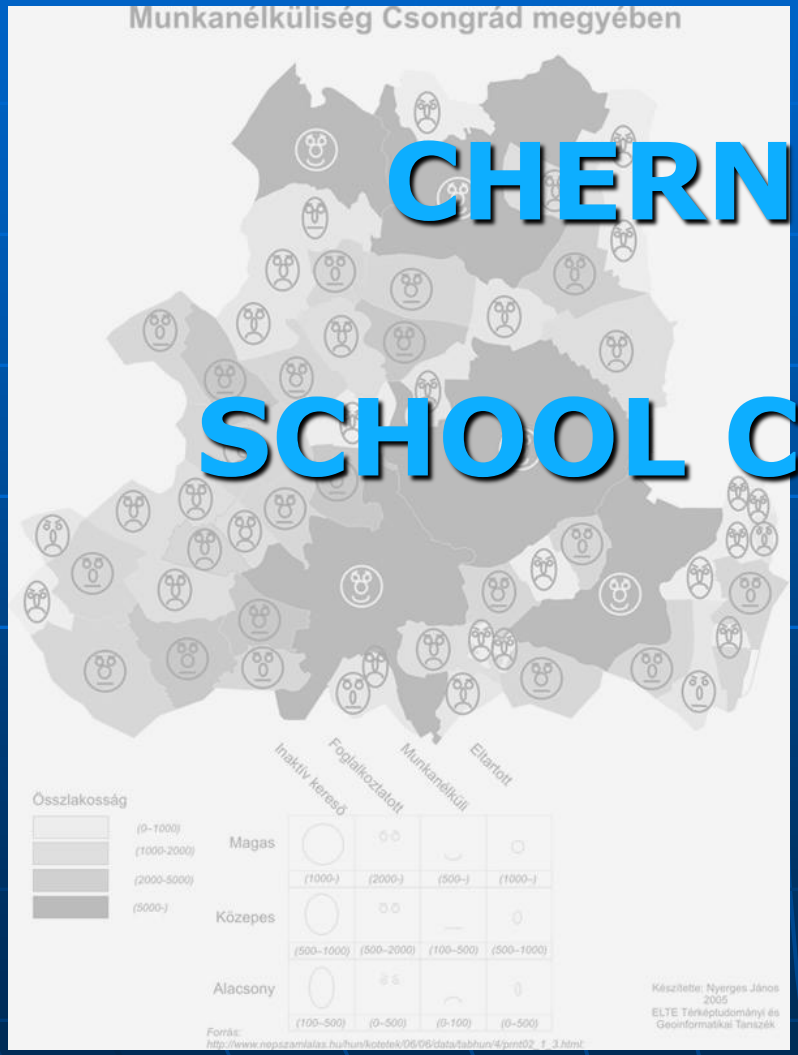
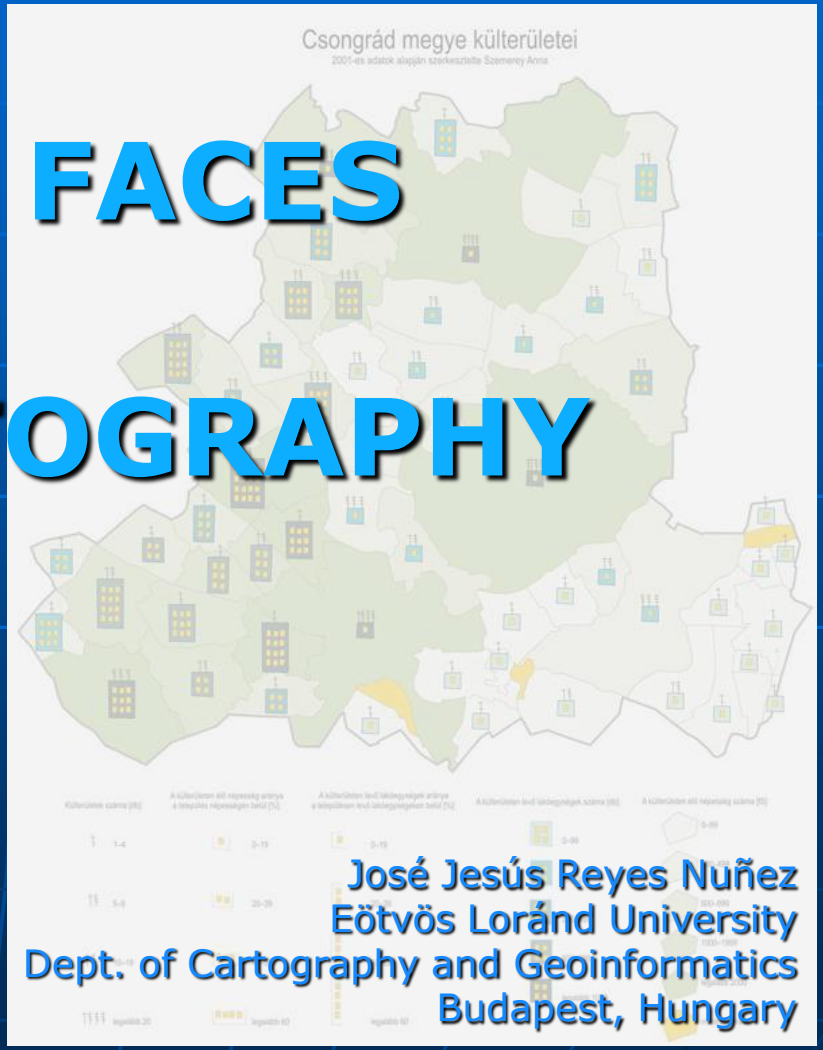
IDEAS FOR THE USE OF CHERNOFF FACES IN SCHOOL CARTOGRAPHY



Made by János Nyerges, 2005



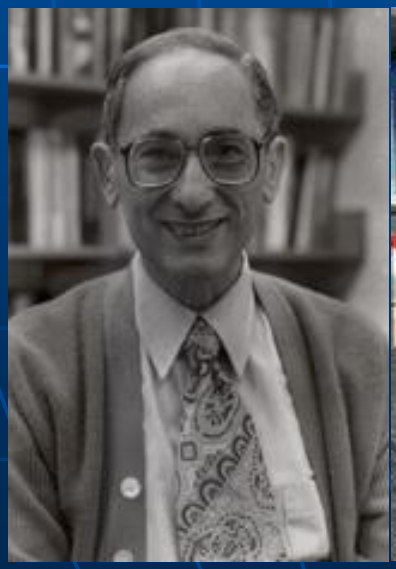
José Jesús Reyes Nuñez
Eötvös Loránd University
Dept. of Cartography and Geoinformatics
Budapest, Hungary

