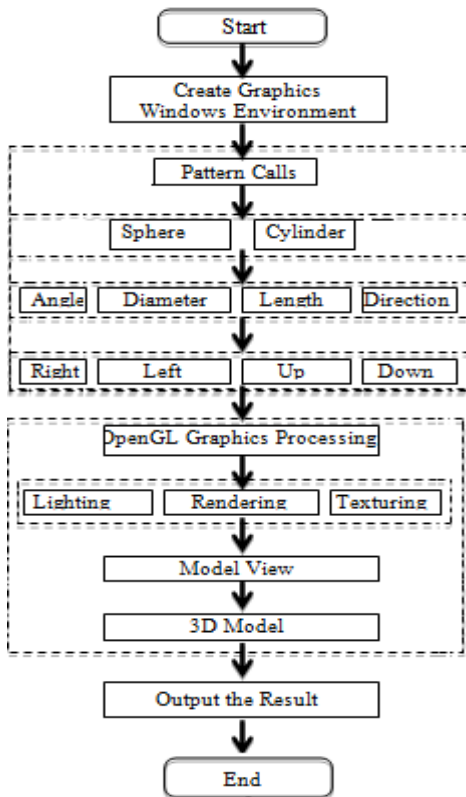






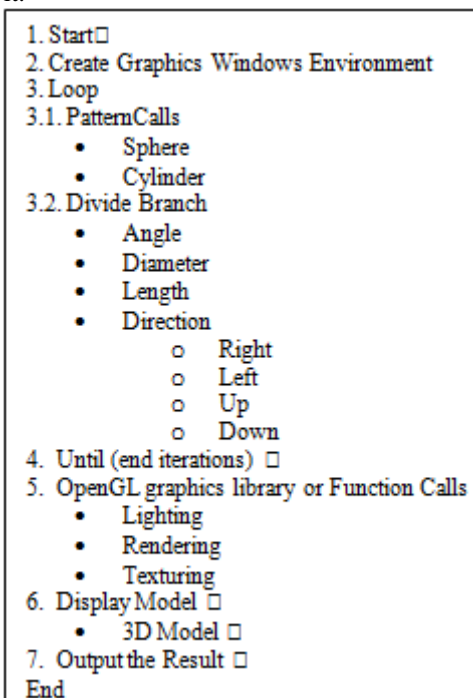
## 4. Purpose System

The proposed system consists of four main steps, namely (1) creating graphics windows environment, (2). Iterative function system (IFS) that is a method of constructing fractals, (3)OpenGL graphics processing and (4) Output the result.



**Figure 2:** Development of the 3D Modeling using IFS and OpenGL

Figure 2 shows the development of the 3D Modeling using IFS and OpenGL, when in Figure 3 shows the quasi code used for it.



**Figure 3:** The Quasi Code for Development of the 3D

Modeling using IFS and OpenGL

## 5. Result of Simulation

Modeling and creation of the graphic environment are two important stages of computer graphic [29]. To implement and simulate the development of the 3D Modeling Indonesia Ring Jewelry Ornaments, C programming and OpenGL functions are used.

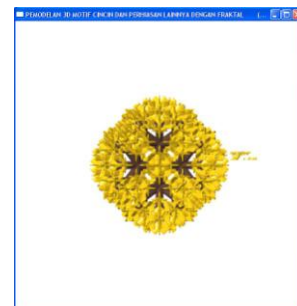
Here are four examples of modeling images: “Kendari Batik Parang”, “Kendari Batik Pamiluto”, “Kendari Batik Sidomukti” and “Kendari Batik Ranting Cirebon”.



**Figure 4:** The Display 3D Model of Ring Jewelry of “Kendari Batik Parang”, n=5.



**Figure 5:** The Display 3D Model of Ring Jewelry of “Kendari Batik Pamiluto” n= 5.



**Figure 6:** The Display 3D Model of Ring Jewelry of “Kendari Batik Sidomukti; n=6.



**Figure 7:** The Display 3D Model of Ring Jewelry of “Kendari Batik Ranting Cirebon”, n=3.

Modeling ring by using IFS generate a lot of interesting models. As seen in Figure 4, the display 3D model of ring jewelry of "Kendari Batik Parang" produced from initial value: angle =  $50^{\circ}$ , diameter = 0.5, length = 7 and number of iteration (n) = 5. For direction, RIGHT: Rotate (angle, Y-axis);LEFT: Rotate (-angle\*2, Y-axis);UP: Rotate (-angle\*2, X-axis and Z-axis);DOWN: Rotate (angle\*2, Y-axis);

For the next model as shown in Figure 5 namely 3D model of ring jewelry of "Kendari Batik Pamiluto", the changes made by changing the initial value i.e. angle =  $45^{\circ}$ , diameter = 1, length = 5 and number of iteration (n) = 5.

