

THE HISTORICAL HUNGARY OF 1914:

A MAPINFO BASED PROJECT



Ion Sola Torralba
Irene Antona Erdozain



0. INTRODUCTION AND GOALS

This thesis deals with Historical Cartography of Hungary and the main goal is the obtaining of thematic maps of three selected counties, representing data from 1914. These maps are based on thematic data (population, nationalities and religion) and on graphic data in digital format. A GIS has some different applications working with maps and databases. The idea of this work is creating some thematic maps with the data obtained from an atlas of Hungary made in 1914. Connecting the map to the thematic data can be created different thematic maps about religion and nationality, which can show to the user a general idea about the social situation in Hungary in this age and also can be the beginning of a more detailed analysis of this data. Users can also compare the situation in 1914 and nowadays. The thematic data is very understandable for almost anyone and is very easy to utilize for extracting conclusions.

The most important thematic maps are the ones representing all the religious groups and the different nationalities in the selected counties. But it is also possible to create some maps about each religion and each nationality or about the total population of each settlement.

Our first idea was to work with an old map of Hungary from 1890 but it is a very vast land and there wasn't enough time, so the thesis was only focused on some provinces of the historical Hungary. We have finally worked with Fejér, Tolna and Pest-Pilis-Solt-Kiskun, three provinces in the heart of Hungary, all of the them close to Duna river.

There are two different ideas about what to do with the project after finishing it. The first idea is to follow the project working with the other counties of the historical Hungary, and to complete the Geographic Information System (GIS) about the whole country. The other idea is an international project following the Duna River in different countries, from Germany to Romania.

In the first part of the thesis we explained briefly the history of Hungary in this period. It was very important for us to know some facts about the history and the situation of Hungary in those years related to the obtained results.

In short, a GIS project is divided in four parts: The entry of data, the handle of data, data analysis and data representation. Our goal is to complete all of them.

1. BRIEF HISTORY OF HUNGARY

1.1.- Brief history of the country

1.1.1. Before foundation of the Austro-Hungarian Empire

Origin. The Magyars arrived to the Carpathian Basin in one of the last waves of the Great Migrations. The ethnic group, which the Magyars came from, was the Finno-Ugric. When Ugric people arrived to the foot of the Ural Mountains, the Magyars became a separate ethnic group around 500 BC. After the conquest of Hungary (ended in 900), it seemed for a time that the Magyars would not be able to adapt themselves quickly enough to settle in Europe. However their leaders (the princes of the House of Árpád), soon recognized the danger, these periods of plundering raids held for the Hungarians.

Statehood. Prince Géza began the great task of linking his country to Europe, and his son, King Stephen (1000-1038) sealed the process by having his people converted to Christianity. King Stephen married a German princess, and he received the crown used at the coronation of the Pope (which is featured among the national emblems on the coat of arms). Rome later canonized Stephen and several other members of the House of Árpád too. The Kingdom of Hungary adopted the social model and the system of values, developed in Western Europe. The Hungarian nation, which at the time of the conquest had been semi-nomadic, moved from animal breeding to agriculture.

Middle Ages. In the 14th century Hungary was considered an important market in European trade. At the same time it was one of the most stable countries in Europe, because the rifts characteristic of a feudal society did not lead the country to long-standing disintegration of its territory. The Árpád kings (up till 1301), the Anjou dynasty (1308-1387), the Luxembourg dynasty (1387-1437), the Habsburg dynasty (1437-1458), the house of Hunyadi (1458-1490) and the Jagello dynasty (1490-1526) all strove to preserve the primus inter pares situation.

Fight for Independence. The Mongolian invasion (1241-1242) was the first serious disaster for Hungary. The healthy development spurred by the rebuilding of the country after the Mongol invasion was brought to an end by the advance of the Ottoman Turks into Europe. From the 15th century they threatened the Hungarian territory, and for centuries Hungary fought battles against the Turks. In 1526 at the Battle of Mohács the independent Hungarian

state was destroyed, and in 1541 the royal seat of Buda fell. The country was split into three parts: the territory under Habsburg rule, the part conquered by the Turks and the Principedom of Transylvania. The 150 years of Turkish occupation drastically curtailed the country's development and caused severe loss of material goods and human life. After the Turks were driven out in 1686, Hungary came under Habsburg rule. For several hundred years neither the royal court nor the central administration operated on Hungarian territory. Foreign settlers were moved into the country to swell the dwindling population. Because of this the previous ethnic unity of the country was disrupted. The uprising of Ferenc Rákóczi against Habsburg rule (1703-1711) was the first attempt to win back the country's independence since the expulsion of the Turks.

The 19th Century. The Revolution of March 15, 1848 was a milestone in the history of revolutions in Europe. Bowing to pressure from the masses, the Hungarian Diet accepted most of the revolutionaries' demands, including the liberation of the serfs, equality before the law, freedom of press and an independent Hungarian government. In September 1848 the imperial Austrian government launched an armed attack on Hungary in order to crush the Revolution and do away with its achievements which had earlier been approved by the emperor. The independent Hungarian army succeeded in holding off the attack, and only surrendered when the Austrians sought help from the imperial Russian troops.

These years of oppression were followed by a Compromise in 1867, that separated the legislation and government of the Austro-Hungarian Monarchy, and only the Ministries of Foreign Affairs, Defence and Finance were run jointly.

1.1.2. The Austro-Hungarian Empire

The Austro-Hungarian Empire is a historical state born in 1867 after the Austro-Hungarian Engagement that recognized the kingdom of Hungary as an autonomous entity within the former Austrian Empire, since then Austro-Hungarian. In 1914 the Empire had an extension of 732016 km² and 53 million of inhabitants.