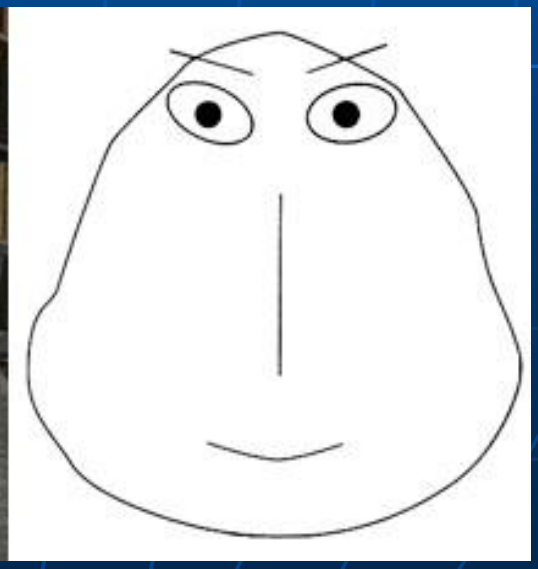
Made by Anna Szemerei, 2006

Short Introduction

What are the Chernoff faces? ⇨ Iconographic representation (glyph)

- The Chernoff faces are a graphic method for the visualisation of multidimensional data
- Author: Hermann Chernoff (at present Professor Emeritus of Applied Mathematics, Department of Statistics at Harvad University)
- Published in 1973 („The use of faces to represent points in k-dimensional space graphically", *Journal of the American Statistical Association*





Short Introduction

What are the Chernoff faces? ⇨ Features of a human face (eyes, nose, mouth, etc) can be used to represent different data

According to Chernoff up to 18 features can be used for data representation

Map made using SYSTAT software

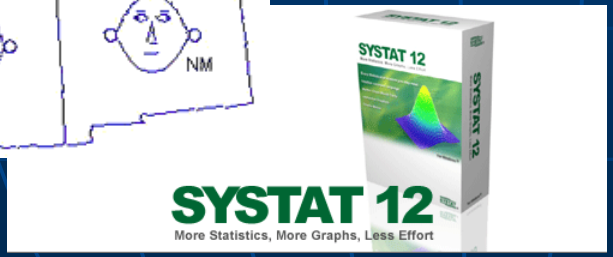


Table 1: Description of facial features of Chernoff face

Dimension	Facial Feature
1	Face width
2	Ear level
3	Half face height
4	Eccentricity of upper ellipse of face
5	Eccentricity of lower ellipse of face
6	Length of nose
7	Position of centre of mouth
8	Curvature of mouth
9	Length of mouth
10	Height of centre of eyes
11	Separation of eyes
12	Slant of eyes
13	Eccentricity of eyes
14	Half length of eye
15	Position of pupil
16	Height of eyebrow
17	Angle of brow
18	Length of brow
19	Radius of ear
20	Nose width

First experiences using Chernoff faces on maps

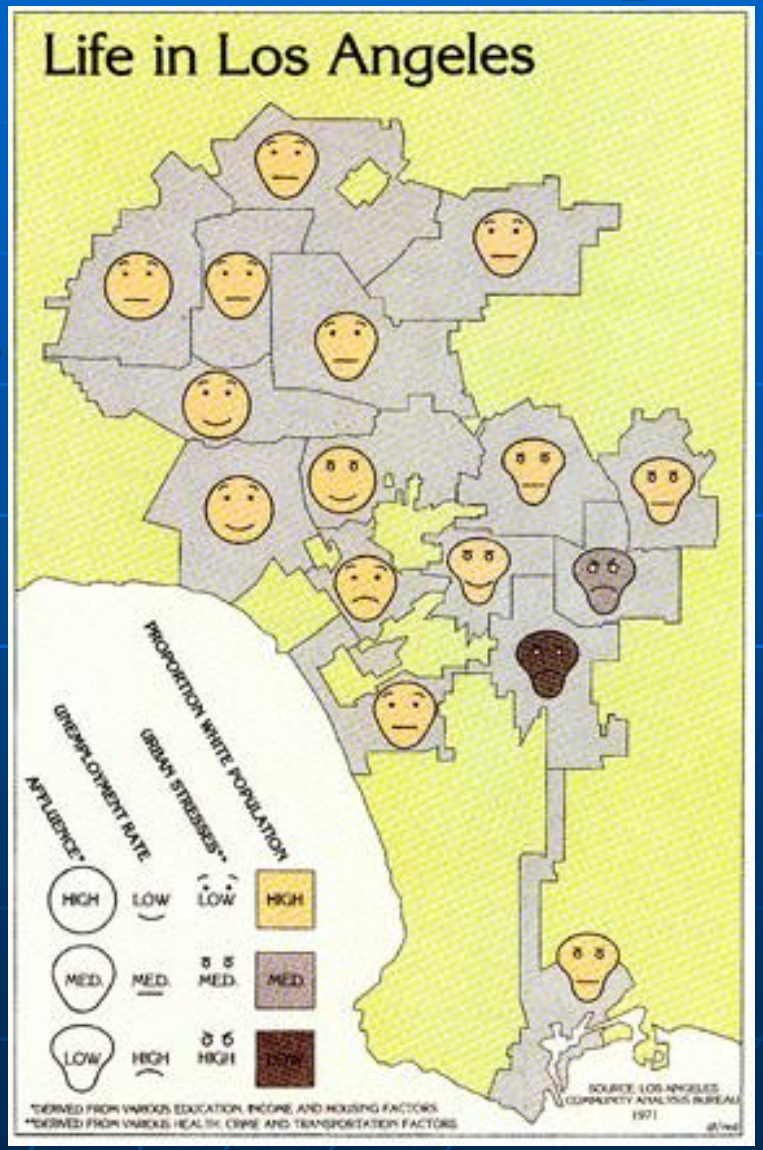
During the last 20 years the Chernoff faces were used for the representation of data in thematic maps

A classic example:

The first thematic map drawn using Chernoff faces (1977)
Title: „Life in LA, 1970”
Author: Eugene Turner, Geography Dept. at California State University (drafted by Richard Doss)

"It is probably one of the most interesting maps I've created because the expressions evoke an emotional association with the data. Some people don't like that."