Furthermore, the model as shown in Figure 6, namely 3D model of ring jewelry of "Kendari Batik Sidomukti", changes were made to change the initial value only. The changes made by changing the initial value i.e. angle =  $45^{\circ}$ , diameter = 0.5, length = 7 and number of iteration (n) = 6.

Finally the next model as shown in Figure 7 is the 3D model of ring jewelry of "Kendari Batik Ranting Cirebon", the change is also done simply by changing the initial value only i.e. angle =  $100^{\circ}$ , diameter = 0.3, length = 13 and number of iteration (n) = 3.

Of the four examples of modeling results above, can produce a variety of models with large numbers of more than 340 models. To generate the proposed method only requires a period of 6 minutes. Changes in the value of turning angle and rotary axes can yield attractive model. If only use to the combination of Right-Left-Up-Down(LRUD) it will produce 340 models. The calculation result is obtained from the calculation  $4^4+4^3+4^2+4^1 = 340$ . In this case 4 factorial arrangement obtained from each of four combinations can be filled by any one of 4 directions Right-Left-Up-Down. The result of the combination of the top, bottom, left and right it will get as many as 340 variations of fractal shapes. This does not include the added variety and number of iterative way. There will be more than 340 variations of shapes that can be created with this algorithm.

## 6. Conclusion

Nowadays there is much 3D graphic software. Now it is possible to produce new application using the programming techniques, which enjoy high graphic quality and charm. So it is possible to create geometric and compound shapes in programming environments using IFS that is method of constructing fractal. The 3D modeling of jewelry ornament will be tested using Windows Operating System, OpenGL and C programming. This research has produced more than 340 of rings and jewelry designs unique traditional and modern. This research has produced more than 340 of rings and jewelry designs unique traditional and modern nuances. To generate the proposed method only requires a period of 6 minutes.

## References

[1] Suyoto, Computer Graphic with Visual C ++ and OpenGL v.6. (in Bahasa), Yogyakarta: Gava Media, 2003.

- [2] Suyoto, "Computer Graphic with J2ME? (in Bahasa)," Jurnal AiTI, II (2), 2005.
- [3] Suyoto, "Fractal Applications on Mobile Phones with J2ME? (in Bahasa)," Jurnal Teknologi Industri, X (2), 2006.
- [4] LPPM, "Master Plan Research of University of Atma Jaya Yogyakarta Year 2010-2014. (in Bahasa)," Yogyakarta, 2009.
- [5] Y. Yan and L. Kunhui, "3D Visual Design for Mobile Search Result on 3G Mobile Phone," Xiamen University, Xiamen 361005, Fujian, China, 2010.
- [6] R. Yulianto, H. Moch. and H. P. Mauridhi, "Fractal Based on Noise for Batik Coloring using Normal Gaussian Method," The Journal for Technology and Science, XXIII (1), pp. 34-40, 2012.
- [7] Y. Guermond, D. Delahaye, E. Dubos-Paillard and P. Langlois, "From modelling to experiment," GeoJournal, LIX (3), p. 171, 2004.
- [8] I. Stephen, Y. Zhou, D. Walterhouse, Greg Taborn, G. Landini and Philip Lannaccone, "Three Dimensional Visualization and Fractal Analysis of Mosaic Patches in Rat Chimeras: Cell Assortment in Liver, Adrenal Cortex and Cornea," plosone, VII (2), 2012.
- [9] G. Vincenzo, A. Guaccio, P. A. Netti and L. Ambrosio, "Image processing and fractal box counting: user-assisted method for multi-scale porous scaffold characterization," J Mater Sci: Mater Med, XX1, pp. 3109-3118, 2010.
- [10] S. M. Ricardo and A. T. C. Pereira, "Fractal Shape," in Nexus 2010: Relationships Between Architecture and Mathematics, Porto, 2010.
- [11] Y. Hariadi, M. Lukman and a. A. H. Destiarmand, "Batik Fractal: Marriage of Art and Science," Bandung, Indonesia, 2010.
- [12] Y. Li, C.-J. Hul and X. Yao, "Innovative Batik Design with an Interactive Evolutionary Art System," Journal Of Computer Science and Technoogy, XXIV (6), pp. 1035-1047, 2009.
- [13] C.-H. Lin, J.-L. Chen and C. Y. Tseng, "Optical sensor measurement and biometric-based fractal pattern classifier for fingerprint recognition," Expert Systems with Applications, XXXVIII (5), pp. 5081-5089, 2011.
- [14] W.-L. Lee and K.-S. Hsieh, "A robust algorithm for the fractal dimension of images and its applications to the classification of natural images and ultrasonic liver images," Signal Processing, XC (6), pp. 1894-1904, 2010.
- [15] F. Mendoza, N. A. Valous, P. Allen, T. A. Kenny, P. Ward and D.-W. Sun, "Analysis and classification of commercial ham slice images using directional fractal dimension features," Meat Science, LXXXI (2), pp. 313-320, 2009.
- [16] J. C. Germain and J. M. Aguilera, "Identifying industrial food foam structures by 2D surface image analysis and pattern recognition," Journal of Food Engineering, CXI (2), pp. 440-448, 2012.
- [17] S. Ben Moussa, A. Zahour, A. Benabdelhafid and A. M. Alimi, "New features using fractal multi-dimensions for generalized Arabic font recognition," Pattern