The extension of the Austro-Hungarian Empire covered regions from twelve actual European states: Austria, Hungary, Czech Republic, Slovakia, Slovenia, Croatia, Bosnia-Herzegovine and the regions of Voivodina and Mouths of Kotor in Serbia, Trentino-South of Tirol and Trieste (in Italy), Transilvania and part of Banato (in Romania), Galicia (in Poland) and Rutenia (subcarpatic region of Ukraine).

Chronology

1867 : Austro-Hungarian Engagement

1879 : Alliance of Austria-Hungary and the German Empire

1882 : Italy joins the alliance

1907 : Comes into force the universal suffrage for every man older than 24

1907 : First elections in Austria. New engagement between Austria and Hungary

1908 : Annexion of Bosnia-Herzegovina

1912 : Serbia and Bulgaria make an alliance against the Austro-Hungarian Empire

1914 : The archduke Franz Ferdinand is murdered in Sarajevo. The war declaration of Austria-Hungary to Serbia causes pile-up war declarations initiating the First World War.

1915 : The Austro-Hungarian Empire declares to be determined to give in the region of Trieste. The treaty of London is signed, secret in the United Kingdom, France, Russia and Italy. Italy change sides obtaining Trieste as incentive.

1916 : In the middle of the war the Emperor dies after 69 years of reign.

1918 : Charles sends to William II of Germany a telegram announcing the end of the alliance

- October 28th, the Czechoslovakian Republic is proclaimed.
- November 1st, Secession of Hungary.
- November 3rd, Armistice between the Austro-Hungarian empire and his allies.
- November 16th, the Republic of Hungary is proclaimed.

1919 : The Austro-Hungarian Empire gets absolutely dissolved after the signing of Peace Treats in Trianon.

Demography

The population of the Austro-Hungarian Empire was about 48.592.000 inhabitants in the census of 1907. In 1910 (we have worked with data from this census) had 53.400.000 inhabitants. Austria had 28,5 millions, Hungary had 23 and the province of Bosnia-Herzegovina 1,9.

The Austrians, German spoken, were majority in High Austria, Low Austria, Carintia, Estiria, Salzburg, Silesia, Tirol and Vorarlberg and there were important focus in Bohemia, Moravia, south of the Hungarian plain, Slovakia, Transilvania, Bucovina and Carniola. The Hungarians inhabited the plain of the Danube and Transilvania.

Here we can see the territory occupied by the Austro-Hungarian Empire. In orange the Austrian part and in pink the Hungarian part. In



Kingdoms and countries of Austria-Hungary

The Czechs inhabited Bohemia and Moravia; the Polish Western Galicia; the Ruthenians (Ukraine) Eastern Galicia and Lodomeria, North of Bucovina and the Transilvanian Maramuresh; the Romanians most of Transilvania, eastern parts of the Bánato and the Panónic plain as well as the South of Bucovina; the Serbo-Croatian inhabited Croacia, Slavonia, Bosnia-Herzegovine, Dalmacia yand Rijeka (*Fiume* in Italian), and most of Istria; the Slovaks lived in the land wich belongs to current Slovakia; the Slovenian Carniola and in a less extent Estiria and Carintia; and the Italians the South of Tirol (current Trentino) and the cities of Gorizia and Trieste.

Wien increased its population from 446.400 inhabitants in 1850 to 2.200.000, being the third biggest city in Europe after London and Paris just before the beginning of the First World

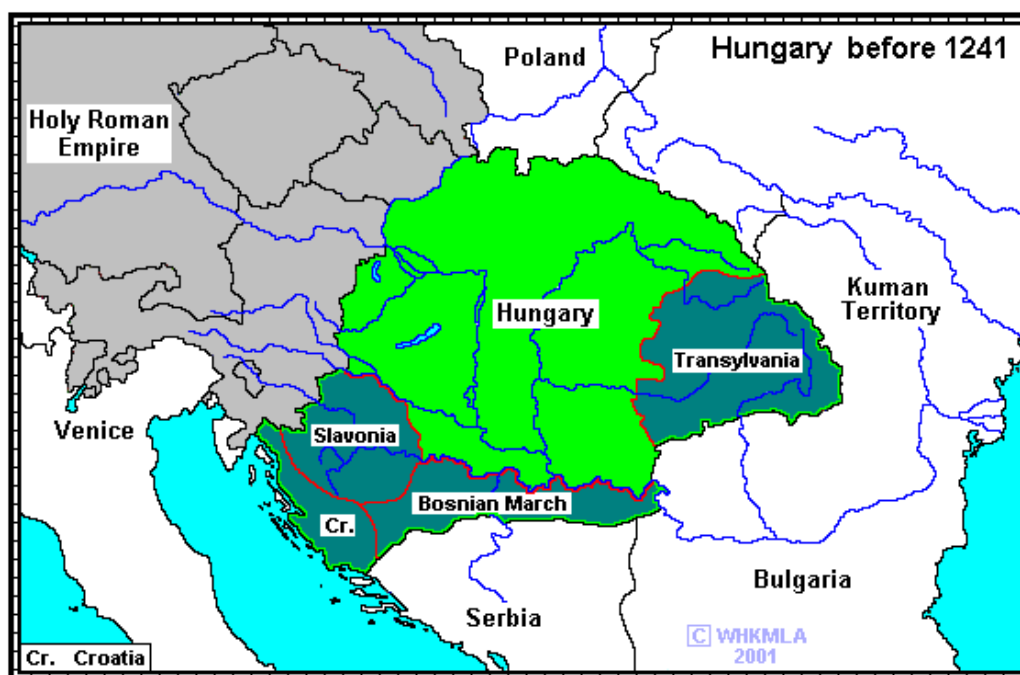
War. Other cities with important population in the Empire were Budapest (773.400), Prague (514.300), Trieste (230.000) and Krakow (90.000).

