

# 8<sup>th</sup> March

## —an OTF exercise of Cyrillic by PostScript—

### Abstract

An OTF with Cyrillic — keyboard and glyphs — is used in PostScript for an 8th March congratulation. The wired-in ASCII code table in T<sub>E</sub>X inhibits keyboarding Cyrillic.

### Keywords

Adobe, afii, ASCII, CID, Cyrillic, EPSF, encoding vector, keyboard layout, lemniscate, minimal encapsulated PostScript, OTF, plain TeX, Photoshop, PSlib, qwerty, T<sub>E</sub>Xworks

### Introduction

In the beginning of March I saw an advertisement on Russian (satellite) tv with a congratulation along the path of the digit 8 on occasion of the international women day. This inspired me to make a present for my wife: a lemniscate as path with congratulations in Russian along its path by PostScript.

On the internet I found many congratulations as YTUBE videos, only a few photographs



20 years ago I might have tried to use T<sub>E</sub>X for the purpose unaware of the PostScript path`text` procedure for typesetting text along an arbitrary path, as published in Adobe's 1985 Blue Book. However ...

EPSF is an AnyT<sub>E</sub>Xie's graphics companion

This note is not about OpenTypeFonts in PostScript in general, but only about how the congratulation was obtained via the use of MinionPro-Regular, an Adobe OpenTypeFont with Cyrillic glyphs, available in Acrobat Pro, which I use as PostScript interpreter.

### Lemniscate

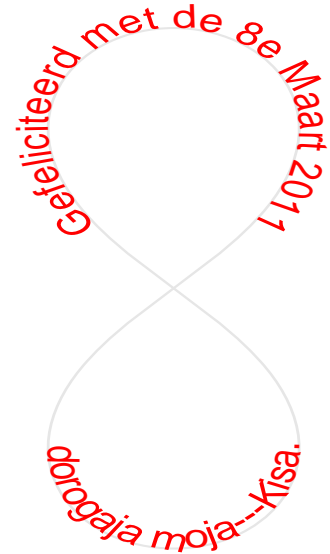
The equation for the lemniscate in polar coordinates  $(\phi, r)$  reads  $r^2 = 2a^2 \cos 2\phi$ ,  $a$  a constant.

*Text along the lemniscate* With the use of `pathtext`, to set text along an arbitrary path, as given by Program 11 p.167 of Adobe's Blue Book the following with congratulations in Dutch and sender in transcribed Russian, was easily obtained.

```

%!PS-Adobe-3.0 EPSF-3.0
%%BoundingBox: -200 -300 200 310
%%BeginSetup
%%EndSetup
%%DocumentFonts: Helvetica
%%BeginProlog
(c:\PSlib\BlueBook.eps) run %pathtext
%%EndProlog
%
% Program ---the script---
%
/Helvetica 16 selectfont /a 90 def
%upper part of lemniscate
3 2.2 scale 90 rotate 0 0 moveto
45 -1 -45{/t exch def
/r sqrt2 a mul 2 t mul cos sqrt mul def
/x r t cos mul def
/y r t sin mul def
x y lineto
}for
gsave .9 setgray stroke grestore%paint path to the current page
gsave
1 0 0 setrgbcolor (Gefeliciteerd met de 8e Maart 2011) 41 pathtext
grestore
%lower part of lemniscate
newpath 0 0 moveto
45 -1 -45{/t exch def
/r 2 sqrt a mul 2 t mul cos sqrt mul def
/x r t cos mul neg def
/y r t sin mul def
x y lineto
}for
gsave .9 setgray stroke grestore%paint path to the current page
1 0 0 setrgbcolor (dorogaja moja---Kisa.) 91 pathtext
showpage
%%EOF

```



But ... how to do the above with Cyrillic glyphs?

### Cyrillic by PostScript

I did not know on 8<sup>th</sup> March how to use Cyrillic in ASCII-biased PostScript. The above was my present, apart from two added photographs by Photoshop in the inner parts of the lemniscate.

