

FlashMandelPPC

Dino Papararo

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Chapter 1

FlashMandelPPC

1.1 FlashMandelPPC Guide

FlashMandelPPC 1.2 © 1996-2001 by Dino Papararo

A new program for **Mandelbrot's set**.

Installation How to install

Requirements Minimum requirements

YAFG Yet Another Fractal Generator

Interface Program's interface

Features Major features

History History and old versions

Future To do...

Author Yes I'm...

Greetings ... Hi everybody !

Copyright Necessary informations

1.2 Installation

To install the program, simply move the whole drawer "FlashMandel" into the desired directory.

However FlashMandelPPC does not need explicit assignments, changes to user-startup or not standard libraries. On start up an automatic assignment of FLASHMANDEL: is done to the PROGDIR: directory and it's removed at the exit in a transparent way.

FlashMandelPPC only requires to find into his drawer the following dirs: Docs, Pictures and Palettes so please don't move them in other places, or program couldn't be used fine. For the invocation of the guide inside the program it's a must to have the Multiview command into the SYS:Utilities path otherwise the guide will not be showed.

1.3 Mandelbrot's informations

Benoit Mandelbrot is the fractal's inventor. In year 1975 he coined this word to refer to auto-similar and fragmented forms, characteristics common to all fractals.

Mandelbrot's set is a fractal generated by mathematic formula $Z = Z^2 + C$.

This function is iterated many times into complex plane (you get a complex number initially equal to zero, square it and add a constant, then you restart procedure); "many times" correspond to the "Iterations" that you can set in many fractal's programs.

The result of this iteration can converge to a number or go to infinite. In the case that it goes to infinite, we assign a corresponding color to the speed of the divergence in the complex plane.

This is the Mandelbrot's puppet.

1.4 System's requirements

FlashMandelPPC does not need a lot of resources.

It works on any Amiga or compatible computer with at least Kickstart 3.0, 1 Mb of ram, a Motorola 68020 or greater processor with an fpu, from 68020 to 68060 and any chip-set.

Now the PPC is also supported, via powerpc.library (WarpOS). The executable is in FAT-binary format, it's able to autodetect if the PPC is installed and correctly configured. Once started you can switch between CPUs via the menu Options/Processor.

If there are Graphic's boards, they are supported by Screen Database and ToolTypes.

However I suggest you to get at least 10 MB ram, Kick 3.1 & AmigaOS 3.9 on an Hard Disk, CPU Motorola 68040@33 MHz/PPC603e, a graphic board and a good 17" or greater monitor.

1.5 Yet Another Fractal Generator

Why another fractal's generator

For joke, but also because does not exist something like it which is full based on Amiga OS and doesn't make, to gain more speed, dirty tricks.

At this time the binary is about 120 KB, one executable for 68k and PPC versions; moreover the others do not manage well RTG, Overscan, Multitasking or they writes directly into Chip ram or somewhere...

Obviously there can be BUGs !

For the features read the node [Features](#).

1.6 Program's interface

FlashMandelPPC is system friendly, and respects the Style Guide, so all gadgets, menus and requesters are easy.

These are the supported ToolTypes:

SCREENWIDTH : initial screen's width between 640 and 16368 pixel (default=800).

SCREENHEIGHT : initial screen's height between 480 and 16384 pixel (default=600).

SCREENPLANES : initial screen's depth between 3 and 8 bitplanes (default=8).

SCREENMODE : initial hexadecimal display mode OCS,ECS,AGA,RTG (default=40d20001 CGX 640x480x8).

REALMIN : initial left real limit between -8 and +8 (default=-2.0).

REALMAX : initial right real limit between -8 and +8 (default=+2.0).

IMAGMIN : initial bottom imaginary limit between -8 and +8 (default=-1.5).

IMAGMAX : initial top imaginary limit between -8 and +8 (default=+1.5).

FONTNAME : initial screen font (default=courier.font).

FONTSIZE : initial font size (default=13).

STARTPRI : initial program priority (default=-3).

STARTWITHJULIA: initial formula '0' for Mandelbrot and '1' for Julia (default=0).

JULIACONSTREAL: initial Julia real constant (default=-0.72).

JULIACONSTIMAG: initial Julia imaginary constant (default=-0.26).

