花弁の枚数 と 幅　**代入定義**

n=13　m=3　a1 = 0.3　a2 = 0　d = 0　v = 1　h1=0.04　h2=-0.04

花形を構成する関数群　**関数定義**

f1(t)=a1+(1−a1−a2)cos(nt)−a2cos(3nt)
f2(t)=0.25cos(2nt)
f3(t)=0.20cos(3nt)
f4(t)=0.16cos(4nt)
f5(t)=0.13cos(5nt)
f6(t)=0.6(f2(t)+f3(t))
f7(t)=0.6(f2(t)−f3(t))

ニュートン法　f1(t) = 0　(1)

newton((1),t=0.1,$\varepsilon=10^{-10}$)　t = 0.154900566989887

α = t　α = 0.154900566989887

$\beta = \frac{2\pi}{n} - \alpha$　β = 0.328421379716235

fp2(t)=f1(t)+d+f2(t)−α2
fp3(t)=f1(t)+d+f3(t)−α3
fp4(t)=f1(t)+d+f4(t)−α4
fp5(t)=f1(t)+d+f5(t)−α5
fp6(t)=f1(t)+d+f6(t)−α6
fp7(t)=f1(t)+d+f7(t)−α7

fm2(t)=f1(t)+d−f2(t)+α2
fm3(t)=f1(t)+d−f3(t)+α3
fm4(t)=f1(t)+d−f4(t)+α4
fm5(t)=f1(t)+d−f5(t)+α5
fm6(t)=f1(t)+d−f6(t)+α6
fm7(t)=f1(t)+d−f7(t)+α7

j52_20_0z10p_0.clk　center

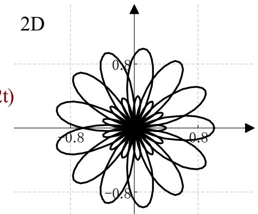
α2=f2(α)
α3=f3(α)
α4=f4(α)
α5=f5(α)
α6=f6(α)
α7=f7(α)

A(t)=mod(t,2π/n)

g(t)=h*cos(t)

g(t)=h1cos(t)−h2sin(2t)

2D



x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fp2(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fp2(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fm2(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fm2(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fp3(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fp3(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fm3(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fm3(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fp4(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fp4(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fm4(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fm4(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fp5(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fp5(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fm5(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fm5(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fp6(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fp6(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fm6(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fm6(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fp7(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fp7(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fm7(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fm7(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fp8(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fp8(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fm8(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fm8(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fp9(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fp9(t) & \alpha\le A(t)<\beta \end{cases}$

x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=g(t)+v*\begin{cases} fm9(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fm9(t) & \alpha\le A(t)<\beta \end{cases}$

解説

タンポポやガザニアのような花は、花びら全部が揃いすぎると不自然です。
適度に乱れを与えるために、g(t)=h1cos(t)−h2sin(2t) を、変数を変えながら使えるようにしました。

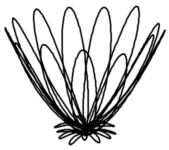
このファイルは、上記で解説した「下向きの花弁群を形成する部分の z軸方向だけを、符号を変えて反転させた」結果として最も一般的な、 3D花形曲線を羅列しています。
その代表選手が「fp2〜fp5 及び fm2〜fm5」です。

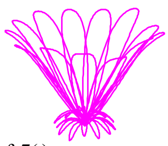
fp2〜fp5 及び fm2〜fm5 を基本型と考えて 4隅に置き、隅同士の平均値的なものを間に配置しています。

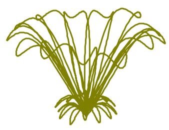
n は花弁の枚数、m は花弁の幅を指定する値で、何れも整数。m/n が大きい程、広幅になります。
a1 は「バラ曲線」の変形値です。a2 も「バラ曲線」の形状設定値です。
ほかの変数群は、追って解説する予定です。

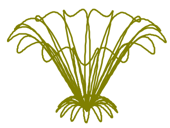
グラフの陳列順は、左に並べた x, y, z 組の順番をやや無視しています。

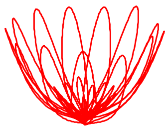
x(t)=f1(t)*cos(mt)
y(t)=f1(t)*sin(mt)
$z(t)=v*\begin{cases} fm3(t) & A(t)<\alpha \vee A(t)\ge\beta \\ -fm3(t) & \alpha\le A(t)<\beta \end{cases}$


fp2(t)

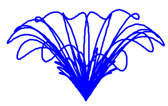

fp7(t)

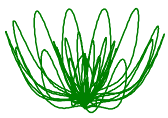

fm3(t)

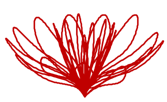

fm3(t)
（対比例）

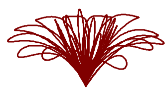

fp6(t)

