

“Enhancing roles and contributions of young researchers to unleash Indonesia’s potential”

MOTIVATION

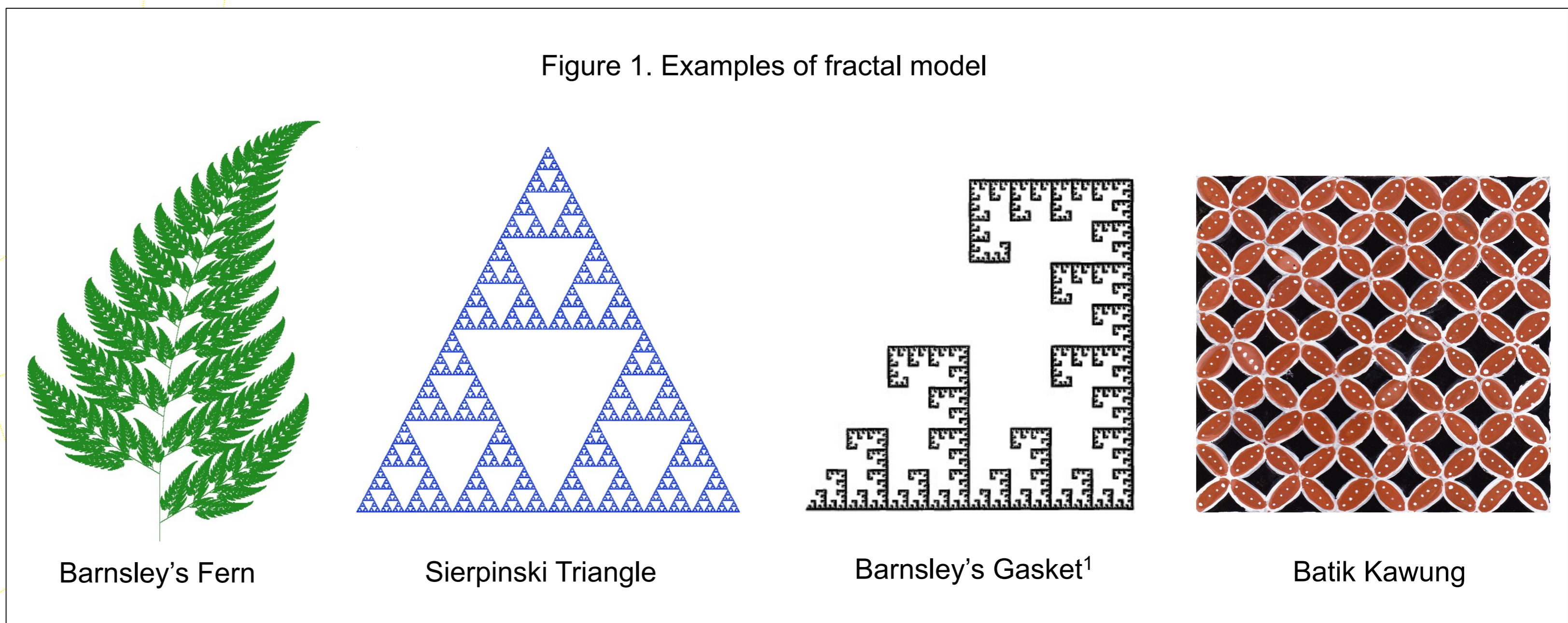
Batik is one of the popular Indonesian traditional costume. It is widely known as a cultural heritage of Indonesia. According to some researches, the Batik patterns resemble fractal i.e. a mathematical object where a small piece of it, if viewed up close, looks the same as a larger chunk (see Fig.1). Such characteristic known as self-similarity. Iterated Function System (IFS) is mathematical method to construct the fractal models. In this work, we develop a computer software to generate Batik patterns based on the IFS method.

IFS DEFINITION

IFS is a finite set of affine transformations given by $\{F_n(x,y) = (a_nx + b_ny + e_n, c_nx + d_ny + f_n)\}$ where parameters $a_n, b_n, c_n, d_n, e_n, f_n$ are called the IFS code with $n=1,2,\dots,N$ and x,y are variables.