COLORSREMAP : Linear=0, Ln(x)=1, Repeated=2, Sqrt(x)=3, $x^2-x=4$, $\text{Sqrt}(x^3-x^2-x)=5$, $\text{Sinh}(\text{Ln}(x^3))=6$, $\text{Cosh}(\text{Log}(x^3))=7$, (default=0).

USEPPC : if you set this to 1 program will use the PPC if present (default=1).

USERNAME : write your name here and you'll be the author of all your saved pictures and palettes (default=Dino Papararo) ;-).

At the start, if you haven't modified ToolTypes, Mandelbrot's set is rendered between (-2.0,1.5i) and (+2.0,+1.5i) limits, with a 800 x 600 screen at maximum colors supported (256 for **AGA/RTG**, 16 with **ECS/OCS**).

Later the rendering, an instant with a PPC, the about requester will be displayed showing the version of the program and the Giftware condition status.

Hitting the "More" gadget will be shown the workgroup too.

To continue choose the "Ok" gadget.

On the screen's title bar there are the following parameters:

Real current coord for real axis.

Imag current coord for imag axis.

These two parameters will continually change moving the mouse pointer.

W:H is the ratio between screen's dimensions.

R:I is the ratio between fractal's dimensions.

For a real representation these two parameters MUST be equal !

If not, is NECESSARY to go into the Coordinates Requester ShortCut Amiga C and select the Ratio button, then recalculate the picture with the new values.

There are four menus, with shortcuts obviously:

Project

Options

Calculate

Video

Holding down the left mouse button over fractal's picture, will appear a rectangle corresponding to the new coords for a Zoom or Preview.

Meantime rendering, with the Tab key you can jump **current rectangle**; hitting the Esc key or using the Stop ShortCut Amiga X, you'll stop the rendering.

1.7 Menu Project

There are eight choices, About, Load Picture, Save Picture, Load Palette, Save Palette, Print e Quit.

About it's the same requester which appears at the start, it gives you infos about **Author** and his workgroup.

Shortcut: Amiga A

System info shows a requester about processors 68k & PowerPC and free memory.

Shortcut: Amiga N

Help shows the guide of FlashMandelPPC in asynchronous way, so you can continue with renderings, but remember you must have Multiview into the default path SYS:Utilities/Multiview. The guide is also supported hitting the 'HELP' key but only into the main window.

Shortcut: Amiga H

Load Picture loads a previously saved IFF picture, setting parameters automatically like those at the save time.

Shortcut: Amiga L

Save Picture saves current picture in IFF format, with a special Chunk where to store fractal's coords and other parameters (iterations, mapping, etc...). The file obtained can be viewed by any program able to read IFF ILBM files. Be careful to not overwrite an existing file, but there is a verify function to inform you.

Shortcut: Amiga S

Load Palette loads an IFF palette file.

Shortcut: Amiga Y

Save Palette saves current palette in IFF format, the file obtained could useful for any other graphic application.

Shortcut: Amiga E

Print performs a hard copy of the screen, it will print screen just like it is (settings are based on system preferences), the title bar, if it's present, is not printed.

Shortcut: Amiga D

Quit exits the program and frees all resources allocated.

Shortcut: Amiga Q

1.8 Menu Options

There are six choices: Title, Limits, Iterations, Priority, Color mapping, Processor.

Title is a submenu which has a **boolean flag** that means if to show or not the title bar (Shortcut: Amiga O); if the title bar is ghosted, you can zoom even in the higher part of the screen, but holding down the right mouse button the menu will always be there.

This submenu has the Last time (Shortcut: Amiga T) submenu choice, which shows on the title bar the last rendering elapsed time and the average speed in Pixels per Seconds, obviously if during rendering you stop it, time and speed will be wrong because only a part of fractal has been rendered.

Please notice that in FlashMandelPPC the rendering speed is not proportional to the screen dimensions, due to its rendering method, the so-called 'Divide et Impera'.

With other programs, starting to rendering in an 800x600 screen needs four times than one in 400x300 (480.000 Vs 120.000 pixels), instead with FlashMandelPPC you'll have to wait about the same time.

Limits shows a window with some numeric gadgets and permits to insert by hand new values for complex coordinates and the Julia constant.

Four **Button Gadget** Accept, Ratio, Reset, Cancel are left to accept and apply changes, adjust coord's aspect ratio to the screen dimensions, to come back to the original values and to close the window without any change.

