Tracing Neli Kolam Patterns

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Kolams are thought to bring prosperity to homes. In South India, it is widely practiced by female Hindu family members in front of their homes and also kolam is a tradition art of South India. There are different types of kolams are pulli(dots) and Kambi/Suzhi kolam. To be specific sikku/neli kolam is unique to kolam designs of Tamil Nadu. Sikku kolams are quite complex in nature, and need trained hands to be done perfectly. The main feature of sikku kolam designs is that the viewer cannot determine the origin and the end point of the kolam. A number of android applications are already existed for sikku kolams. But, the major detracts of the Existing System is it is only embedded with images and it takes large memory to store sikku kolam images and it doesn't have tracing concepts. Tracing Neli kolam Patterns will avoid all these issues in existing applications. The Proposed Android Application displays different patterns randomly in Square and Rhombus shaped dot Structure and it also traces all dot patterns to make users convenient to draw and it reduces perplexion of user while comparing to other applications.

I. INTRODUCTION:

Kolam also known as Rangoli, is a dainty floor painting, which is an integral part of South Indian tradition. It is a beautiful and perhaps the only one art, drawn every day by women in the households. It symbolizes beauty and provides a welcoming environment. Kolam is a form of drawing that is drawn by using rice flour/chalk/chalk powder/white rock powder often using naturally/synthetically colored powders in Tamilnadu. A Kolam is a geometrical line drawing composed of curved loops, drawn around a grid pattern of dots. Sikku kolam is also a form of Rangoli that is based on the dot grid technique. However, this technique

depicts curved lines joining or circling the dots on the kolam grid.

II. LITERATURE SURVEY:

A fundamental study of kolam shapes by Yanagisawa and Nagata revealed a new method for simplifying the search for the number of possible kolam patterns on a matrix of a certain size. Nagata and Yanagisawa, Nagata and Thamburaj reported digitalization, analysis of Kolam patterns and Kolam designer software as well as identified Kolam pattern block tool .In the art form of kolam, dots called pulli are arranged in rhombic, square, triangular, or free shapes. Then a single, uninterrupted linear or curvilinear line, called the kambi, intertwines these dots. While there are no written or verbally stated rules, Yanagisawa and Nagata have deduced some of the basic rules of pulli and kambi kolam from examining the designs: "(1)

Loop drawing-lines, and never trace a line through the same route. (2) The drawing is completed when all points are enclosed by a drawing-line. (3) Straight lines are drawn along the dual grid inclined at an angle of 45 degrees. (4) Arcs are drawn surrounding the points. (5) Smooth drawing". They have also pointed out that some exceptions to these rules are made although rarely, Girls somehow understands these implicit regulations and operate within the parameters. Listed some rules of pulli (dots) and kambi/Suzhi kolam. Rules can be added / removed. They are uniformly spacing of dots, Smooth drawing

line around the dots, Symmetry in drawings, Drawing lines never trace back, Arcs adjoining the dots. Kolam is completed when all points are enclosed by the drawing line. The following Figure explains the components of Kolam. They are Dot/Pulli structure, Drawing Line, Intersection Point/ Vertex.