1.2.- History of Hungary in maps

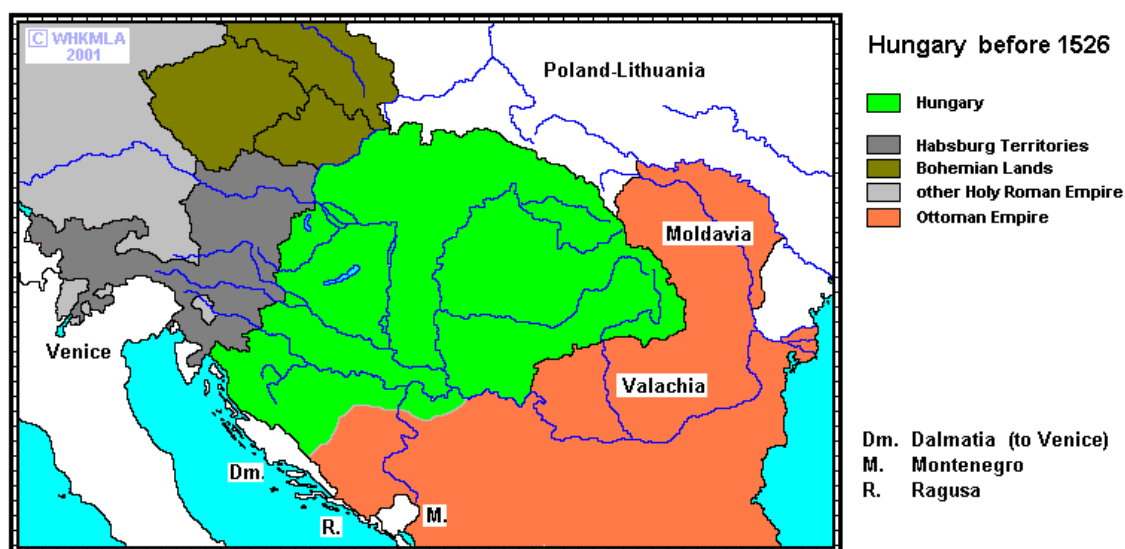


This map represents the land of Hungary in 1090, including the actual region of Transylvania where a considerable Hungarian population is still living. The west border frontier to the menacing Holy Roman Empire.

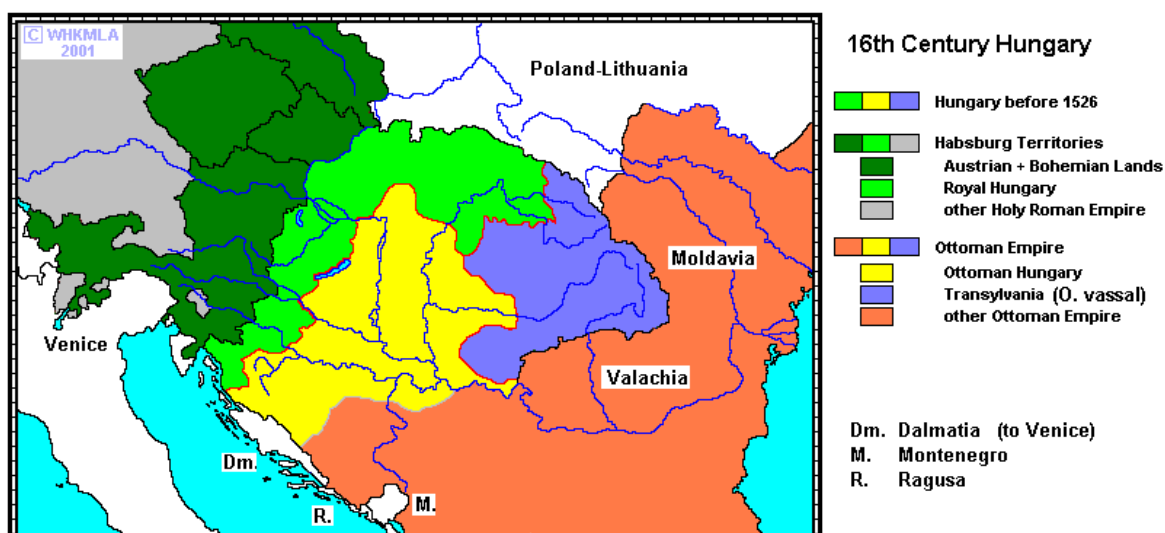
In this period Hungary had been converted to Christianity and was becoming bigger and stronger reigned by the Arpad House.