The Other button, instead, holds only one of two complex dimensions for a successful next ratio adjustment; default is fractal's real coords.

Shortcut: Amiga C

Iteration is a submenu where to set **iterations**, between 8 preset values or a numeric requester. You are warned about best iterations number **MUST** be greater than screen's colors otherwise you'll not be able to use all colors. Be warned high values for firsts zooms lead to bad results too, you must increase Iterations by little increment steps, zoom after zoom. This parameter interferes a lot with the final result and the rendering time !

Max iterations are equal to $2^{15} \rightarrow 32768$.

Shortcut: Amiga I to store a not preset iteration number.

Priority is a submenu for task priority. Choices are between -5 and +5 to not interfere with normal OS activity.

Shortcut: Amiga <n> to set the priority at +<n>, where <n> is a numeric value between 0 and 5.

Amiga Shift <n> to set the priority at -<n>, where <n> is a numeric value between 0 and 5.

Color remap i colori sono calcolati in funzione delle iterazioni eseguite per ogni punto. FlashMandel ha 8 differenti modi di assegnare un colore ad un punto.

Linear colors are remapped following the graph of $y=x$ function.

$\ln(x)$ colors are remapped following the graph of $y=\ln(x)$ function.

Repeated colors are remapped following the graph of $y=x$ function and repeated when last color is reached.

\sqrt{x} colors are remapped following the graph of $y=\sqrt{x}$ function.

x^2-x colors are remapped following the graph of $y=x^2-x$ function.

$\sqrt{x^3-x^2-x}$ colors are remapped following the graph of $y=\sqrt{x^3-x^2-x}$ function.

$\sinh(\ln(x^3))$ colors are remapped following the graph of $y=\sinh(\ln(x))$ function.

$\cosh(\log(x^3))$ colors are remapped following the graph of $y=\cosh(\log(x))$ function.

Shortcut: Amiga <n> to choose between the first 4 way of fractal color mapping.

Amiga Shift <n> to choose between the last 4 way of fractal color mapping.

Fractal Type is a submenu to set the **rendering formula**.

Julia To select the Julia rendering formula.

Shortcut: Amiga J

Mandelbrot To select the mandelbrot rendering formula.

Shortcut: Amiga M

Processor is a submenu to switch between the CPU module (68k/PPC)

68k To select the Mc 68xxx CPU, from the 68020 to the 68060 with an FPU.

Shortcut: Amiga -

Ppc To select the PowerPC 6xx CPU, from 603e to 620, and maybe next generations too ;-)

Shortcut: Amiga +

1.9 Menu Calculate

There are five choices: Preview, ReCalculate, UnDo, Zoom, Stop.

Preview opens a window four times smaller than screen for a faster rendering.

Shortcut: Amiga W

ReCalculate rewrites fractal with a new set of parameters.

Shortcut: Amiga R

UnDo comes back to the previous coords.

Shortcut: Amiga U

Zoom renders fractal within the new rectangle coords.

Shortcut: Amiga Z

Stop stops rendering.

Shortcut: Amiga X, same result holding down ESC key.

1.10 Menu Video

There are four choices: Cycle, Palette, Screen mode, Font settings.

Cycle is a submenu with three options:

Forward starts the **color cycling** forward (Shortcut: Amiga >).

Backward starts the **color cycling** backward (Shortcut: Amiga <).

Delay sets delay between color cycling (0..100) (Shortcut: Amiga -).

Palette opens the **Palette requester** to manage colors.

Screen mode to select new screen resolutions, for all modes there is a window proprieties to let you choose the best mode.

Font settings to change screen's fonts, useful for higher resolutions. Gui will change automatically with new fonts. Maximun font size is 24 pixel and are supported proportional fonts.

1.11 Boolean Flag

A boolean flag has two states, True/False, On/Off, Zero/One...; in this case shows or not the screen title.

1.12 Button Gadget

A Button Gadget is a Gadget (Interface Selectable Element) which can be pressed to execute any function.

(I didn't belive there were people who don't know it...)

1.13 Palette Requester

Palette Requester is a window where to modify, copy, spread, etc. the colors.

This window has many gadgets. The first on the left is a rectangle with all modifiable colors, selecting one you can modify every cromatic component. Colors are ordered from left to right and from top to down; first color is in the top-left corner, last instead is in the bottom-right corner. First 4 colors should be unchanged, because are used for the interface look, however you can change them as you wish, but pay attention... you are warned!