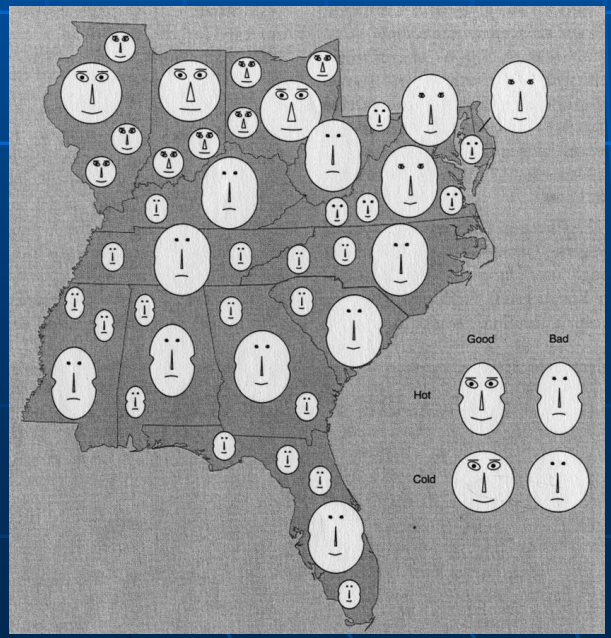
http://www.csun.edu/~hfgeg005/eturner/gallery/gallery.htm



First experiences using Chernoff faces on maps

Other research related to Chernoff faces on maps:

- Howard Wainer (1979, University of Pennsylvania) – Regional differences in USA, map using Chernoff faces to represent nine variables
- Daniel Dorling (1991, University of Newcastle upon Tyne) – PhD thesis
- Elizabeth S. Nelson (1997-2007, University of North Carolina, Greensboro) – Cartographic potential of the face symbol
- Sarah I. Fabrikant (2004, University of Zurich) – USA map of Presidential Elections



Experiences teaching Chernoff on maps

My first experience

1998, ICA Joint Seminar
(Wroclaw, Poland)
Chernoff workshop
by Prof. Henry Castner
(Greensboro, USA)

From 2005 ⇒ MSc on Cartography, Practical lessons within the subject entitled „Thematic Cartography III”

Positive and negative experiences discussed with students – Psychological (Nelson, 2007) and editing factors using Chernoff faces

Experiences teaching Chernoff on maps

Psychological and editing questions

Dorling (1991)

Psychological questions:

Nelson (1997,2007)

After Nelson (2007):
Reading of a face determined by two factors

Natural correspondence
Face as a whole expressing a human feeling (happiness, sadness)

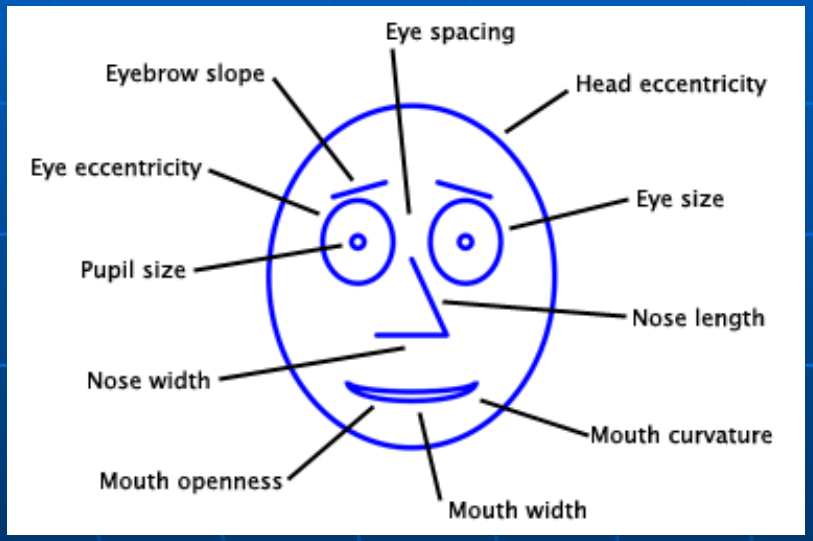
Feature salience
Role of a feature transmitting the psychological message of a face as a whole

„Individual" expression – can provoke a contradiction between features („angry" eyebrow – smiling mouth)

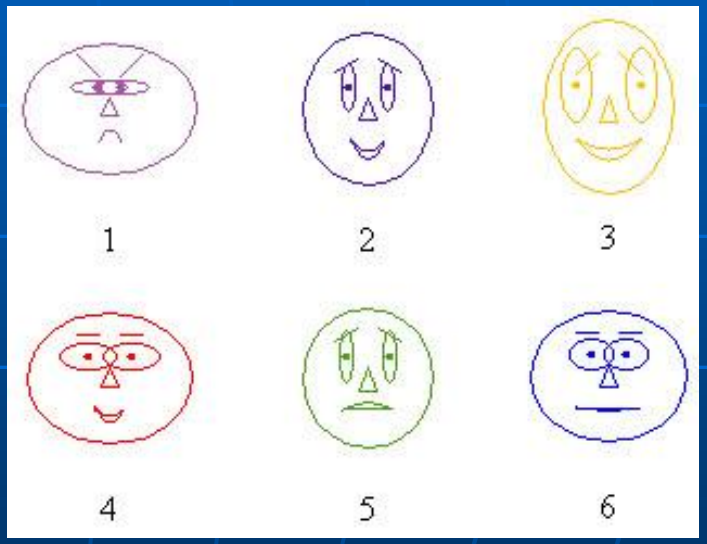
Experiences teaching Chernoff on maps

Editing questions
Number of variables to be represented

Chernoff (1973) – up to 18 variables can be represented on a face



Bradley Mohr (1995-2003) –
11 features



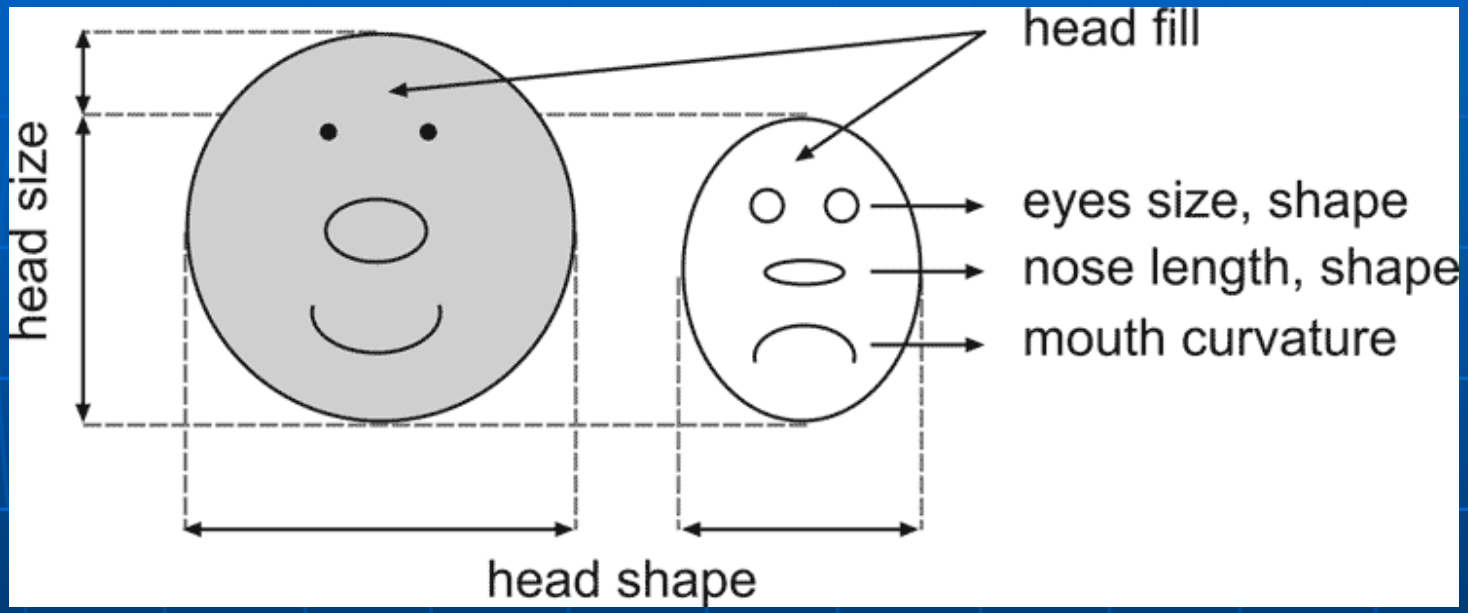
John Wiseman (1998) –
10 features

Too much!!!