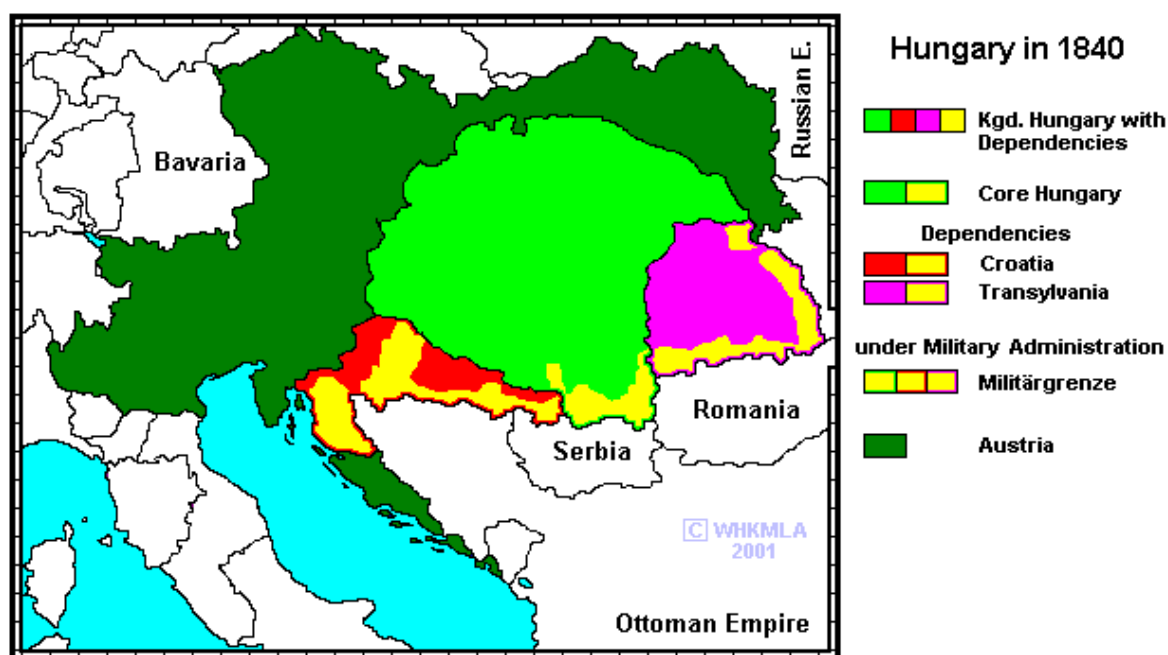
This second map contains Hungary in the XIII century with the regions of Transylvania, Bosnian March, Slovenia and Croatia. In this age Hungary the West Hungarian frontier reached the Adriatic coast, which at present belongs to Slovenia and Croatia.



Till the beginnings of 16th century the Ottoman Empire was trying to extend his territory in Europe and in 1526 they were stopped in the actual Hungary. The frontiers of the Empire in the West were the Habsburg and Bohemian Lands and on the East side the Holy Roman Empire.



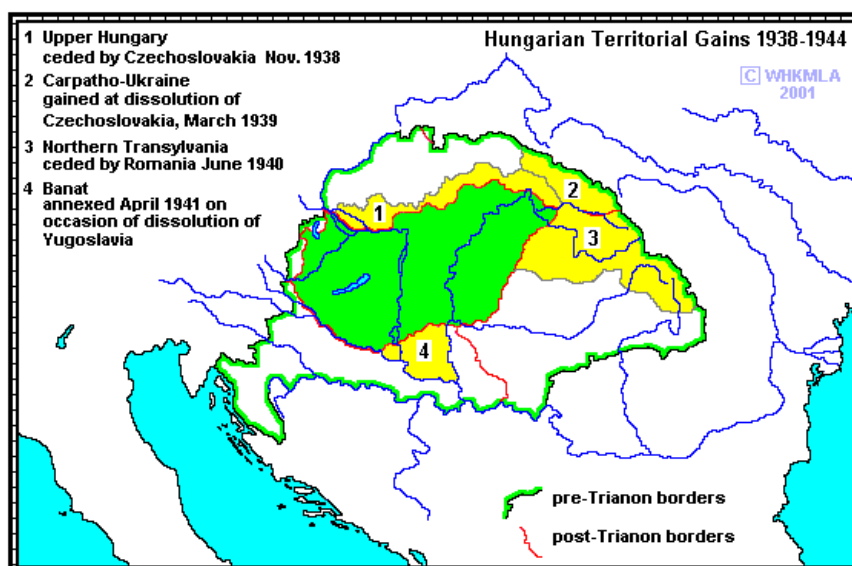
In the 16th century Hungary was divided in three regions: the East region was Transylvania, the South one was the Ottoman Hungary and the North-West region was the Royal Hungary, close to the Habsburg territories.



In 1840 Austria added new territories to the Empire: one of the three was the region of Galicia, in the North border of Hungary while Croatia and Transylvania were dependencies of Hungary. The zones drawn in yellow colour, in the South of the Core Hungary and Croatia and Transylvania, were under Military Administration.



At the beginning of the 20th century (the date selected for our work), the territorial extension of Hungary was much bigger than nowadays. Transylvania and Croatia belonged to Hungary, and also the current Slovenia and Slovakia. This is the period of the Austro-Hungarian Empire. The regions of Galicia, Moravia, Bohemia and Dalmatia were also part of this strong empire.



This map presents the changes in the territory of Hungary between the First and the Second World War. The green line is the border before the Treaty of Trianon in 1920. Current

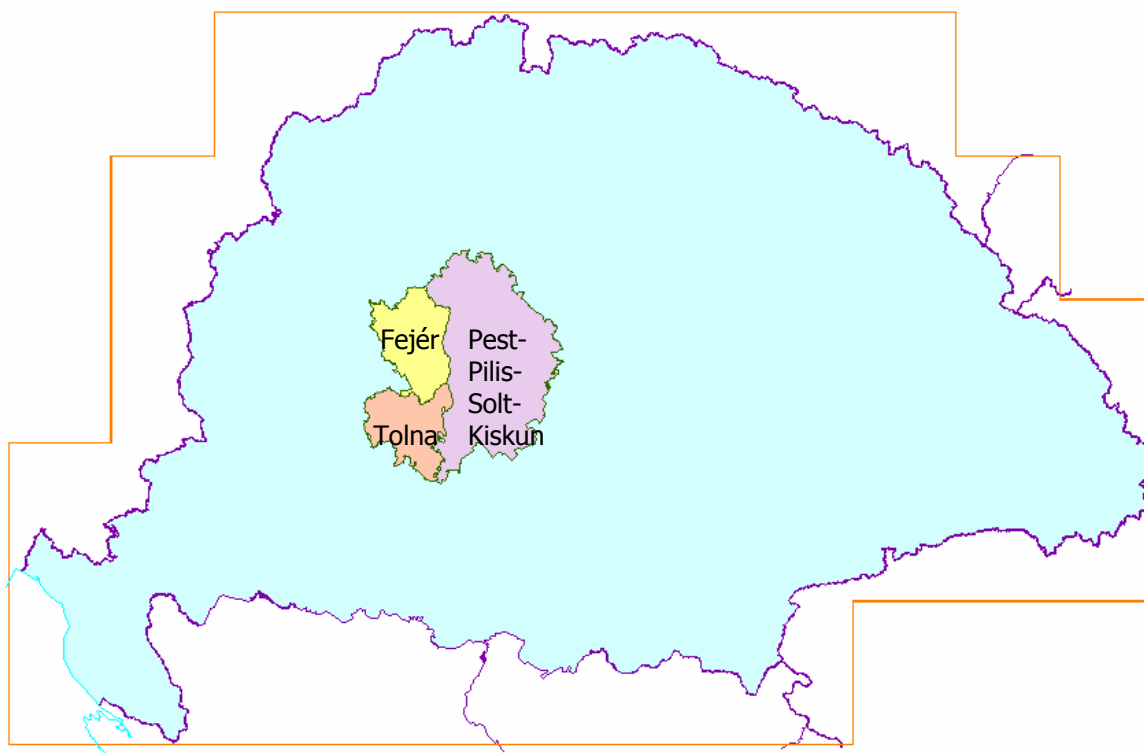
Hungary appears filled in red, representing the remained territory, just after the Treaty of Trianon, which caused the dismemberment of Hungary. In yellow colour are the regained lands during the Second World War.