But ... I did continue, I wanted to know how to use Cyrillic in PostScript. Is PostScript's CID multi-byte fonts machinery necessary? For the use of Cyrillic in PostScript we have 2 problems:

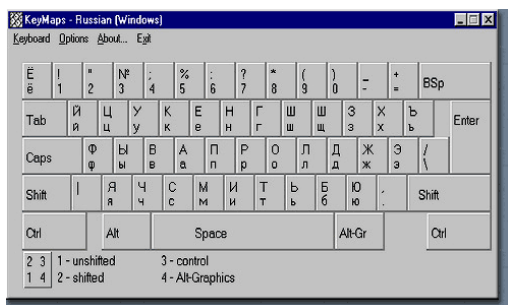
- what is the font name
- how to keyboard the characters.

The LRM 3, p.330 prompts the solution

... It allows applications to specify how characters selected from a large character set are to be encoded. Some character sets, especially OTF, consist of more than 256 characters, including ligatures, accented characters, and other symbols required for highquality typography or non-Latin writing systems. Different encodings can select different subsets of the same character set. ...

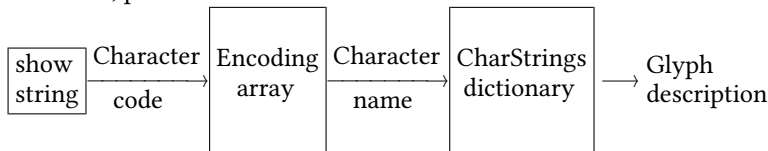
*Font name* What fonts are in PostScript available? FontDirectory does not provide the answer. I looked into the font directory of Acrobat Pro and found the Minion-Pro-Regular OTF. I read in the ATN 'OpenType User Guide for Adobe Fonts' that when the name contains Pro the font has Cyrillic glyphs, which I verified with the MS accessory 'Character Map' i.e. speciale tekens in Dutch.

*Keyboarding Cyrillic* The layout of a Russian keyboard is given below with at right the layout of my QWERTY keyboard.



With the help of ReEncodeSmall of the Blue Book Program 18, I reencoded the font MinionPro-Regular such that for example the ASCII code 8#141, corresponding to the character a on the QWERTY keyword, is associated with the Russian af i i 10086, i.e. the glyph ф. (In ATN 5013 Adobe Standard Cyrillic Font Specification I found the Adobe names for the Cyrillic glyphs: capital Russian A is called af i i 10017 etc.)

From the LRM 3, p.329



Encoding scheme for Type 1 fonts

... For example, in the standard encoding vector used by Type 1 Latin-text fonts such as Helvetica, the element at index 38 is the name object ampersand. When show encounters the value 38 (the ASCII character code for &) as an element of a string it is printing, it fetches the encoding vector entry at index 38, obtaining the name object ampersand. It then uses ampersand as a key in the current font dictionary's CharStrings subdictionary and executes the associated charstring that renders the & glyph. ...

The extra level in referencing in PostScript is more flexible than the (internal) 1-level of ASCII referencing in T<sub>E</sub>X. The lack of the encoding vector concept is a serious flaw in the otherwise parametric setup of T<sub>E</sub>X&METAFONT.