Experiences teaching Chernoff on maps

Number of variables that can be represented on a face:

MAX. SIX!!!

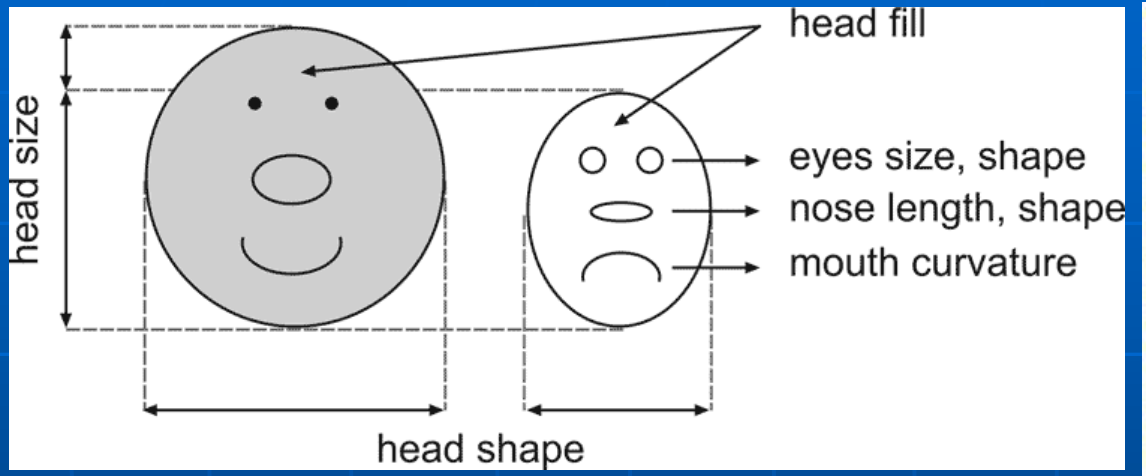


Head size and fill – two „purely” cartographic parameters

More important parameters:

- Curvature of mouth: essential parameter to determine the expression of a face
- Head size/shape and fill: easily recognizable

Experiences teaching Chernoff on maps



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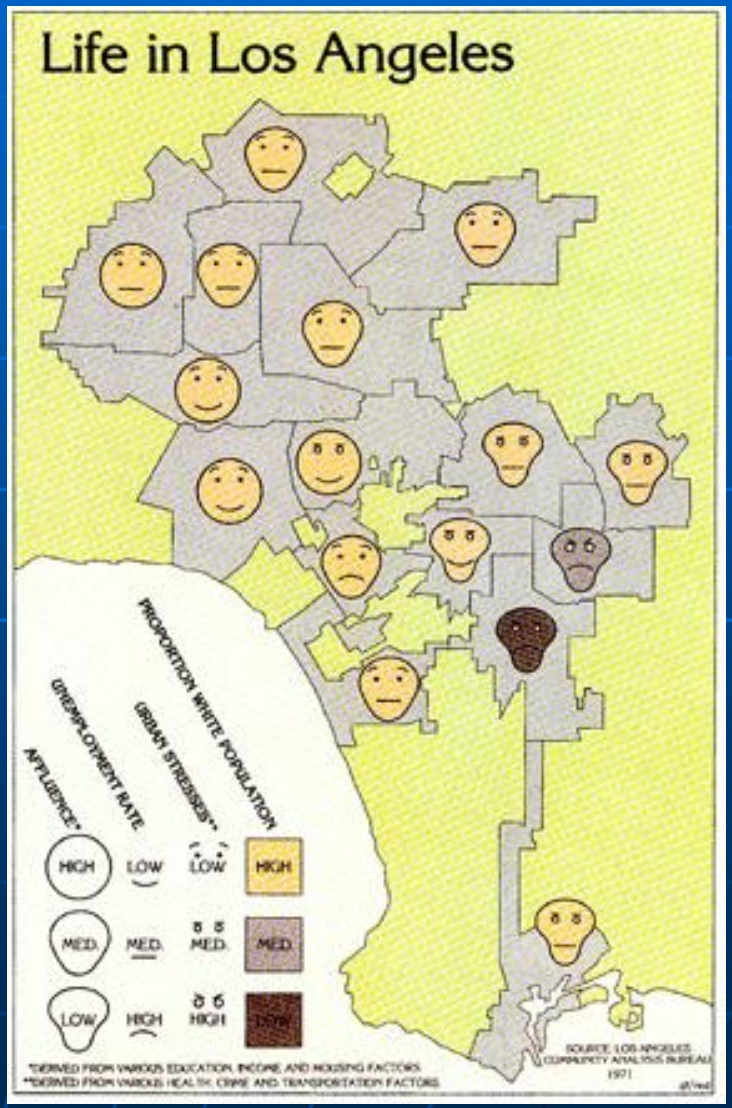
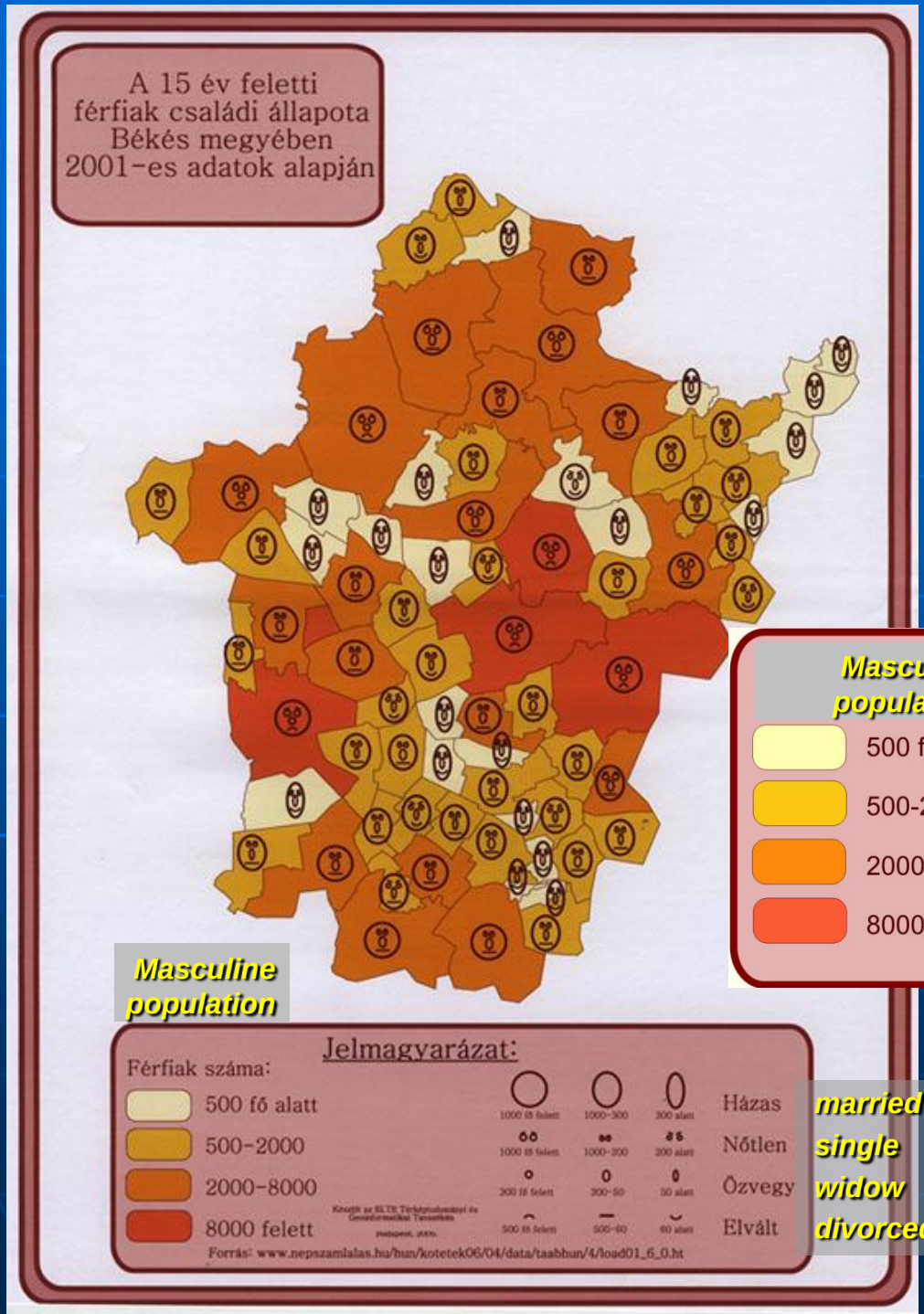
Eugene Turner,
„Life in LA, 1970”



