

Computer graphics-creators of Kolam loop patterns is also available to be used as tools for training recognition function of the brain and stretching. A chart for training of the brain and stretching the eye-muscles is shown in Fig. 25 [5].

In Figs. 26–28, there are some Kolam puzzles for training of recognitive functions. The answer of Kolam puzzles are the following Figs. 29, 30 and 31.

10. Collaborations for Understanding Kolam Loop Patterns by Japanese and Indian People

Since KASF was founded in 2003, some collaboration

Fig. 21. Ubiquitous play with Keitai/mobile phone with animation (http://www.seeda.jp/kolam).
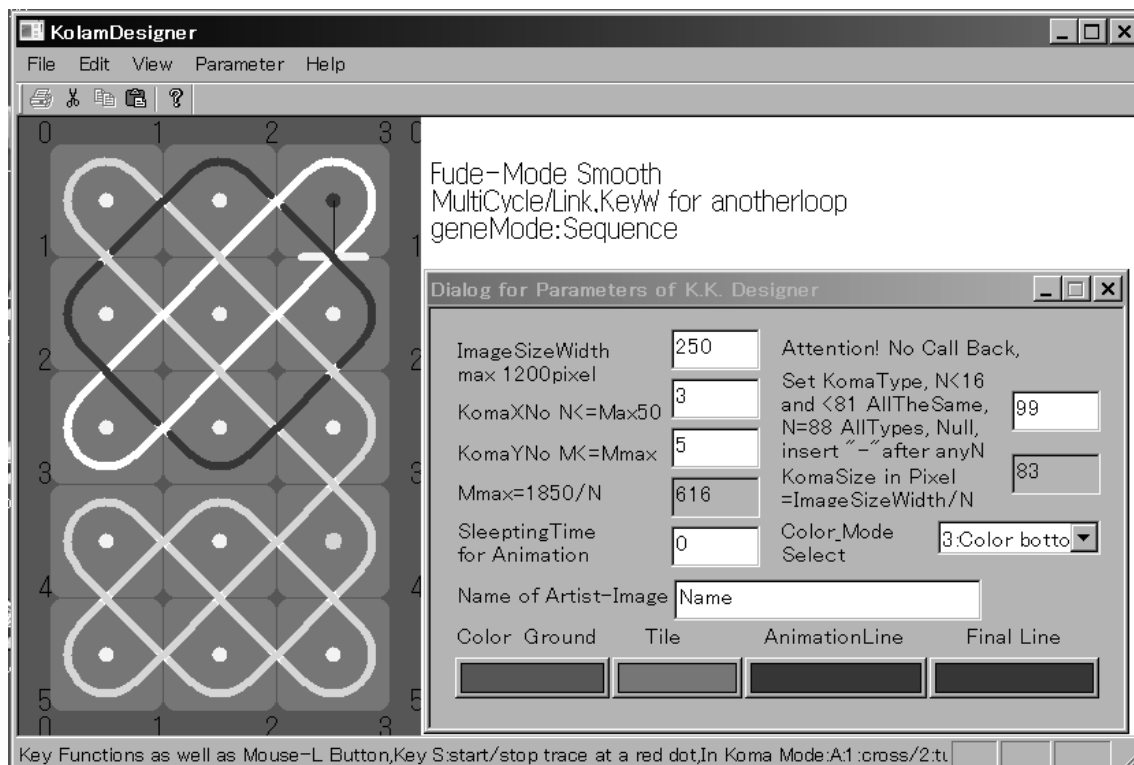

Fig. 22. Versatile Kolam designer with multi-color and multi loop in animation (not on a web-page, off line software).

for understanding and exchanging on their cultures, especially on loop patterns between Japan and other countries were executed.

In 2006, KASF co-organized the International Symposium on Katachi/Form in Folk Art, Osaka, Japan 2006 (ISKFA06 Japan) with the Society for Science on Form in Japan. This activity was reported and the selected papers were contributed in FORMA, 22, 2007.

Some other activities are shown in the following photos of Figs. 32 and 33.