Recognition Letters, XXXI (5), pp. 361-371, 2010.

- [18] R. Quevedo, M. Jaramillo, O. Díaz, F. Pedreschi and J. M. Aguilera, "Quantification of enzymatic browning in apple slices applying the fractal texture Fourier image," *Journal of Food Engineering*, XCV (2), p. 28, 2009.
- [19] Y. Tao, E. C. M. Lam and Y. Y. Tang, "A Combination of Fractal and Wavelet for Feature Extraction," *International Journal of Pattern Recognition & Artificial Intelligence*, XV (8), pp. 2777, 2001.
- [20] Y. Q. Chen and G. Bi, "On Texture Classification Using Fractal Dimension," *International Journal of Pattern Recognition & Artificial Intelligence*, XIII (6), pp. 929, 1999.
- [21] A. R. Backes, D. Casanova and O. M. Bruno, "Plant Leaf Identification Based On Volumetric Fractal Dimension," *International Journal of Pattern Recognition & Artificial Intelligence*, XXIII (6), pp. 1145-1160, 2009.
- [22] C. S. Calude and J. Lewis, "Is there a universal image generator?," *Applied Mathematics & Computation*, vol. CCXVIII (16), pp. 8151-8159, 2012.
- [23] J. Courtial and M. J. Padgett, "Generation of self-reproducing fractal patterns using a multiple imaging system with feedback," *Journal of Modern Optics*, vol. XLVII (8), pp. 1469-1474, 2000.
- [24] K. Chung and H. Ma, "Automatic generation of aesthetic patterns on fractal tilings by means of dynamical systems," *Chaos, Solitons & Fractals*, XXIV (4), pp. 1145-1158, 2005.
- [25] K. Chung, H. Chan and B. Wang, "Automatic generation of nonperiodic patterns from dynamical systems," *Chaos, Solitons & Fractals*, XIX (5), pp. 177, 2004.
- [26] A. S. Aribowo, "The Model of Searching Digital Image on Database Image using the Approach of Color Pattern Proximity Calculation.," in *Seminar Nasional Informatika*, Yogyakarta, 2009.
- [27] L. Sumarno and E. Harjanti, "Pengenalan Ucapan Dengan Jaringan Saraf Tiruan Kohonen," *Jurnal SIGMA*, Program Studi Teknik Elektro, Fakultas Teknik Universitas Sanata Dharma, VIII (2), pp. 117-125, 2005.
- [28] Samsuyardi, "Pengidentifikasian Pembuat Tulisan Tangan Dengan Pengenalan Pola Biomimetik," *Jurnal Generik Fakultas Ilmu Komputer Universitas Sriwijaya*, IV (2), pp. 31-33, 2009.
- [29] F. S. Gharehchopogh, I. Maleki and S. Sadouni, "Analysis of the Fractal Koch Method in Computer Games Development," *International Journal of Computer Graphics & Animation (IJCGA)*, IV (1), January 2014.

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