Experiences teaching Chernoff on maps



Combining Chernoff faces with other traditional methods of representation

MSc on Cartography, Practical subject entitled „Thematic Cartography III”: Different solutions for the use of Chernoff faces on choroplet maps

Map made by Gyöngyi Strapkovics, 2005

Chernoff principle on school cartography

Professional discussions about Chernoff faces

Positive

Negative

„Unusual” pictorial method of representation

Can or not arouse the children’s attention better than a traditional method of thematic representation?

Simplified version of Chernoff faces
(representing only 3-4 themes)
on easy thematic maps for school atlases

Why should only faces to be used???

Chernoff principle on school cartography

Adaptation of the principle followed by Hermann Chernoff
for cartographic symbols

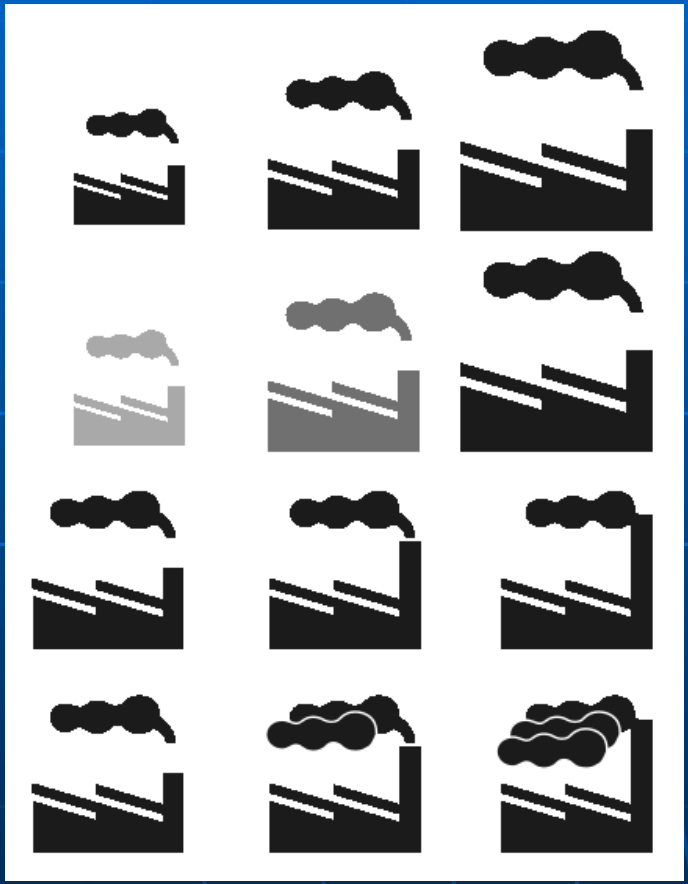
Improving the traditional use of symbols:
A cartographic (pictorial or geometric) symbol can be divided into its more relevant and graphically better recognizable elements (features)

Different data (variables) related to a specific theme can be represented using each of these components

Max. 4-6 variables, considering which are the more important features within the selected (pictorial) symbol