The last map represents the actual Hungary. The Danube River cuts the country in half from north to south. The Balaton Lake, also called the sea of the central Europe, is located in the West side of the country. In the north the country borders on Slovakia and Ukraine. In the South borders on Romania, Serbia and Croatia and in the West the country borders on Austria and Slovenia.

1.3.- Short description of the selected counties

The three selected counties (Tolna, Fejér and Pest-Pilis-Solt-Kiskun), are situated in the heart of the historical land of Hungary in 1914, and all of them are in the sides of Duna River. The map below shows the location of these three counties:



Tolna is a southern province located in the west side of Duna river. Its borders are Fejér in the North, Pest-Pilis-Solt-Kiskun in the East (with the river in the middle), Veszprém and Somogy in the West and Baranya in the South. In 1914 Tolna was the smallest province of these three with 3462 km². The population in this age was about 252312 inhabitants. An important characteristic of this county is the high density of German people, who are the 29,3 % of the total population.

Tolna	
Area	3462 km ²
Number of Settlements	123
Population	252 312
Density of population	72,9 inhabitants / km
Nationalities	69,4 % m, 29,3 % n
Religions	69 % rk, 14,8 % r, 12,6 % ev, 2,9 % iz

Pest-Pilis-Solt-Kiskun is mostly situated on the right side of Duna river. Its borders are Nógrád, Heves and Hont in the North, Jász-Nagykun-Szolnok and Csongrád in the East, Bács-Bodrog and Baranya in the South and Tolna, Fejér, Komárom and Esztergom in the West. As it can be seen in the table below Pest-Pilis-Solt-Kiskun was the biggest province of the selected ones with an area of 10 288 km². It was also one of the biggest in the whole land of the historical Hungary in this period. Pest-Pilis-Solt-Kiskun is also the county with most number of settlements in the work area.

Pest-Pilis-Solt-Kiskun	
Area	10 288 km ²
Number of Settlements	219
Population	829 192
Density of population	80,6 person / km
Nationalities	86,3 % m, 9,5 % n, 2,9 % sl
Religions	71,3 % rk, 17,2 % r, 7,7 % ev, 2,8 % iz

Finally, Fejér is located in the left side of Duna River and in the North borders on Komárom, on Pest-Pilis-Solt-Kiskun in the East, on Tolna in the South, and on Veszprem in the West. This is the least populated province with 214 045 inhabitants in 1914 and it is also the province with the smallest density of population, 53,4 person per kilometre.

Fejér	
Area	4009 km ²
Number of Settlements	104
Population	214 045
Density of population	53,4 person / km
Nationalities	85,7 % m, 11,1 % n, 2 % sl
Religions	68,2 % rk, 26,2 % r, 3,1 % ev, 2 % iz

Abbreviations:

- m Hungarian
- n German
- sl Slovakian
- rk Roman Catholic
- r Calvinist
- ev Lutheran
- iz Jewish

2. DATA CAPTURE

In every geographical information system is compulsory to work with two different kinds of data: thematic data and graphic data. The main goal of the GIS is to relate both of them and to analyze together the connected databases, representing graphically the results of this analysis.

2.1.-Thematic data

The thematic data have been obtained from the Hungarian atlas called "*A Történelmi Magyarország Atlasza és Adattára 1914*" ("Atlas and Gazetteer of historical Hungary in 1914") and it has been edited by Talma editorial. This atlas used an administrative map from 1913, while the numerical statistics are based on the national census data of 1910. The thematic information we have processed is the number of inhabitants, the ethnic and religious data of each settlement.

Each settlement has the information structured in this way:

- Name of the settlement.
- Code of letters and numbers for locating the settlement in the map.
- Name of the county where is located.
- Name of the district.
- Actual name of the settlement and the country to which belongs.* (only if it has a different name).
- Number of inhabitants of the settlement.
- Number of people of each nationality.
- Number of people of each religious group.

**Sometimes the settlement located in Hungary in 1914 is actually located in another country. In these cases the name can be different, written in the language of the country to which it belongs.*

This is an example:

Nagymodró 2B5 Nyitra vm. Vágújhelyi j. (Modrová, SL)
 356 3m 11n 341sl 343rk 11iz

The settlement named as Nagymodró can be found on the map sheet no. 2 of the Atlas (field B5). The settlement administratively belonged to Vágújhelyi District of Nyitra County. Modrová is the present name and now belongs to Slovakia. The settlement had 356 inhabitants in 1910: 3 people avowed themselves to be Hungarian, 11 German, and 341 people to be Slovakian, while the rest of the inhabitants belonged to other ethnic groups. From the total number of inhabitants, 343 people avowed themselves to be Roman Catholic, and 11 people to be Jewish according to the census of 1910.