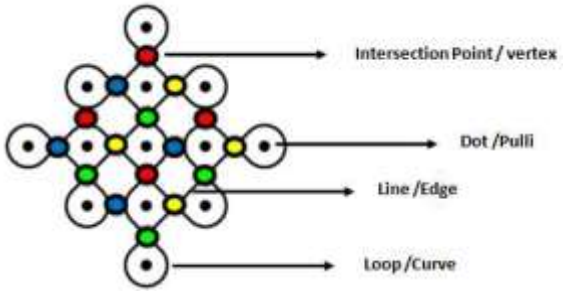


Figure 1. Special Graph-Suzhi kolam drawn with 1-5-1 Dot Structure

When certain array of points are given, an inclined grid paving the way of a drawing- line is uniquely defined.Comparing various Kolam patterns which can be drawn on the same array of points, with its inclined grid underneath, it is found that the shapes of circular arcs of a drawing-line on the borders are common to the all patterns, and that the differences between them are only the shapes at the intersections of the inclined grid. The types of shape at the intersections are two: “crossing (or a cross)” and “uncrossing(or two curves)”.when certain array of points is given as a prior condition, the form of the pattern is determined only according to the accumulation of the choices of whether the drawing - line goes straight or curves at each intersection of the inclined grid. By setting “crossing = 1” and “uncrossing =0”, therefore, all the Kolam patterns can be represented as binary numbers. By additionally combining four contiguous intersections, they will be converted into hexadecimal and decimal numbers. The fact that Kolam patterns can be expressed with hexadecimal numbers means that they can consist of 16 types of units. One of the usefulness of numeric representation is that an exhaustive analysis on a computer becomes easy. Consequently, with computer programs, the author[4] tried to count the number of one-stroke patterns, drawn with one stroke of drawing-line, among the whole Kolam patterns which can be drawn on 1-5-1 and 1-7-1 array of points.

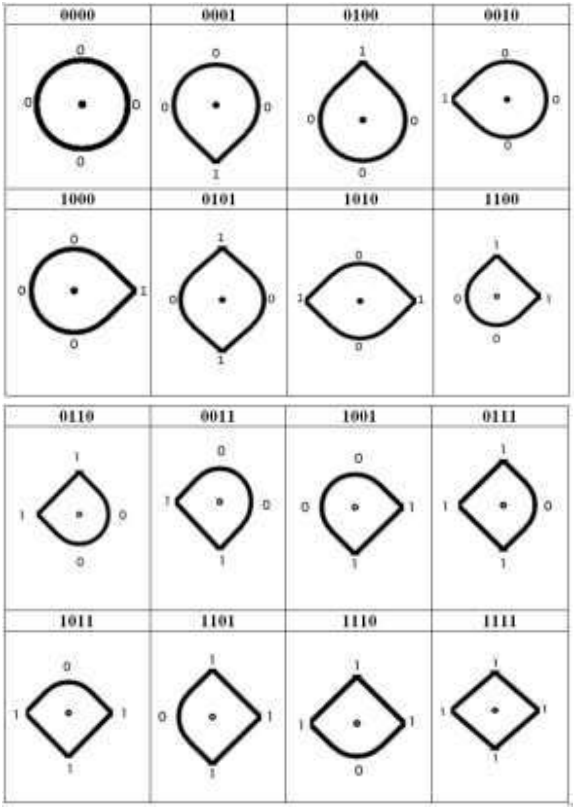
In the case of 1-5-1 array of points, the total number of patterns is 216 = 65,536, because there are 16 intersections in the inclined grid. Conversion of numbers into patterns is carried on in a reverse process of patterns to numbers. Patterns are virtually drawn on an X-Y coordinate with 0 and 1, and checked as if tracing a drawing-line with your finger. Setting the initial location and direction, the finger moves as follows: go straight at crossing = 1 square and curve centering on the nearest point at uncrossing = 0 square . The judgment as one stroke or not is done by checking that the finger has passed through all the inner squares twice when it returns to the starting location. It is however, difficult to distinguish the complexity of Kolam at glance. Creating Kolam pattern is expected to be useful for activating/training human brain. It is a wonder that a woman with no math knowledge (except counting) is able to draw any type of complex pattern without much effort. They show their perfection in geometrical presentation, symmetry, straight lines, curves etc., Girls capture, encode, and decode the image in their memory with much clarity before reproducing it on the ground.

Kolam can be called as an "ethno mathematical" activity The field of ethno mathematics examines the mathematical accomplishments of different cultural groups. Drawing kolam increases ones concentration and give strength to mind by Investigating pullis/dots required for a kolam, symmetry in drawing, discovering the ways to draw, tracing a line/curve etc., Even a girl child with age of 2 and half year is able to replicate the kolam drawn by her mother/sister/aunt. A kolam task requires one to store and recall images. Beforere producing the kolam on the ground, children first call up animage in their visual imagery, and then register the image in their visual memory in terms of pulli and kambi, parsed constituent units, and symmetry. The dual coding theory(Paivio, 1986) explains how the visual image is received which is to be coded by a dual coding system (verbal and visual), hence making recall easy. Thus, one could argue that, kolam possibly aids in the development of the visual and verbal imagery systems. In elementary mathematics, creating a visual image of a problem greatly enhances children's problem-solving skills.