Copy gadget copies the selected color into another. Select color to copy and press the Copy gadget, than select destination position and click on gadget Paste.

Paste gadget clones in current pen position the previously copied color.

Spread gadget merge colors between current color and next selected with a very soft effect.

Invert gadget invert the palette from top to down. Is useful to test high palette's pens without zooming far into picture and to import palettes from other Mandelbrot's programs. FlashMandelPPC for speed reasons uses colors in a different way from other programs, the pen 255 is the first to be used, the pen 254 the second and so on...

<< gadget rotate by one in one position the whole palette from right to left.

>> gadget rotate by one to one position the whole palette from left to right.

UnDo gadget abort olny last operation.

The three scroller gadgets modify the three colors components red (R), green (G) and blue (B) of selected pen.

I suggest you to modify the single color's components with the keys 'e'-'t' for red, 'f'-'h' for green, 'v'-'n' for blue. The keys are 'case sensitive' and if used with shift/caps lock you will add/sub 10 units per time.

The three gadgets Accept, Reset and Cancel downwards can accept the new changes, reset to original colors and reject any change.

1.14 Color Cycling

The Color Cycling is a special function to animate the picture, moving palette color sequence.

In a Color Bar with a sequence of colors, if we copy the first in the second and so on, we'll have an animation effect.

The **Mandelbrot's set** generated has next related property: for all near functions divergences are set same colors, therefore the palette rotation, in this case, generate a special effect.

1.15 Rendering formula

There are two types of rendering formula.

The Julia Set is graphed by calculating the complex coordinate of each pixel Z , and by squaring that number and adding a second constant complex number C each iteration. If that number never goes to infinity, then that number is in the set, and the pixel is colored with the black color. If not, the corresponding to the number of iterations it took to determine that number is going to infinity is plotted. There are an infinite number of Julia Sets, as the constant C can be any complex number.

The Mandelbrot Set, modeled after the Julia Set, uses the same basic process for each pixel, starting with Z equal to zero instead of starting out with the pixel's complex number value, and adding the pixel's number value C each iteration after squaring what you've got (Z) instead of adding a constant. Just as with the Julia Set, you can create different fractal by using different C values, in the Mandelbrot Set, you can use different starting Z value. You can also compute Z to a power other than 2 before adding C . Z^3+C is a cubic Mandelbrot, etc..

1.16 Program features

FlashmandelPPC is system friendly, with full respect of OS and Multitasking, uses only standard library functions, and SHOULD not be Enforcer or Mungwall Hit.

FlashMandelPPC is developed and tested on an Amiga 4000 tower with Cyberstorm 060@50/604e@200, CybervisionPPC, CGX V4.

The program is coded with the efficiency in mind, so I assure you about the use of every register of both Mc 68k and Ppc processors and every memory cell allocated by FlashMandelPPC.

Rendering is speeded up with a direct access of ALL variables into the FPU registers for both 68k and Ppc, so don't worry about your math libraries versions but be sure to got a working FPU ;-)

Uses the **Divide et Impera** recursively method to gain time for **Mandelbrot's set** rendering.

Uses ToolTypes to be extremely configurable directly on the first use.

Supports for every graphic display able to provide an entry in the Video Mode Database, OCS, ECS, AGA, P96, CGX.

You can choose from two different fractal types the Mandelbrot and Julia Sets.

If you have a PowerPC 6xx processor the program will use it for instant renderings otherwise the 68k.

Sources are spreaded to learn as example and to improve/continue developing program.

1.17 FlashMandelPPC Future

I'd like to add at least the following features but I'm not sure I'll do that :-((:

1) Locale.library support for graphic user interface and errors report.

2) Reaction classes support for graphic user interface.

Please send **me** any comment, suggest, bug, by normal mail or E-Mail DinoP@IName.Com.

1.18 FlashMandelPPC History

FlashMandelPPC 1.2

Renderings in 68k mode are much faster, about 30% on my Mc68060 due a better use of data cache.

PowerPC FPU datas now are 32 bit aligned speeding up a bit the rendering, bugfixed by Frank Mariak.

FlashMandelPPC runs on MorphOS too, under WarpOS emulation :-)

Reducing screen depth caused wrong colors remap, fixed.