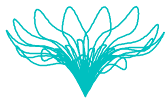
fp2 fp7 fm3
fp6 　 fm6
fp3 fm7 fm2

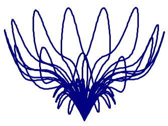

fm6(t)

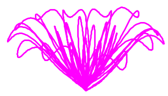

fp3(t)


fm7(t)

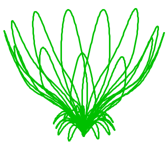

fm2(t)

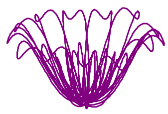

fm9(t)

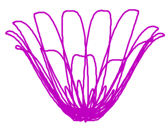

fp4(t)

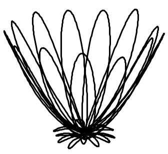

fm8(t)

fm2 fm9 fp4
fm8 　 fp8
fm4 fp9 fp2


fp8(t)


fm4(t)


fp9(t)


fp2(t)

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fp10(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fp10(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fm10(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fm10(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fp11(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fp11(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fm11(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fm11(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fp12(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fp12(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fm12(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fm12(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fp13(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fp13(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fm13(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fm13(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fp14(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fp14(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fm14(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fm14(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fp15(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fp15(t) & \alpha\leq A(t)<\beta \end{cases}$$

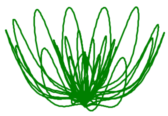
$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fm15(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fm15(t) & \alpha\leq A(t)<\beta \end{cases}$$

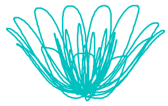
$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fp16(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fp16(t) & \alpha\leq A(t)<\beta \end{cases}$$

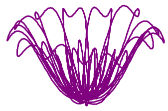
$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fm16(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fm16(t) & \alpha\leq A(t)<\beta \end{cases}$$

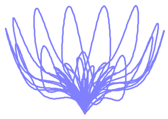
$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fp17(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fp17(t) & \alpha\leq A(t)<\beta \end{cases}$$

$$x(t)=fl(t)*\cos(mt)$$
$$y(t)=fl(t)*\sin(mt)$$
$$z(t)=g(t)+v*\begin{cases} fm17(t) & A(t)<\alpha \vee A(t)\geq\beta \\ -fm17(t) & \alpha\leq A(t)<\beta \end{cases}$$

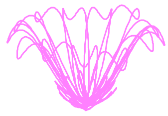

fp3(t)

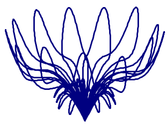

fp13


fm4(t)

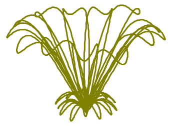

fp12(t)

fp3 fp13 fm4
fp12 fm12
fp4 fm13 fm3

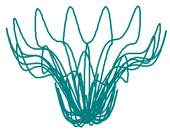

fm12(t)

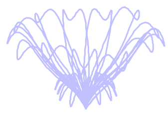

fp4(t)


fm13

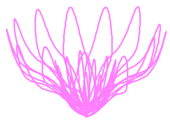

fm3(t)

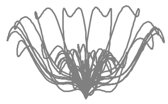
fm15


fp5(t)

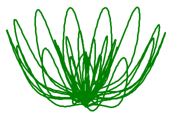

fm14

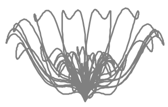
fm3 fm15 fp5
fm14 fp14
fm5 fp15 fp3

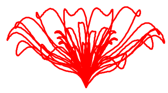

fp14

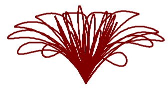

fm5(t)

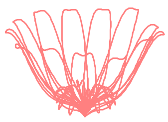
fp15


fp3(t)


fm5(t)

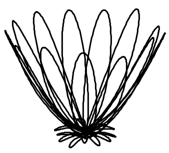

fm10

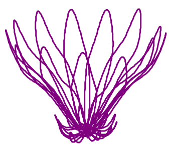

fm2(t)

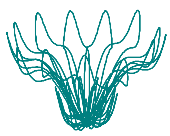

fp11(t)

fm5 fm10 fm2
fp11 fm11
fp2 fp10 fp5

fm11(t)


fp2(t)


fp10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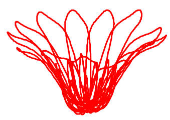
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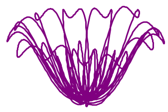
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fp16

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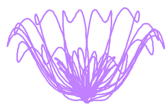
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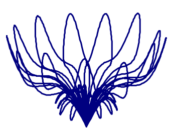
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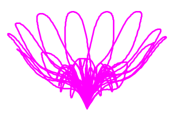
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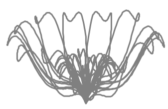
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