III. EXISTING SYSTEM

The existing system of neli kolam application contains features like the application can display different neli kolam
patterns according to user's input, The input size of the nelikolam can be extended up to 35 dots in both square and rhombus shapes, The Option Draw kolam is used for viewing
the kolam drawing for 3*3 neli kolam patterns. It also displays Hexa Decimal Representation for each neli kolam pattern.

Table I. 16 Possible loops (right, top, left, bottom)



IV. DRAWBACKS

The main detracts of the Existing System is it only traces for 3X3 input size of neli kolam pattern. The System doesn't have facility to trace all NXN neli kolam patterns. User will find difficulties while drawing large neli kolam dot structure.

V. PROPOSED SYSTEM

The Proposed System reduces the problems in the existing system. The additional features made are, it trace all neli kolam patterns not only the 3x3 kolams but also all sized kolams. The generic algorithm to be developed for tracing any input sized kolam. The users can have the facility to change the background color of the frame and kolam color according to their wish and the random color option is also available.This System will help the users to draw the neli kolam patterns in succinct way.

VI. MODULE DESCRIPTION

1. GENERATE PATTERNS

The Module 1 work deals to implement the automatic generation of the patterns. It includes a button which gives different types of 3x3 patterns. Basically all the neli kolams are drawn by some kind of loops (small patterns). All available loops are displayed in the Table I. Here, simply take the values 0 and 1 represents the curve-side and the corner side.Total possible loops to generate all the neli patterns are 16 (i.e. 2^4=16)

To Generate 3x3 Neli kolam, it need 2x2 matrix boxes likeFig.1.The Fig 1 represents the First Quarter of the 3x3 nelikolam pattern and it has t1, t2 and t3 variables which hold binary numbers like 0001, 0010…..But This t1, t2, t3 variabl es count will vary for different input size neli kolam patterns. For3x3, 3 variables needed and for 5x5, 10 variables are needed to draw the neli kolam pattern.

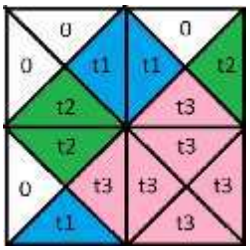


Figure 2. 2x2 boxes for 3x3 Neli kolam

Calculate the count of the variables needed to draw thepattern and store the count in variable n. The number ofpossible patterns of the each input size is calculated by usingthe formula like 2^n .Therefore, for 3x3 input size, 2^3=8different possible patterns are available shown in Table II

Table II. 3x3 possible pattern Values

S.NO	T1	T2	T3
1	0	0	0

2	0	0	1
3	0	1	0
4	0	1	1
5	1	0	0
6	1	0	1
7	1	1	0
8	1	1	1

Likewise t1, t2, t3 values are taken to draw the neli kolam pattern. Using these binary values of above table 3x3 patterns will generate all possible patterns of 3x3 kolam and its formation.

The Remaining quarter of the neli kolam patterns are generated by simply rotating this first quarter to 90 degree angle. While rotating this first quarter matrix, second column of 2x2 box will overridden by the rotated pattern of same 2x2matrix box shown in Fig.2. Here, the second row of the first quarter 2x2 matrix will be same as the first column of the rotated second quarter of the 3x3 neli kolam pattern. So, only the t1, t3 have same color which indicates that the variable must hold the same Boolean value then only it forms the perfect neli kolam pattern shown in Fig 2.

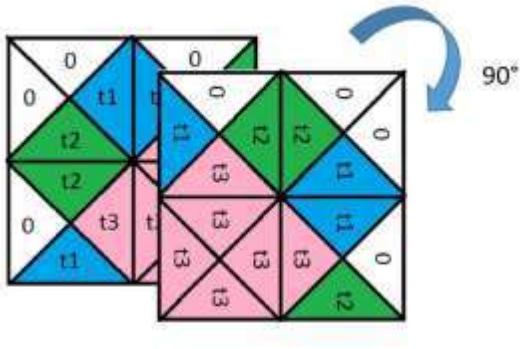


Figure 3. Rotation of 2x2 matrix

Same rotation happens for 3rd and 4th quarter of the neli kolam pattern .The same process will take place for remaining quarters. Here the noticeable thing is the edges of the nelikolam pattern will be curve side so, the edges of the nelikolam pattern have binary value as 0.The value 0 indicates curve side and the value 1 indicates the corner side of neli kolam pattern. After Rotation happens for remaining
Quarter shown in Fig 3.