From this information we have used just the data of population, religion and nationalities. The first problem was that the information is not ordered by counties, but alphabetically and we had to select only the information dealing with the counties that belonged to the three counties we are working with.

So the first task was to find the settlements from these three counties, typing the data of these settlements and creating a database using the software Excel, as it is shown in the table below:

Name of the settlement	Settlement code	Province code	Population	Nationalities	n	...
				Hungarians	Germans	...
Alsónaná	tol001	TOL	1522	15	1357	
Alsólyék	tol002	TOL	1543	1457	63	
Apar	tol003	TOL	771	32	739	
Báta	tol004	TOL	4212	4055	97	
Bátaapáti	tol005	TOL	1310	107	1180	
Bátaszék	tol006	TOL	8039	2119	5605	
Bedeg	tol007	TOL	1202	1202		
Belacz	tol008	TOL	552	7	544	
Belecska	tol009	TOL	757	218	537	
Bikács	tol010	TOL	1057	219	802	
Bonyhád	tol011	TOL	6452	2009	4415	
Bonyhádvarasd	tol012	TOL	686	14	672	
Bölcske	tol013	TOL	4589	4577		
Börzsöny	tol014	TOL	439	103	323	
Czikó	tol015	TOL	1784	55	1723	
Csibrák	tol016	TOL	909	189	719	
Decs	tol017	TOL	3699	3427	225	
Diósberény	tol018	TOL	1152	169	975	
Dombóvár	tol019	TOL	6785	6534	174	
Döbrököz	tol020	TOL	4163	4146	12	

The first column is the name of the settlement. We had to spend more time than usual typing the names because we were not used to Hungarian alphabet. Besides, the keyboard of the Spanish laptop is configured for the Spanish language and some vocals and consonants are in different positions or they are not included.

The second column is the code of the settlement. This code is necessary to relate the map with the thematic data. We considered also using the actual code of Hungarian settlements, which was determined by Hungarian Institute of Statistics (Központi Statisztikai Hivatal, KSH). At the end we decided to use a new code, because the Hungarian Institute of Statistics gave an official code only to the actual Hungarian settlements, but in the examined period of time (1914) there are numerous settlements that at present are in neighbour countries or disappeared along the last century. The code we have put has the three letters refer to the county and the three digits are the alphabetical order of the settlements in each county.*

** Trying to find the settlements which belong to these three counties we omitted some names. We discovered much later these mistakes and we gave new codes to these settlements but we put them at the end of the list.*

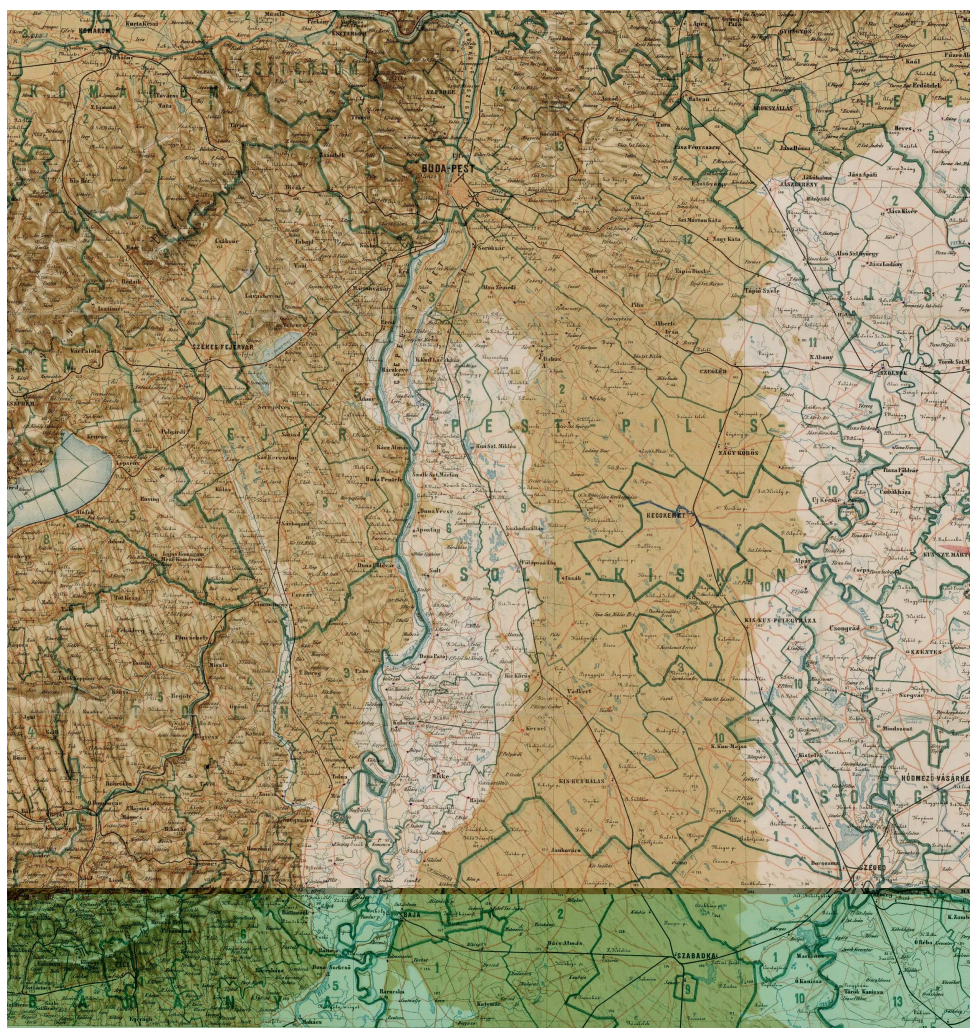
The third column is a code of three characters, the first three letters of the county to which it belongs. It could be TOL, FEJ or PES. Using this column it was easier to work with the database; we had a table with all the settlements of the three counties ordered alphabetically but we can also possible to separate them in three different tables, dealing each one with a province.