11. Future Works

Kolam loop pattern will be more popular using recent high-tech and convenient display tools. For example, a tablet computer available to operate for tactile input on the display screen and to assign the position of an object image directly will be more useful for the aged or children. Any crossings of Kolam pattern will be assigned in location or in conditions directly and easily with a human sensory-motion system like hand drawing. This tool

Fig. 23. Upper-left Yanagisawa-type blocks, Upper-right, Nagata-type blocks. This project was also introduced in the Asahi-Shinbun news paper on 2011 May 26 (http://www.osaka-ikuseikai.or.jp/sonota/file/vector/vector391.pdf).
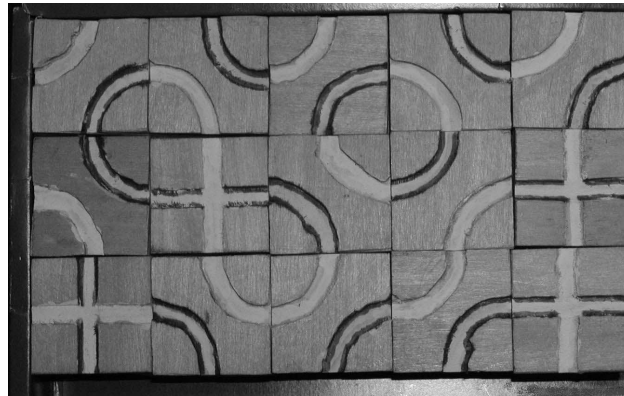

Fig. 24. Two-face tiles: with the surface and the back, each side of which has a cross or two 4th arcs of a circle (quadrants) carven respectively.

will be applied to Kolam puzzles-games for training recognition function of the brain.

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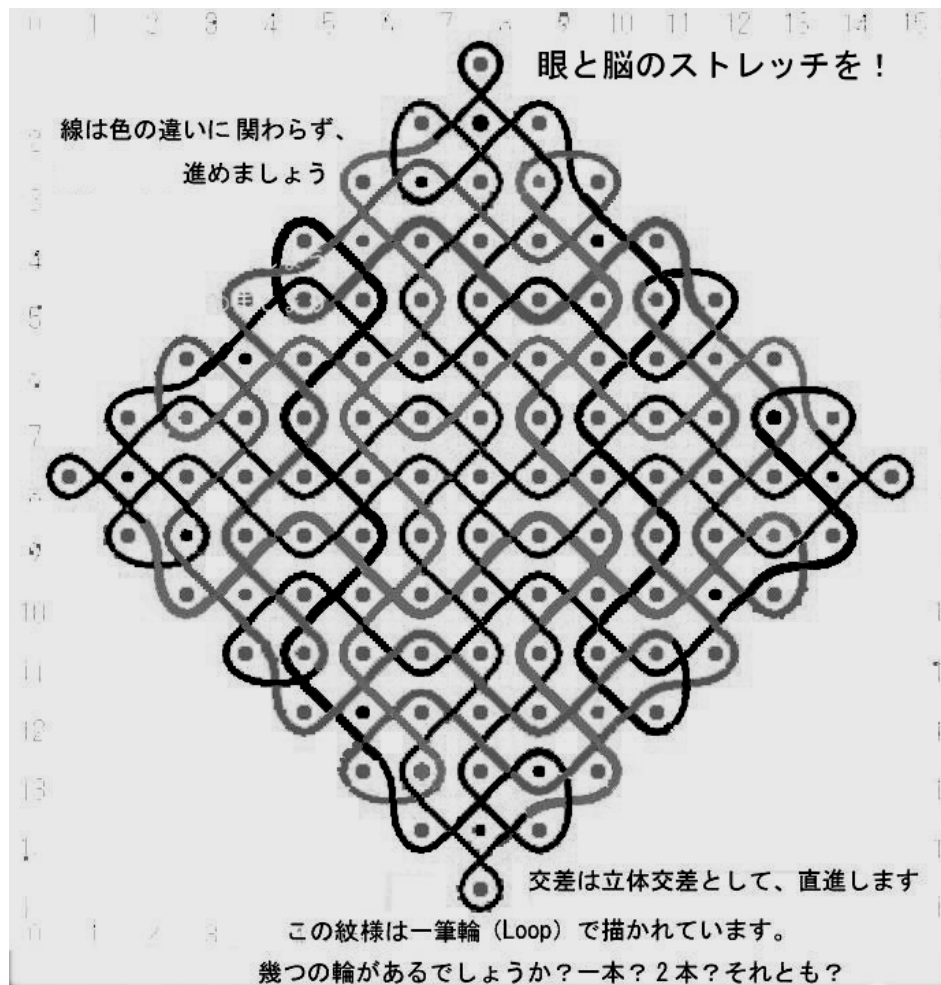[2-1] Nagata, S. and Yanagisawa, K. (2004) Attractiveness of Kolam

