MandelFilm v1.00 by OiPaz

URL: **www.oipaz.net** – eMail: **OiPaz@oipaz.net**

1 Mathematical and Implementation Notes

MandelFilm is a small Visual Basic application that makes films (or better: slideshows!) with the famous Mandelbrot set. There are a few things to be known about MandelFilm: first of all MandelFilm is not able to zoom into the Mandelbrot set in the common sense of the word "zoom". Besides, it works with "extended" Mandelbrot sets.

One of the classical definitions of the Mandelbrot set is:

Definition 1. $M = \{c \in \mathbb{C} : \lim_{n\to\infty} |z_n| < \infty\}$, *where*

$$\begin{cases} z_0 = 0 \\ z_{n+1} = z_n^2 + c. \end{cases}$$

Extended Mandelbrot sets M^e are obtained by changing the exponent in Definition 1:

Definition 2. *Let* $e \in \mathbb{R}$, $e \geq 1$. *Then* $M^e = \{c \in \mathbb{C} : \lim_{n\to\infty} |z_n| < \infty\}$, *where*

$$\begin{cases} z_0 = 0 \\ z_{n+1} = z_n^e + c. \end{cases}$$

Obviously $M^1 = \{0 + 0i\}$ and $M^2 = M$. Furthermore for $e > 1$ there exist two values ϱ^e_{min} and ϱ^e_{Max} such that the closed disk centered in the origin of $\mathbb{C}$ with radius ϱ^e_{min} is entirely contained in M^e. On the other hand M^e is entirely contained in the closed disk centered in the origin of $\mathbb{C}$ with radius ϱ^e_{Max}. A simple calculation shows that:

Definition 3.

$$\varrho^e_{min} = \frac{e-1}{e\sqrt[e-1]{e}}$$
$$\varrho^e_{Max} = \sqrt[e-1]{2}.$$

You can see that $\varrho^e_{min} < 1$, $\varrho^e_{Max} > 1$ and both of them tends to 1 when e goes to infinity (that is to say, $M^\infty = \lim_{e\to\infty} M^e = \{z \in \mathbb{C} : |z| \leq 1\}$). Furthermore it is easy to prove that, $\forall e \in \mathbb{N}$ such that $e \geq 2$, the set M^e admits $e-1$ simmetry axes. Those are the lines passing through the origin of $\mathbb{C}$ with argument $\frac{2\pi}{e-1}k$, where $k = \{0, 1, \ldots, e-2\}$.

In according to definitions 2 and 3, the only interesting part of M^e is the "window" $W^e = \left\{\varrho e^{i\varphi} \in \mathbb{C} : \varrho^e_{min} < \varrho \leq \varrho^e_{Max}, 0 \leq \varphi < \frac{2\pi}{e-1}\right\}$. $\forall e > 1$ MandelFilm plots the set $\overline{W^e}$ (with $\varphi < 2\pi$ if $e < 2$) and it can plot that set not only for integral e, but even if e is fractional, in order to obtain a smooth slideshow. The frames calculated by MandelFilm are stored in bitmap files (sorry for the waste of HD space, but BMP is the only graphic format managed by VB!), in a subdirectory of the one of the application itself. Each filename contains the value of e up to three decimal digits.

2 Legal Stuff

MandelFilm is FREEWare! This means you pay NOTHING to its Author and that you will receive customer support only when the Author has time, so it might take a while before you get an answer. NO guarantee, either implicit or explicit, is offered on the software or for damages that its use may cause. Registration is NOT needed, but the Author always appreciates an eMail telling him that you use (and like!) the program. The Author declines any responsibility for the notoriously frequent conflicts between Microsoft-produced software components.

You may freely use and distribute MandelFilm, although it must be distributed with all original files in their original format with NO changes. You can not charge anyone for it. MandelFilm may not be distributed as part of any commercial product without permission by the author.

Contents of the distribution file of MandelFilm:

- MandelFilm.exe (THE Program!)
- MandelFilm.dvi (full documentation in DeVice Independent Format)
- MandelFilm.pdf (full documentation in Acrobat Portable Document Format – the font used in this file could work well only for printing)

- MandelFilm.ps (full documentation in PostScript Format)
- VB6sp5 Setup.exe (installation of the required libraries)

3 System Requirements

MandelFilm requires an IBM-compatible PC with at least a Pentium processor (or similar). As MandelFilm performs strong calculations, a fast processor is recommended (1 GHz or more). It also needs enough free space in the HD in order to save the images it calculates.

MandelFilm works under 32 bit Windows and does not need any particular resources apart from the normal RunTime Visual Basic v6.0 (SP5) libraries which are included, if needed, in the file "VB6sp5 Setup.exe".

4 How to INSTALL

Create a directory for MandelFilm, UnZip in that directory the distribution file of MandelFilm. Try to execute "MandelFilm.exe". If it does not work, double-click the file "VB6sp5 Setup.exe" and follow the prompts.

5 How to UNINSTALL

If, for some reason, you do not like MandelFilm, just close it (if it is running) and... delete its directory. That's it!

MandelFilm does NOT leave any rubbish on the HD or Registry. However, if you added links or shortcuts to the executable in the Start Menu or on the Desktop, or if you had to install Visual Basic libraries, these can be cancelled and removed. Remove the Visual Basic libraries through the usual "Add/Remove" applet in Windows Control Panel, but be careful: they may be shared with other programs!

6 How to Use

The use of MandelFilm should be intuitive and immediate. The program can also be run without mouse, with the usual Windows keyboard interface.

7 Release History

- Version 1.00 - November 3^{rd}, 2002. *First publicly distributed release.*

8 Feedback, Suggestions, Bug-Reports

Any comments, suggestions and (most of all) bug-reports are welcome.

It is advisable to specify "MandelFilm" in the subject field, and to report the version and some info about the Windows and Visual Basic environment of your computer.

9 Acknowledgements

The Author wants to thank all the people who helped him with ideas and valuable suggestions, and the beta testers. Thanks for your patience! :-)

And, obviously, thanks to Laura!!

Well, that's about it, happy playing!!!