The data about religion and nationalities or ethnic groups was included after these columns, typed directly from the gazeteer of the atlas of 1914. The ethnic groups can be Hungarian, German, Slovakian, Romanian, Russniak, Croatian, Serbian, Gipsy, Wend, Polish, Greek, Italian, Bunievatz, Socatz, Czech and Moraviar and Bulgarian. Meanwhile, the religious groups can be Roman Catholic, Greek Catholic, Calvinist, Lutheran, Greek Orthodox, Unitarian or Jewish.

2.2.-Graphic data

Our first idea was to take an old map from the university's library using it to georeferent the graphic database made in vectorial format. This map is entitled "*A Magyar Állam Közigazgatási Térképe, 1884*". Prof. István Elek, our tutor, tried to give it coordinates using a current map and doing a transformation after marking three points (important settlement) on each map, but we found considerable differences between the geographical coordinates in the scanned map and in the current map. We can mention several causes to explain these mistakes. On one side, this map was done 112 years ago and the cartographic techniques did not have the same accuracy as they do nowadays. On the other side, the conservation conditions (such as humidity and temperature) can produce some distortions. Besides, the scanning process never is perfect producing small distortions when the original printed map is "photographed" by the scanner. Considering all these factors we decided to exclude the use of this map in our project.

This is the old map:



We have used a new vectorial map created with the Corel Draw graphic software representing the historical Hungary in 1914, which is the original of the map included in the atlas entitled "*A Történelmi Magyarország atlasza és adattára*". In fact, we get different layers of this maps and using the DXF format we joined them in Autocad keeping without any change the original layer structure of the map. The layers were as next follows: country bordiers, provinces, councils, settlements, hidrography and coast. These last two layers are not usable in our work, but showing them in the final result future users can have a more complete representation of the region, facilitating the use of this map.

3. WORKING WITH DATA

3.1.- Data editing process

1st STEP: Typing the thematic data

2nd STEP: Choosing the map

3rd STEP: Joining the DXF files in a single map using Autocad

4th STEP: Creating polygons of provinces, councils and settlements

5th STEP: Saving the file and opening it in MapInfo

6th STEP: Joining thematic data and graphic data in MapInfo

7th STEP: Checking the regions

8th STEP: Geocoding

9th STEP: Checking possible mistakes in the polygons

10th STEP: Combining different polygons from the same settlement and deleting repeated polygons

11th STEP: Changing the structure of the table for creating thematic maps

12th STEP: Creation of the thematic maps

1st STEP: Typing the thematic data

At the beginning of this thesis, we had an Atlas with all the thematic information needed to create the application. But it was compulsory to have this information in this digital format to work with it. The information in the Atlas was structured in alphabetical order, containing data about the whole territory of Hungary. This thesis was going to include only three provinces, so we had to mark in the Atlas the settlements that belonged to these provinces and to type only these settlements. In this step we spent more time than usual because of the language difficulties. The laptop keyboard is designed to use in Spanish language, but not in Hungarian. We had to change the language of the computer for writing in Hungarian, because there are some characters which are not in the Spanish keyboard. For example the letter Z was located in the "Y" key, and pressing the "Ñ" appeared an "É". The solution was buying some stickers with the Hungarian characters to use on the keys of the laptop.

The typing remained slow but less difficult. In this way we finally passed all the information not only the names of settlements, but also the numeric information about religion and ethnic groups to an Excel database. We typed more than four hundred settlements in several columns that includes codes and the amount of people in each settlement belonged to each ethnic group and religion.

2nd STEP: Choosing the map

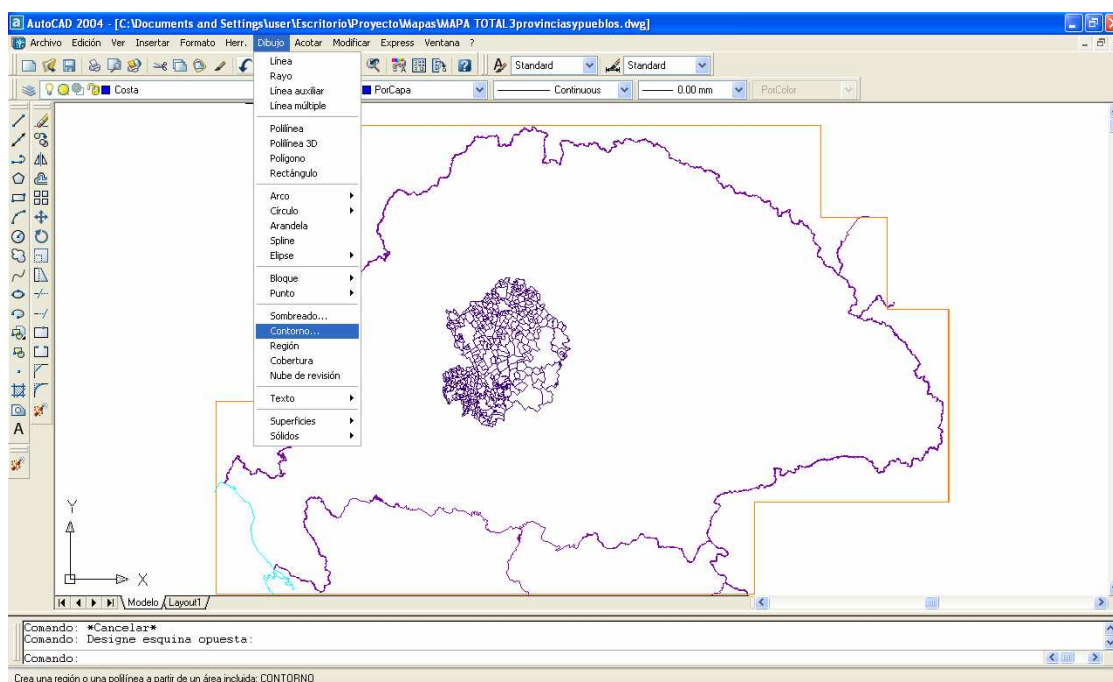
The original old map of 1884 was saved in JPG extension (that is a raster format), but divided in 6 different files after the scanning. This map had obviously no geographic coordinates, so for georeferencing we needed to use another map with coordinates, representing the same area. We tried to georeferate it choosing three clear points in both maps to give it coordinates. But the result was not as good as was needed, because of different reasons listed in page 16, and we had to rule out this map. Prof. Zentai Laszló had done a map about the same period of the thematic data. The map had been created with CorelDraw and it was saved in DXF format for using in different applications. It was the original of the map used in the printed Atlas that we use to obtain the thematic information.