*The encoding* of the 33 Cyrillic letters and the most common punctuation marks is given in the procedure RUSvec in the program below.

```

%!PS-Adobe-3.0 EPSF-3.0
%%Title: Cyrillic (Changing the encoding vector; Blue Book Program~18 .p207)
%%Creator: Kees van der Laan, kisa1@xs4all.nl
%%BoundingBox: 0 530 700 620
%%CreationDate: March 2011
%%BeginSetup
%%EndSetup
%%BeginProlog
(c:\PSlib\Bluebook.eps) run %used: ReEncodeSmall
/RUSvec [%Russian keyboard a la MS word etc      %Cyrillic 33 letters
 8#101 /afii10038 8#141 /afii10086 %key A  a --> cyrillic letter f
 8#102 /afii10026 8#142 /afii10074 %... B  b --> cyrillic letter i
 8#103 /afii10035 8#143 /afii10083 %    C  c --> cyrillic letter es
 8#104 /afii10019 8#144 /afii10067 %    D  c --> cyrillic letter ve
 8#105 /afii10037 8#145 /afii10085 %    E  e --> cyrillic letter u
 8#106 /afii10017 8#146 /afii10065 %    F  c --> cyrillic letter a
 8#107 /afii10033 8#147 /afii10081 %    G  g --> cyrillic letter pe
 8#110 /afii10034 8#150 /afii10082 %    H  h --> cyrillic letter er
 8#111 /afii10042 8#151 /afii10090 %    I  i --> cyrillic letter sha
 8#112 /afii10032 8#152 /afii10080 %    J  j --> cyrillic letter o
 8#113 /afii10029 8#153 /afii10077 %    K  k --> cyrillic letter el
 8#114 /afii10021 8#154 /afii10069 %    L  l --> cyrillic letter de
 8#115 /afii10046 8#155 /afii10094 %    M  m --> cyrillic letter soft sign
 8#116 /afii10036 8#156 /afii10084 %    N  n --> cyrillic letter te
 8#117 /afii10043 8#157 /afii10091 %    O  0 --> cyrillic letter shcha
 8#120 /afii10025 8#160 /afii10073 %    P  p --> cyrillic letter ze
 8#121 /afii10027 8#161 /afii10075 %    Q  q --> cyrillic letter short i
 8#122 /afii10028 8#162 /afii10076 %    R  r --> cyrillic letter ka
 8#123 /afii10045 8#163 /afii10093 %    S  s --> cyrillic letter yeru
 8#124 /afii10022 8#164 /afii10070 %    T  t --> cyrillic letter ie
 8#125 /afii10020 8#165 /afii10068 %    U  u --> cyrillic letter ghe
 8#126 /afii10030 8#166 /afii10078 %    V  v --> cyrillic letter em
 8#127 /afii10040 8#167 /afii10088 %    W  w --> cyrillic letter tse
 8#130 /afii10041 8#170 /afii10089 %    X  x --> cyrillic letter che
 8#131 /afii10031 8#171 /afii10079 %    Y  y --> cyrillic letter en
 8#132 /afii10049 8#172 /afii10097 %    Z  z --> cyrillic letter ya
 8#173 /afii10039 8#133 /afii10087 %    {  [ --> cyrillic letter X
 8#175 /afii10044 8#135 /afii10092 %    }  ] --> cyrillic letter hard sign
 8#176 /afii10023 8#140 /afii10071 %    ~  ` --> cyrillic letter io
 8#42  /afii10047 8#47  /afii10095 %    "  ' --> cyrillic letter e
 8#74  /afii10018 8#54  /afii10066 %    <  , --> cyrillic letter be
 8#76  /afii10048 8#56  /afii10096 %    >  . --> cyrillic letter yu
 8#72  /afii10024 8#73  /afii10072 %    :  ; --> cyrillic letter zhe
 8#44  /semicolon 8#136 /colon      %    $  ^ --> semicolon colon
 8#43  /afii61352 8#46  /question %    #  & --> numero sign question mark
 8#77  /period      8#57  /comma     %    ?  / --> period comma
] def
%
```

```

/width 19 def /tabstops{pop pop /k k 1 add def k width mul y moveto}def
%%EndProlog
/MinionPro-Regular /MPR RUSvec ReEncodeSmall
/k 0 def /y 600 def 0 y moveto
/Courier 16 selectfont
{tabstops}{ABCDEFGHIJKLMNOPQRSTUVWXYZ{ }:><~"#$%^} kshow
/k 0 def /y 580 def 0 y moveto
/MPR 16 selectfont
{tabstops}{ABCDEFGHIJKLMNOPQRSTUVWXYZ{ }:><~"#$%^} kshow
%
/k 0 def /y 555 def 0 y moveto
/Courier 16 selectfont
{tabstops}{abcdefghijklmnopqrstuvwxyz[ ];.,`'&/) kshow
/k 0 def /y 535 def 0 y moveto
/MPR 16 selectfont
{tabstops}{abcdefghijklmnopqrstuvwxyz[ ];.,`'&/) kshow
showpage
%%EOF
    
```