Fig. 25. Training Kolam chart of brain activities to trace and keep the sight to the line, and to memorize the location once traced, for stretching eye-muscle or for preventing vertigoes-dizziness. To trace a moving line-edge in an animation of a large Kolam, for example Kolam called Diamond carpet [5] makes also eye-muscle stretch.

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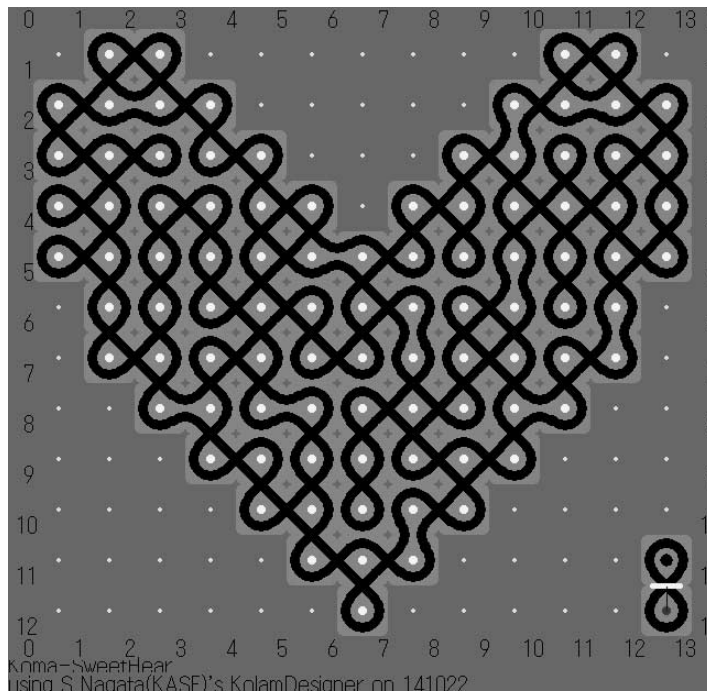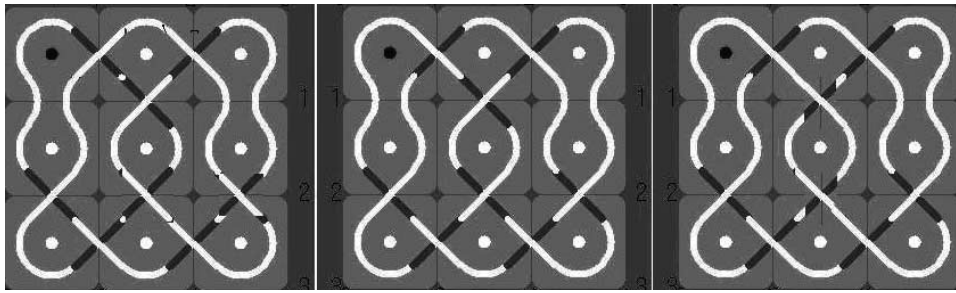
Fig. 26. Upper: Which becomes a true lover's knot (Agemaki musubi in Japan, the lower) with 8 crossings? The answer will be later on. Lower: Which different point does each of a couple of lovers start at to meet up together in a fixed pattern of this Sweet Heart. Or how connect to make a meet with a couple of lovers in a changeable connecting pattern.
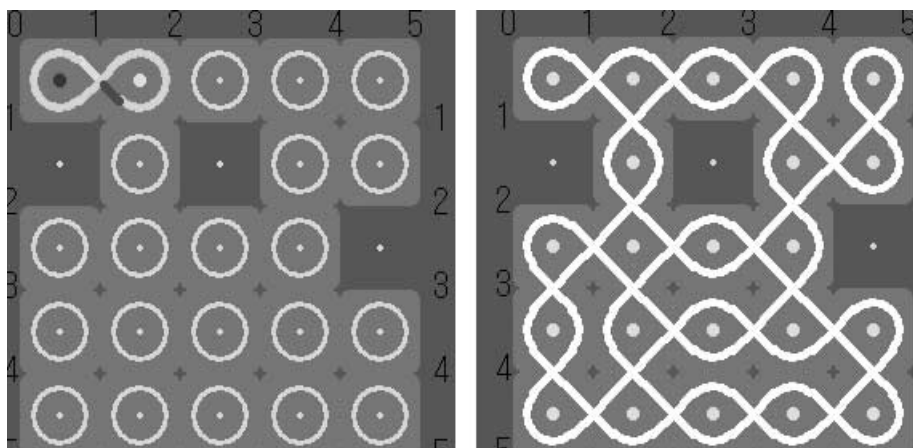