Chernoff principle on school cartography

factory symbol



size

colour

Parameters changed in traditional cartography

Nothing new…

height of the chimney stack

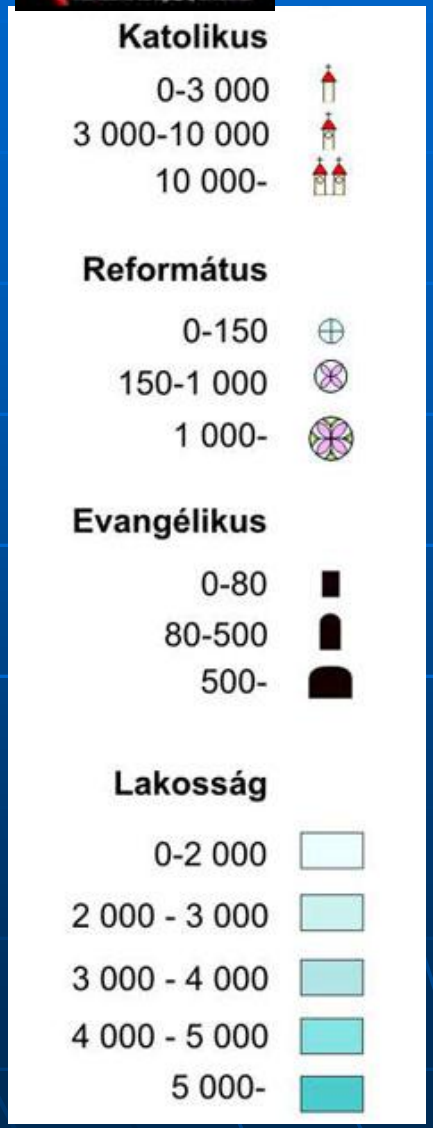
number of clouds of smoke

Parameters not changed while using a traditional symbol

Applying the Chernoff's principle…

Possible field of use: Atlases edited for first grades in Elementary Schools

Chernoff principle on school cartography



Catholic

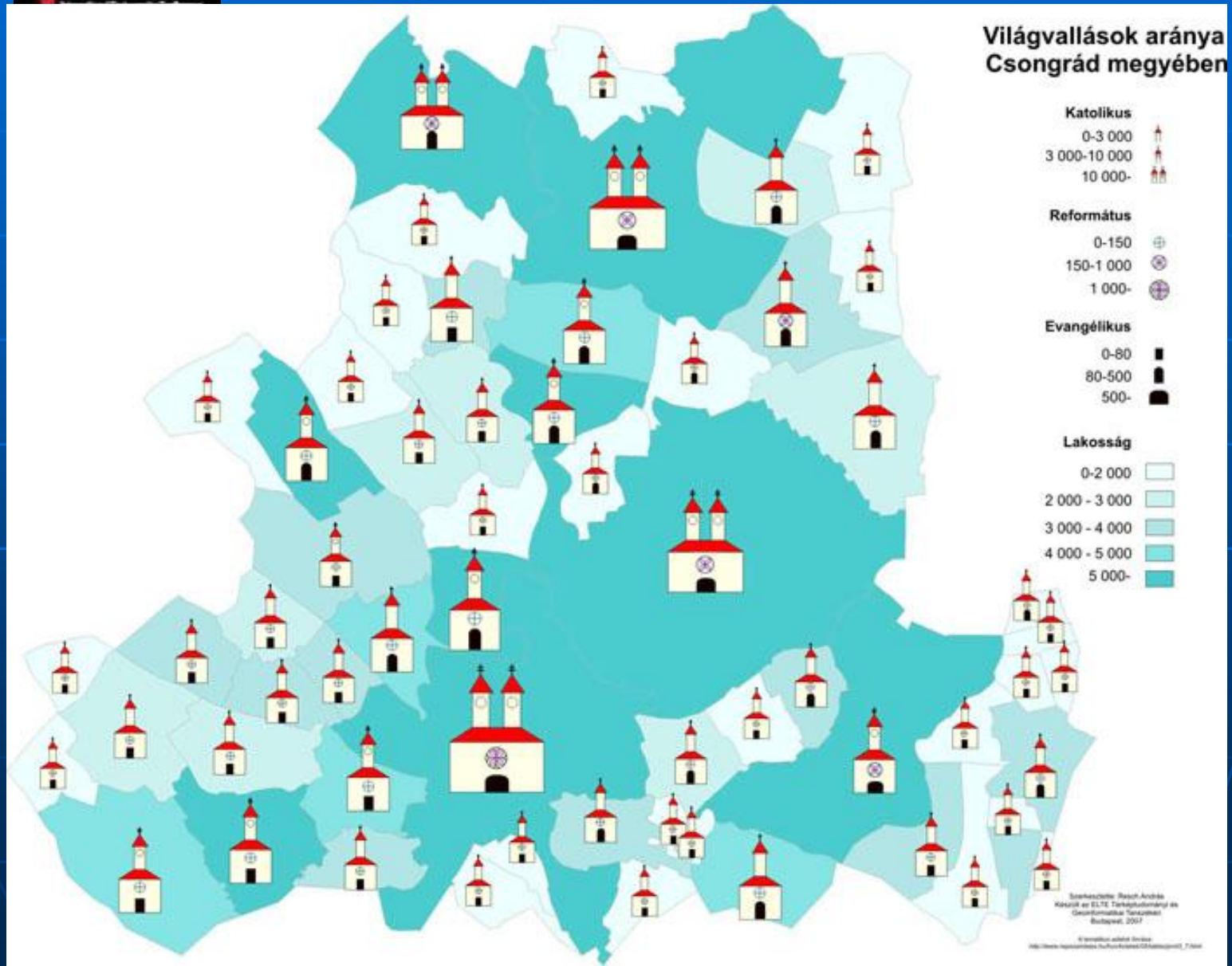
Calvinistic

Evangelistic

Population

Made by András Resch, 2008

Chernoff principle on school cartography



World religions in Csongrád county (Hungary)