with result

А В С D E F G H I J K L M N O P Q R S T U V W X Y Z { } : > < ~ " # ? \$ ^  
 Ф И С В У А П Р Ш О Л Д Ъ Т Щ З Й К Ы Е Г М Ц Ч Н Я Х Ъ Ж Ю Б Ё Э № . ; :  
 а b c d e f g h i j k l m n o p q r s t u v w x y z [ ] ; . , ` ' & /  
 ф и с в у а п р ш о л д ъ т щ з й к ы е г м ц ч н я х ъ ж ю б ё э ? ,  
 QWERTY keys (upper and lower case) with the Cyrillic glyphs underneath

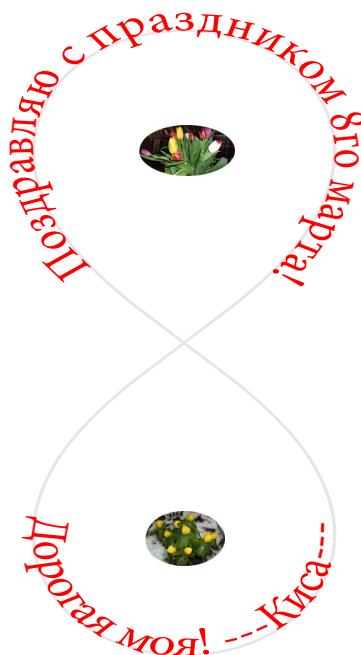
A nice application of kshow this tabular printing of the glyphs; the more efficient xshow could have been used as well, though a little more verbose with the array of equal widths. Another option is to modify the width parameter of the font.

**Result**

The modified 8<sup>th</sup> March program with Cyrillic and the 2 photographs embedded in PostScript reads

```

%!PS-Adobe-3.0 EPSF-3.0
%%Title: 8 March surprise in Cyrillic
%%Author: Kees van der Laan, kisa1@xs4all.nl
%%CreationDate: March 2011
%%BoundingBox: -200 -300 200 310
%%DocumentFonts: MinionPro-Regular
%%BeginProlog
(c:\PSlib\PSlib.eps) run %Rusvec ReEncodeSmall
% and pathtext (modified with centershow)
%%EndProlog
/MinionPro-Regular /MPR RUSvec ReEncodeSmall
/MPR 16 selectfont
%lemniscate upper part
/a 90 def
3 2.2 scale 90 rotate
0 0 moveto
45 -1 -45{/t exch def
/r sqrt2 a mul 2 t mul cos sqrt mul def
/x r t cos mul def
    
```



```

/y r t sin mul def
x y lineto
}for
gsave .9 setgray stroke grestore%paint the path, and restore the path
gsave
1 0 0 setrgbcolor (Gjplhfdkz. c ghfplybrjv 8uj vfhnf) 41 pathtext
grestore
%lemniscate lower part
newpath 0 0 moveto
45 -1 -45{/t exch def
/r sqrt2 a mul 2 t mul cos sqrt mul def
/x r t cos mul neg def
/y r t sin mul def
x y lineto
}for
gsave .9 setgray stroke grestore%paint the path, and restore the path
%for reuse by pathtext
1 0 0 setrgbcolor (Ljhjufz vjz ---Rbcf---) 85 pathtext
%embedding of converted .jpg photographs
gsave -40 150 translate (C:\\CyrillicinPS\\tulpen.eps) run
grestore
-35 -200 translate      (C:\\CyrillicinPS\\winteraconiet.eps) run
showpage
%%EOF

```

*Note* The positioning of embedded EPSF photographs I did by trial and error, quick and dirty. Insert the .jpg photographs in Photoshop, interactively, if you wish.