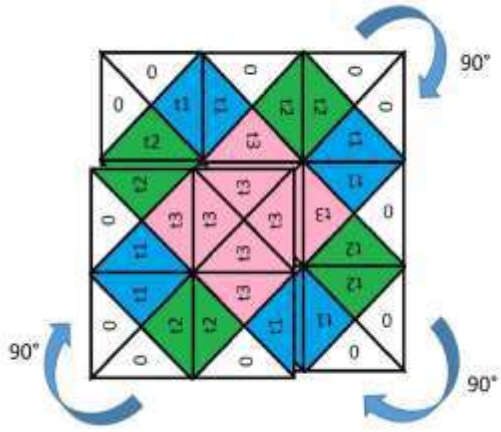
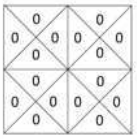
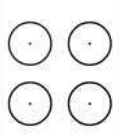
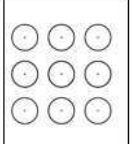
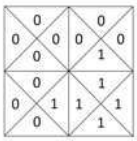
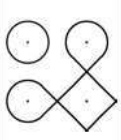
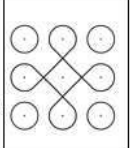
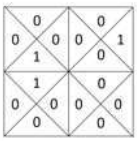
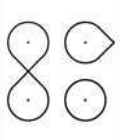
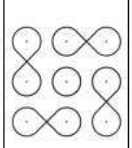
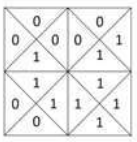
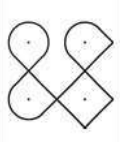
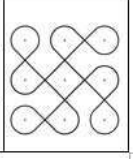
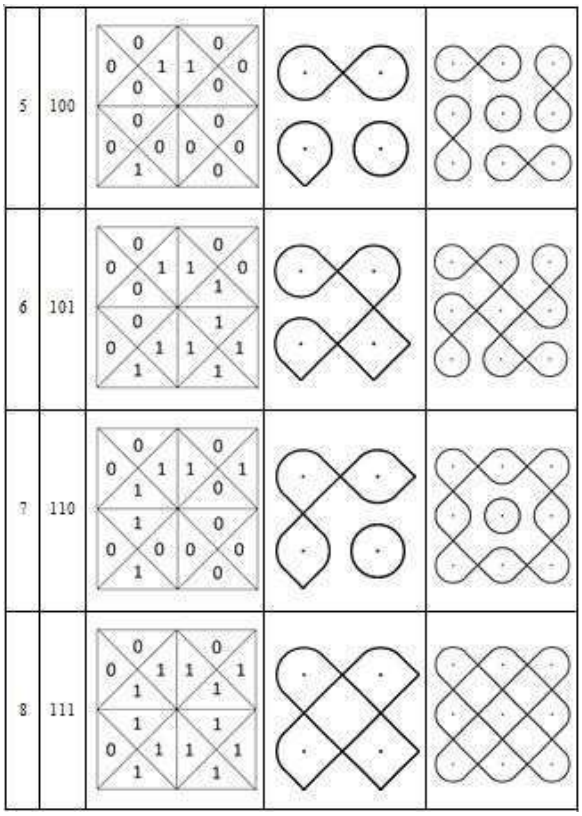


Figure 4. Using rotations, 2x2 produces 3x3 matrix

Table III. All possible patterns of 3x3 neli kolam

s.no	Value	Values of 1st quarter	Output of 1st quarter	Final output with 4 quarters
1	000			
2	001			
3	010			
4	011			



2. TRACING THE KOLAM

This module describes how to trace the 3x3 pattern and it details the working flow of the tracing concepts. It also elaborates the rules of 3x3 kolam. This module helps the user show to draw all those patterns available in 3x3 neli kolam

2.1 RULES TO TRACE 3X3 KOLAM

Initially 3x3 consists of 9 patterns. These patterns are arranged in row and column wise. There is no sequence order exists to trace the pattern. Each pattern can trace in either clockwise or anti clockwise direction. TRUE will draw the pattern in clockwise direction and FALSE will draw the pattern in anti-clockwise direction. The pattern had drawn one by one according to the procedure followed in the code