Changed the default screenmode to the Picasso 800x600x256, tested with WinUAE Jit.

Changed the coordinates record of iff pictures, you can't open older saved pictures :-(

Added an information requester about processors recognized 68k & PowerPC and available memory.

Extended the fade effect 'To Black/From Black' when a new picture or palette is loaded.

Added an Italian guide too, by Giorgio Signori.

Now you can choose between 8 different ways to remap colors.

Optimized PPC code to a better memory access.

Recompiled using Andreas Heumann's PPCMathMib increasing between 1,5 and 9 times the speed of all math functions.

Added new docs icons made by Edgar Schwan.

Refreshed FlashMandel's pictures archive.

Made many internal code changes.

Added new ToolTypes.

FlashMandelPPC 1.0

First public non beta version.

1.19 How reach the author

Snail address (if you have a lot of patience):

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80123 Napoli

Italy

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DinoP@IName.Com

Coder of FlashMandelPPC.

1.20 FlashMandelPPC workgroup

Author greets these people to have helped him during the project development:

Edgar Schwan for the starup code example, deutch docs, beta testing.

Giorgio Signori for FlashMandelPPC GlowIcon, italian docs, beta testing.

Last but not least following people have contibuted with criticisms and hints to debug and improve costantly FlashMandel and FlashMandelPPC:

Vincenzo Iodice,Guillaume Ubbelohde,Jen Allen,Illya Rudkyn,Jarle Thorsen,Francis Labrie,Carol Meilicke,Steffen Haeuser,Staffan Lindberg,Giorgio Signori,Thomas Lorenz,Andreas Steup,Stu Casper,Paula-Christiina Wirtanen,Jon B. Peterson,Ronald Teune,Claudio Pucci,Sergio Tassi,Frank Mariak.....

[illegible]

1.21 CopyRight infos

FlashMandelPPC is GiftWare, send anything to **Author**, if you like it.

USE FlashMandelPPC AT YOUR OWN RISK, THERE IS NO WARRANTY OF FUNCTIONING. **AUTHOR** DOES NOT ASSUME ANY RESPONSABILITY FOR ANY INCONVENIENCE.

The whole archive of FlashMandelPPC or a part of it can't be used for money, anyway it is freely distributable in Public Domain, ShareWare or GiftWare software collections, on condition that they be under 30 US \$ fee. Fred Fish, Aminet, AmyResource, AmigaMagazin and others newspapers are free to include this program in their CD collections in archived and unarchived way, but leaving the whole contents as the original one.

1.22 Supported processors

Any Motorola® 68020+ family processor with an Fpu is supported. PPC support is tested on 603 and 604 mounted on BlizzardPPC & CyberstormPPC.

In this archive is released a versions for Mc68020/68030 + Mc68881/2, Mc68040, Mc68060 processors with or without a PowerPC;

FlashMandelPPC is compiled to generate code for the Mc68020 with an Fpu, but it's full forward compatible with Mc68030/040/060 and optimized for pipelines of Mc68040/060 Cpu, Mc68882+ Fpu, PowerPc 6xx.

The Mc68k & PPC rendering routines are all optimized by hand in 68k & PPC asm code, with the scheduling in mind.

1.23 I chipset supportati

Are supported all the original Amiga OCS, ECS e AGA chipsets. The program adapts itself to your resources, allowing a maximum of 32 colors on OCS and ECS, and screens up to 256 colors on AGA.

If you have a graphic board which adds owner screens to the Screen Database, the program will use them in any resolution (anyway with a 256 colors limitation, for the present).

1.24 Continuità Probabilistica

FlashMandelPPC uses the properties of **Mandelbrot's set** known as Probabilistic Continuity that is to say:

Given a rectangle on the complex plane containing **Mandelbrot's set**, if all the points on the rectangle outline have the same escape speed, in that case is "very probable" that the inner area has the same escape speed too.

The program traces the borders of the rectangle to draw and later check them, if as result they have the same color, fills the area with this one, otherwise it divides the rectangle in two parts and starts again on the two drawn rectangles repeatedly, with a strategy called divide et impera.

An explanation of the word probabilistic is given if you let the program trace the complex plane area with the coordinates $(-8, -8i)$ $(8, 8i)$, which it fills with a uniform color: it's not a program bug, it made only a probability error...