## Conclusions

Using an OTF with Cyrillic glyphs was laborious and confusing, especially creating the encoding vector. More OTF's with Cyrillic would be nice.

The RUSvec encoding vector I expect to be applicable to any Adobe font with pro as part of the name, because the Russian keyboard and the afii...-names are general.

The inclusion of .jpg illustrations converted to EPSF by Adobe Photoshop is handy.

I don't know how to use the OTF MinionPro-Regular in  $\TeX$  with the input via a Cyrillic keyboard, apart from the hassle of the conversion of accompanying AFM into TFM, needed by  $\TeX$ . The wired-in ASCII code table in  $\TeX$  inhibits Cyrillic keyboarding.

$\TeX$  is becoming of age. In PostScript the AFM is not needed.

My wife was happy with the present.

*Æsthetics and effectiveness of the message, cultural contexts?*

- PostScript can be used gracefully, æsthetically, and effectively to set Cyrillic along an arbitrary path
- EPSF is an Any $\TeX$ 's graphics companion.

$\TeX$ 'ies should catch up

## Literature

- Adobe's Red and Blue books. <http://www-cdf.fnal.gov/offline/PostScript/>
- AdobeTechnicalNote#5013, 18 February 1998. Adobe Standard Cyrillic Font Specification.

- OpenType User Guide for Adobe Fonts, October 2008. <http://www.adobe.com/type/opentype>
- AdobeTechnicalNote#5002, Encapsulated PostScript File Format Specification [http://partners.adobe.com/public/developer/en/ps/5002.EPSF\\_Spec.pdf](http://partners.adobe.com/public/developer/en/ps/5002.EPSF_Spec.pdf)
- The Unicode Standard 6.0. 2010. <http://www.unicode.org/versions/Unicode6.0.0/>  
For use of Cyrillic in T<sub>E</sub>X my EuroBachoT<sub>E</sub>X 2002 paper
- Cyrillic and T<sub>E</sub>X – reappraisal of the WNCY font set.

(The keyboarding of Cyrillic is done by transcription which with WNCY fonts and the ligature mechanism yields the Cyrillic glyphs. I don't know how to emulate a Cyrillic keyboard in T<sub>E</sub>X. The assignment of charcode 98 to the letter b etc is internal to T<sub>E</sub>X, which I can't modify as mentioned in Ch8 The T<sub>E</sub>XBook: ... *Thus, b is 98 inside of T<sub>E</sub>X even when your computer normally deals with EBCDIC or some other non-ASCII scheme...* A little later in the chapter it is explained how to deal with a Norwegian keyboard with key æ, for example, via ligatures.

Even the Russian translation of the T<sub>E</sub>Xbook, Bce0 нpo T<sub>E</sub>X, does not explain how to keyboard Cyrillic, does not mention a Russified T<sub>E</sub>X, a serious omission IMHO.)

*Note* My BachoT<sub>E</sub>X 2010 programming pearl – typesetting  $\Pi$ -decimals along an spiral – does not make use of an explicit path.

## Acknowledgements

Thank you Adobe for your maintained, adapted to LanguageLevel 3 since 1997, good old, industrial standard PostScript and Acrobat to view it, for your Photoshop which allows straightforward conversion to EPSF, Don Knuth for your stable plain T<sub>E</sub>X, Jonathan Kew for the T<sub>E</sub>Xworks IDE, Hàn Thế Thành for pdfT<sub>E</sub>X.

Thank you Svetlana Morozova for the Russian keyboard layout and for prompting the Russian texts, and not in the least for being the person to be surprised by my present. Thank you MAPS editors for improving my use of English and Taco Hoekwater for procrusting my plain T<sub>E</sub>X note into MAPS format.

My case rests, have fun and all the best.

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