2.2 DRAWING PATTERNS OF KOLAM.

All the loops are animated by functions. According to the kolam pattern, loops are called by some order. Only using this order user can identify the drawn kolam. Each loop consist a function. All 3x3 neli kolam patterns and its tracing procedures are shown in Table IV. Each loop consist of 3parts, two of them are lines other is an arc, Example shown in Fig 6

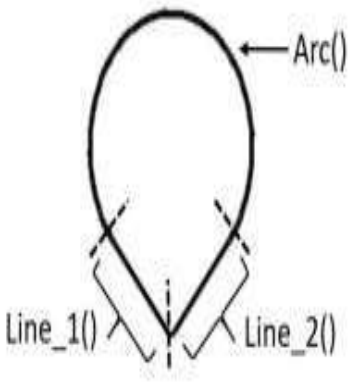
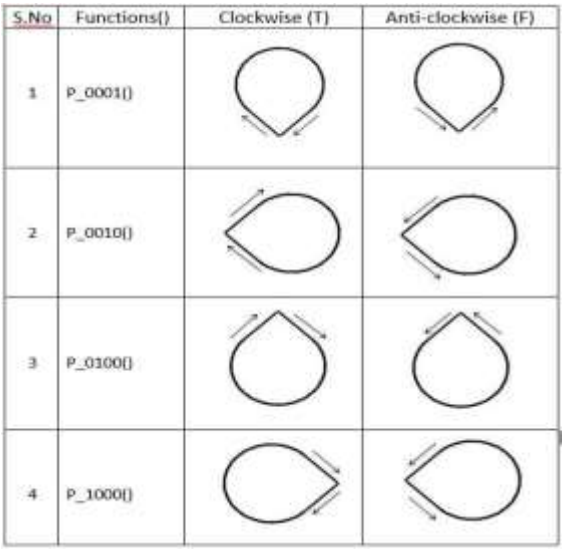
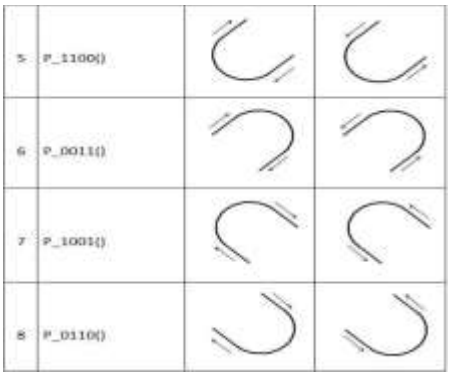


Figure 5. Internal parts of a loop

The Table IV shows the Clockwise and Anti-Clockwise direction of the neli kolam patterns. Here T means True which indicates clockwise direction and F means False which indicates Anti-Clockwise direction.

TRUE will draw the pattern in clockwise direction and FALSE will draw the pattern in anti-clockwise direction.





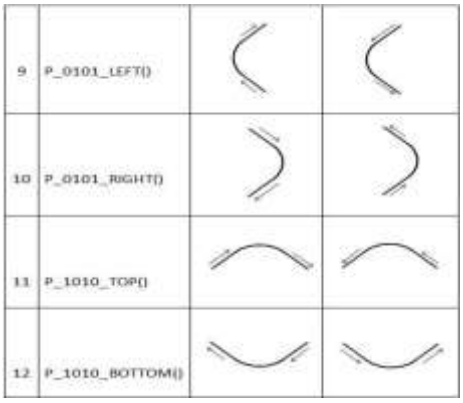


Table V. Functions of Lines

S.No	Function	Direction
1	LINE_11()	
2	LINE_00()	
3	LINE_01()	
4	LINE_10()	

VII. RESULT AND FUTURE WORK

The Android application developed focuses on Digitalization of traditional art neli kolam. The existing android applications displays the stored images and videos of neli kolam patterns. It takes large memory space to store all the patterns. The system implemented overcomes the drawback of the existing system by designing the algorithm to generate and trace neli kolam patterns of various input sizes.This application shows the step by step procedure to draw the neli kolam and it uses memory space efficiently. Users canaccess the developed Mobile App from anywhere.

They can learn the kolam without the guidance from ancestors. Learning to draw kolam triggers the brain activity and improves ones concentration. The major outcome of the project is to preserve the traditional art and pass the culture of drawing neli kolam tothe next generation.

VIII. REFERENCES

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