Catholic

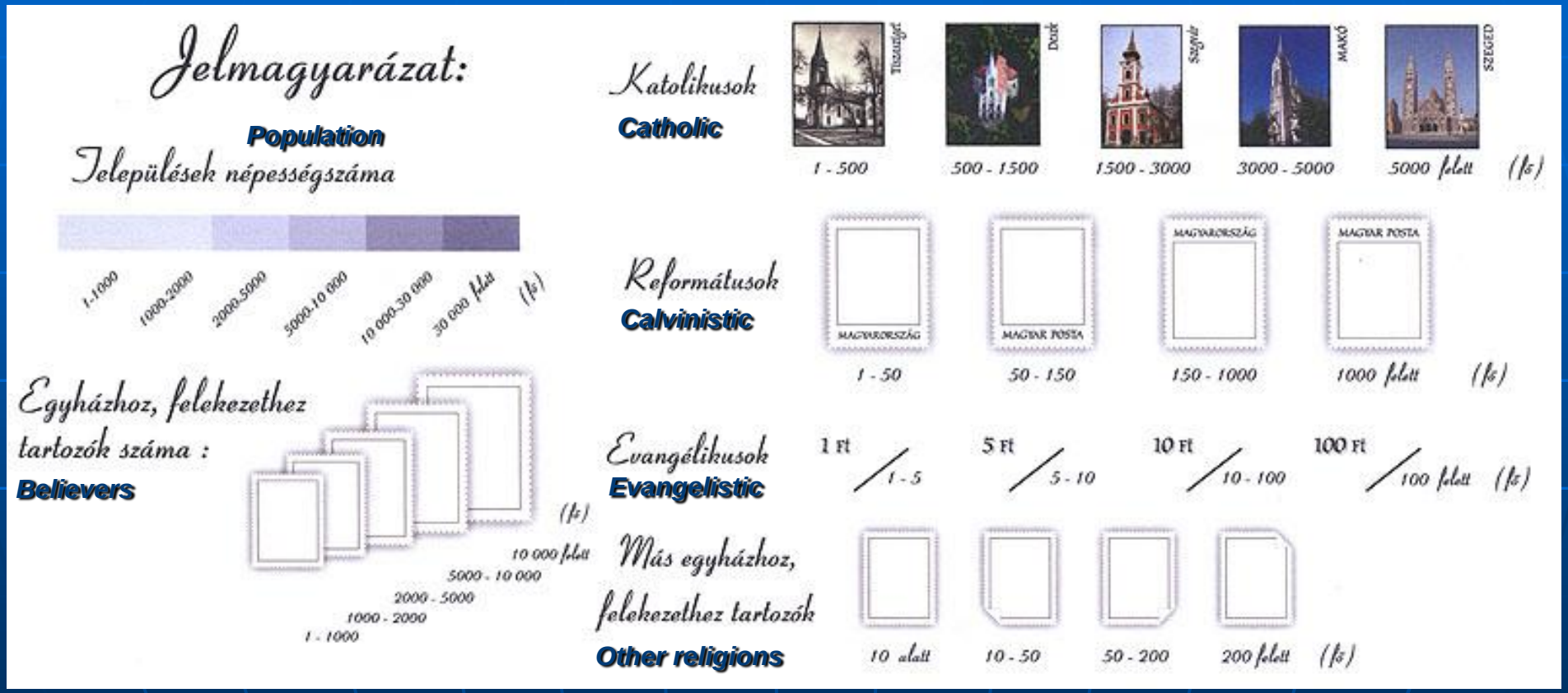
Calvinistic

Evangelistic

Population

Made by András Resch, 2008

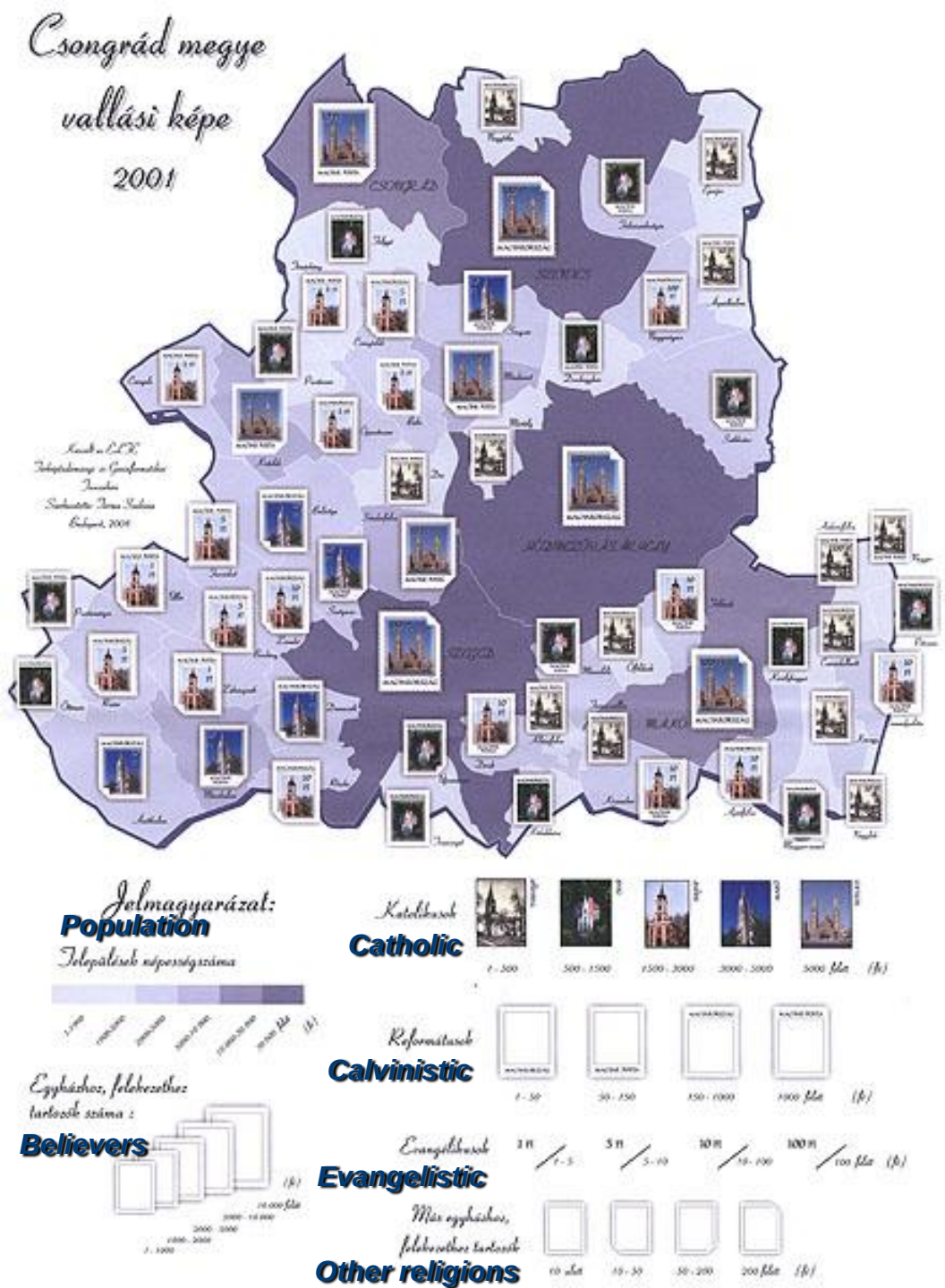
Chernoff principle on school cartography