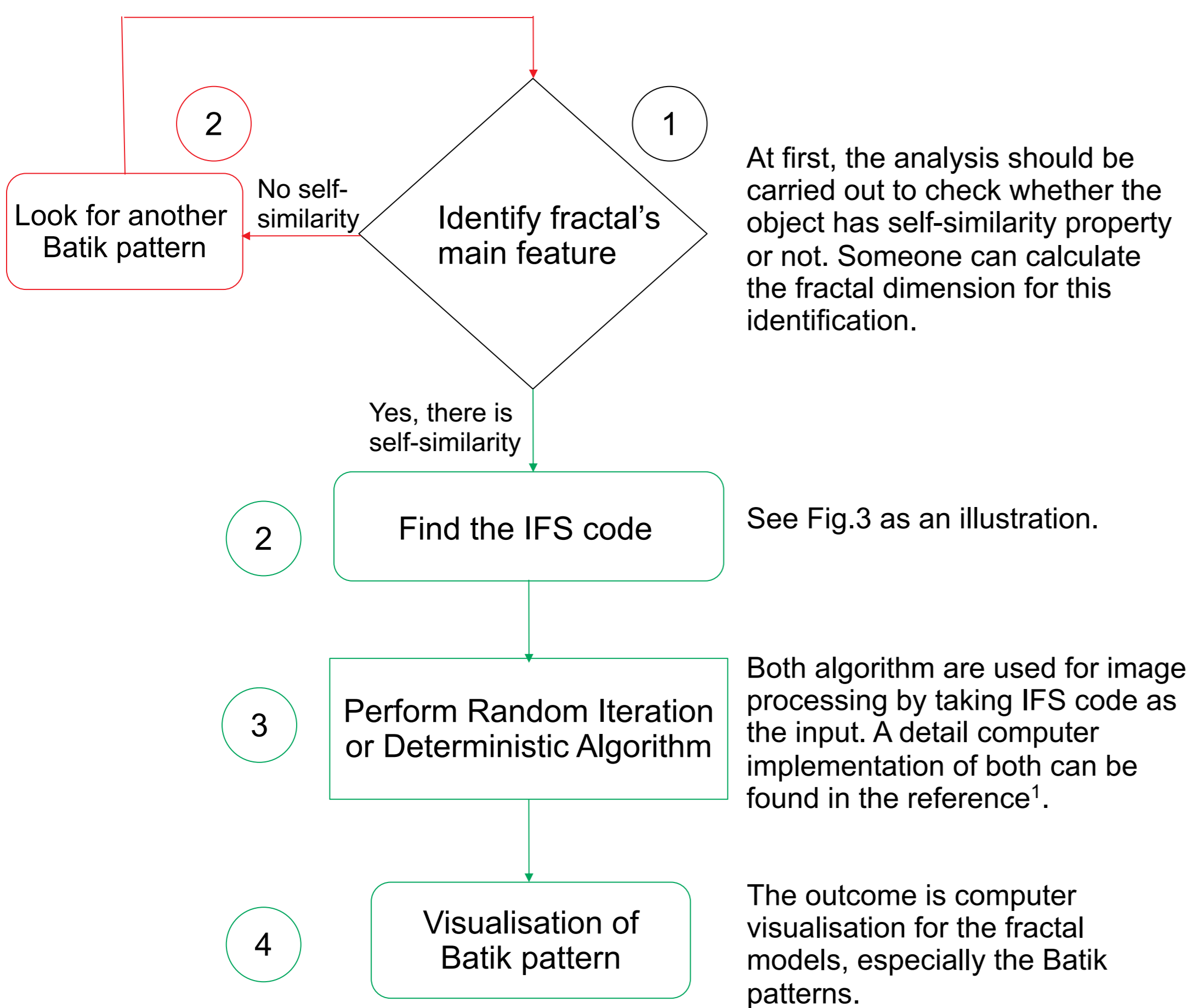
CONTRIBUTION AND SIGNIFICANCE

The goal of the work is creating the “IFS-Based Computer Software” to visualise the Batik pattern (see Fig.2). Any modification of the IFS code yields many variants of the Batik pattern which can be offered to the consumers and markets for commercial purposes.



RESEARCH ON PROGRESS

Figure 2. Working model for the IFS-Based Computer Software



GEOMETRIC APPROACH TO GENERATE FRACTALS

The fractal is made up of union of several similar geometrical shapes. Here, we make a use of two-dimensional shapes such as Polygon (see Fig.3). In the 1st stage, the initial Polygon (1) is duplicated into three smaller copies of itself, and then all copies are organised into a new shape (2). The process of duplicating and organising these copies into a new shape decides the IFS for the fractal model. Next, the same procedure as in the 1st stage is repeated again in the 2nd stage and the upcoming stages as well.

Figure 3. The evolution of Barnsley's Gasket

By performing the technique invented in the reference² we found the IFS code for the Barnsley's Gasket as follows

IFS code	a_n	b_n	c_n	d_n	e_n	f_n
$n=1$	0.5	0	0	0.5	0	0
$n=2$	0.5	0	0	0.5	0.5	0
$n=3$	0	-0.5	0.5	0	0	0.5

The corresponding IFS is given by $\{F_1(x,y) = (0.5x, 0.5y); F_2(x,y) = (0.5x + 0.5, 0.5y); F_3(x,y) = (-0.5y, 0.5x + 0.5)\}$

REFERENCES

- ¹Michael F. Barnsley, Fractals Everywhere, Academic Press Inc., San Diego CA, 1988.
- ²Afifurrahman, Implementasi Teorema Collage untuk mendesain SFI, Jurnal Pijar MIPA, Vol. X No.2, September 2015: 1-7.