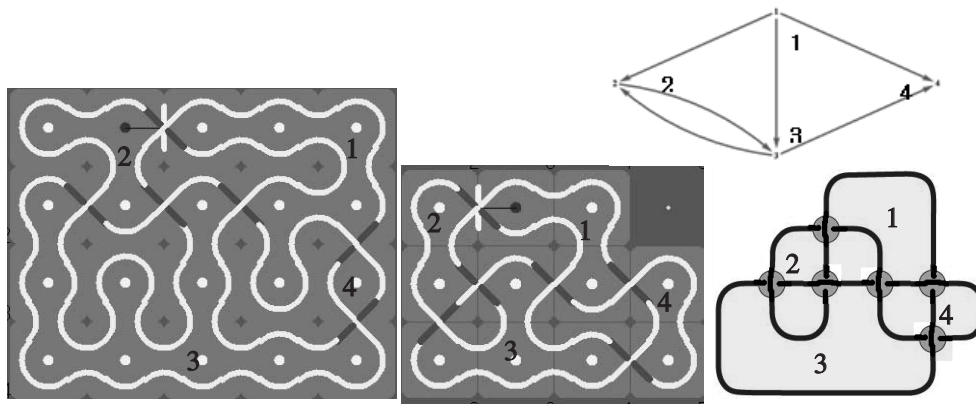Fig. 27. Left: Connect any circles to make a single loop. Right: How many loops does this pattern consist of?

Fig. 28. A game making minimum dot/tile Kolam (center) for the initial large-size Kolam (left). These Kolam are same as the medial graph (right) of the planer graph (upper) consisting of 4 vertices and 6 edges (6 crossings in the medial graph). Another unique game "Region select for crossing change Game" using a knot-link pattern was developed by Ayaka Shimizu (http://www.sci.osaka-cu.ac.jp/math/OCAMI/news/gamehp/gametop.html).
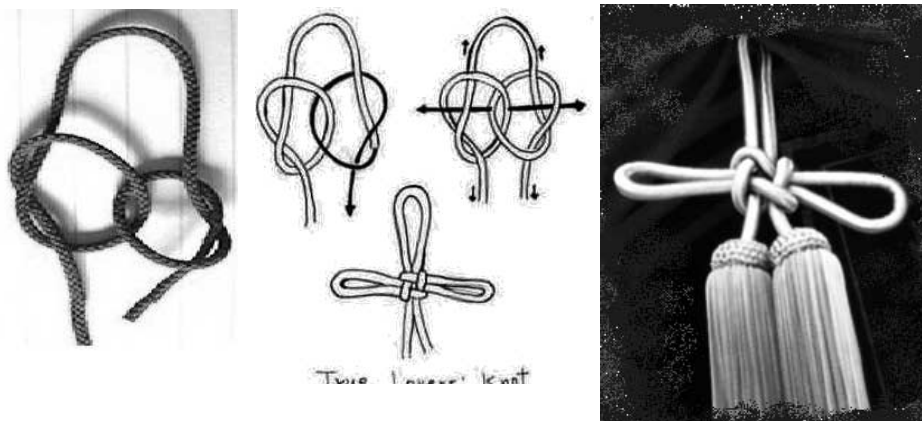