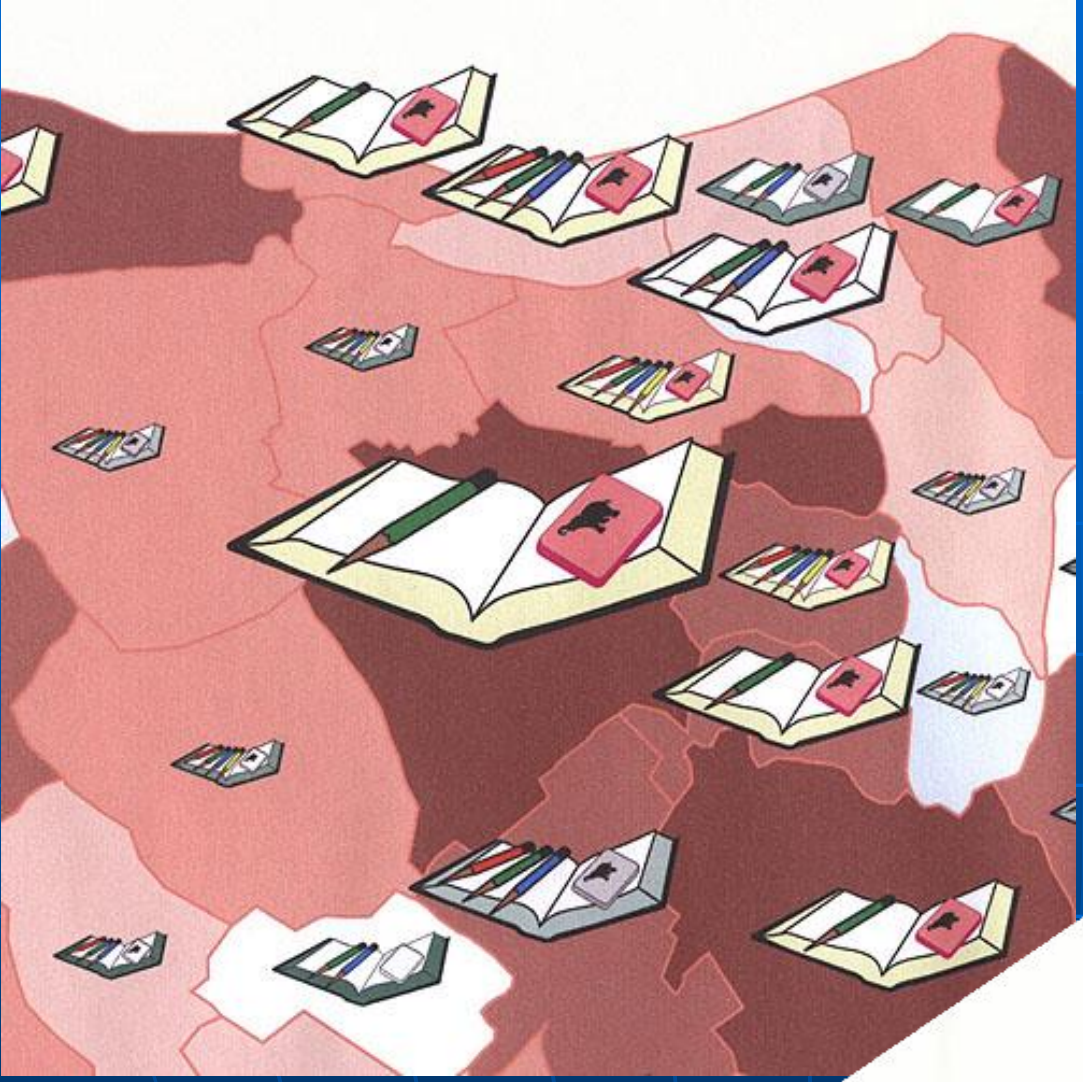
Made by Szabina Torma, 2009

Chernoff principle on school cartography

Made by Szabina Torma, 2009

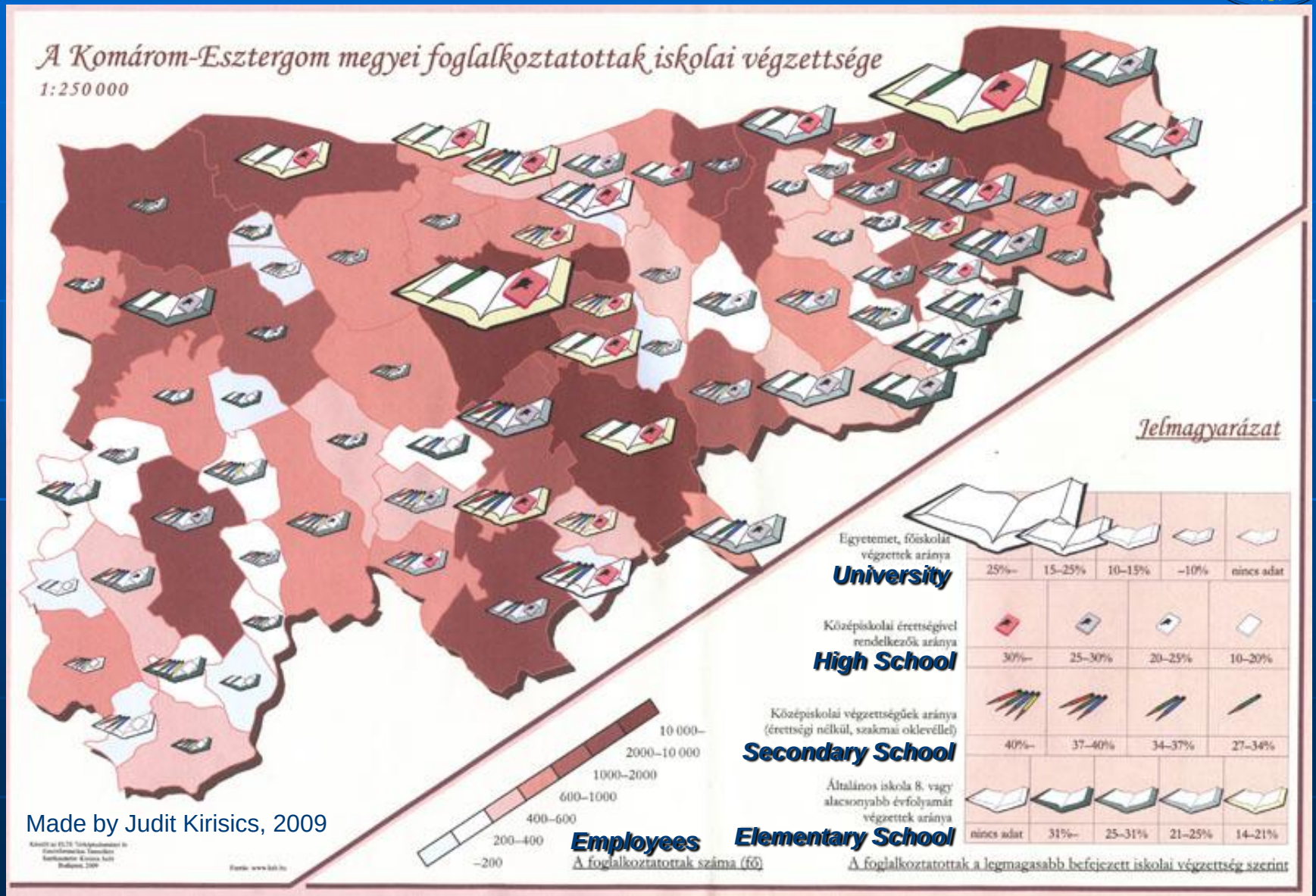


Chernoff principle on school cartography



Made by Judit Kirisics, 2009

Chernoff principle on school cartography



Made by Judit Kirisics, 2009

Research project

Argentine-Hungarian project:

The possible use of the Chernoff faces for data visualisation in school cartography

(2008/2009)

Testing the method in Argentine and Hungarian (Elementary, High?) schools

-„Traditional” Chernoff faces on maps
- Chernoff principle using other pictorial symbols on maps

2008 – Theoretical research and exchange of experiences, first steps to organize a survey
2009 – Making of the test and survey, analysis and presentation of results

If you became interested on this theme – we are very glad to welcome all the contributions!

Please contact us!!!!!

José Jesús Reyes Nuñez
Eötvös Loránd University
Dept. of Cartography and
Geoinformatics
Budapest, Hungary