Fig 29. The answer for the lover's knot is the right of Fig. 26 upper, the left is an unknot, and the center is an alternate crossing knot and the fake. This figure shows how to make a lovers knot (photo: a tassel of Agemaki-musubi in a Japanese shrine).
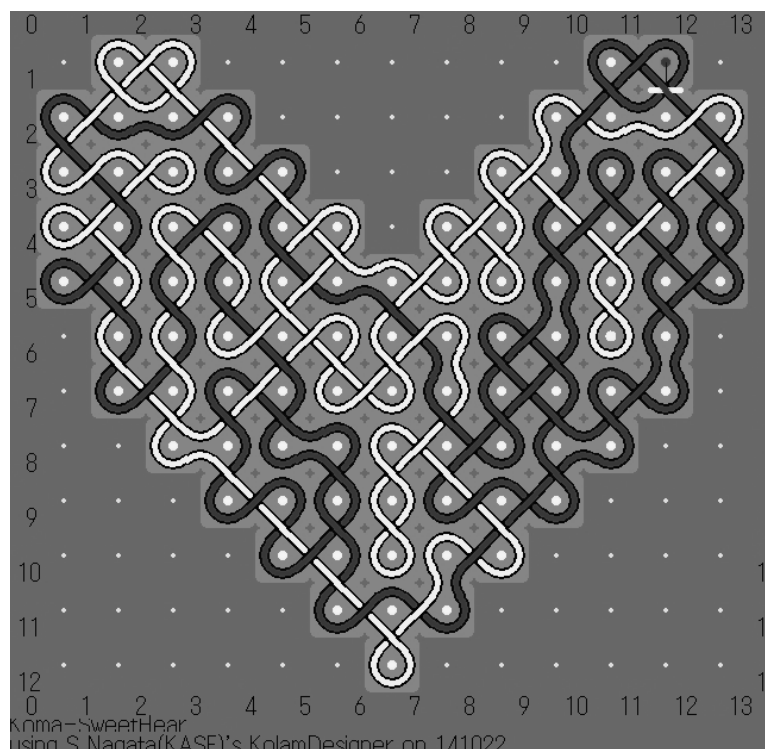

Fig. 30. This Sweet Heart pattern consists of two loops. So a couple of lovers starts at any point in the same color loop to meet up together, If they start at the different color loop, they will not meet up. On another way, if they uncross one crossing (or cross) between the different color loops, they will meet up.
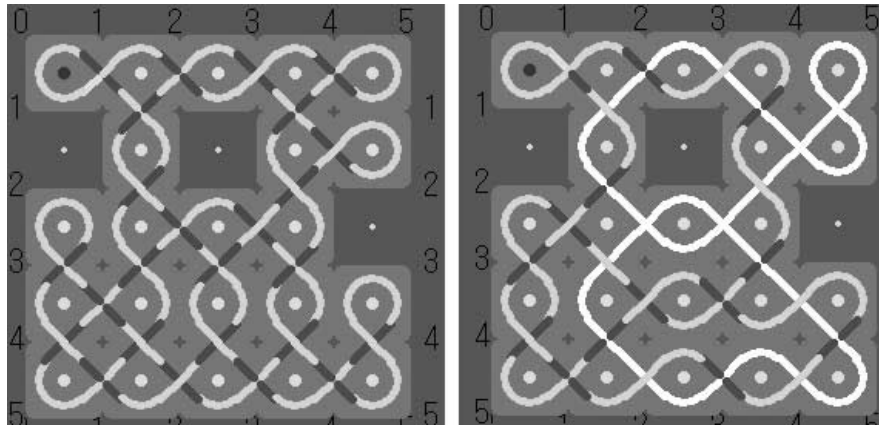
Fig. 31. Left: This is one of the single loop patterns. Right: There are three loops.

Fig. 32. The winners in the classical section and thier work with the author and the video photographer Mr Nagata Ikuo of the KASF Investigation tour in the Pongal Kolam competition in Namakkal, Tamil-Nadu, Jan. 2005.

Fig. 33. The demonstration of Kolam drawing and the painters and collaborator from Tamil-Nadu in India with the author at the Fujisawa Citizen International Festival in Fujisawa city, 28 Oct. 2008.