3rd STEP: Joining the DXF files in a single map, using Autocad

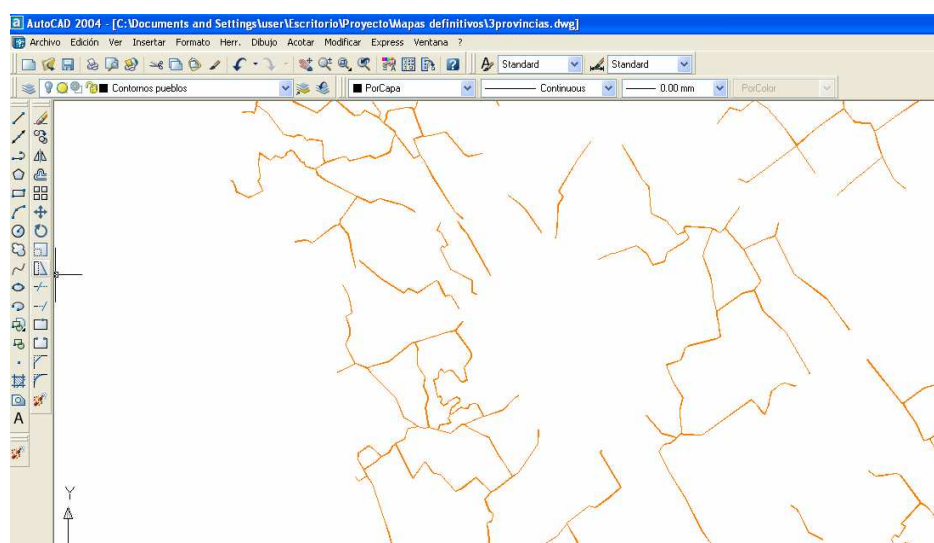
Before starting to work, we had each layer saved in different DXF files. DXF(Drawing Exchange Format) is an extension used as an intermediate format to export/import files from one software to another. This exchange format was created by Autodesk Co. to communicate the different CAD software (e.g. Autocad) with other software (GIS, graphic etc). Each DXF file was opened as an individual map, but our goal was joining all of them in a single map, structured in layers. We had to cut and paste the maps and new layers were created for these maps. Doing this, we got a map with each category (settlements, councils, provinces...) in a separated layers.

4th STEP: Creating polygons for the provinces, councils and settlements

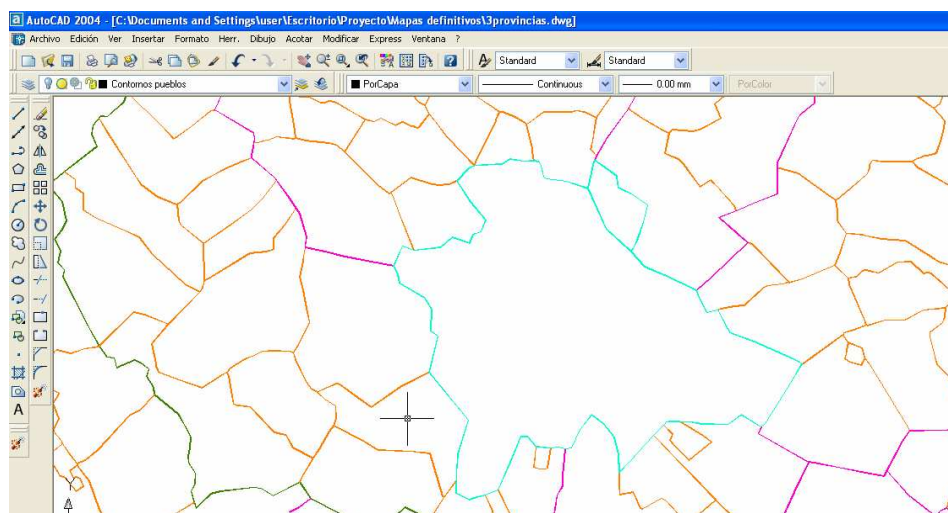
At the beginning of this phase the different layers were already in the same map, but there was a problem, the DXF files imported from Corel Draw contained the regions of the original map not as polygons, but in very small polylines. It was obligatory to have the provinces, councils and settlements divided in single and closed regions to follow the preparatory work. First we worked with the whole territory of Hungary creating polygons of all the provinces, and then creating also the polygons for the councils. This map was named "Total map". After that we copied the map and we deleted all the provinces except the three ones needed for our work. We deleted also the councils that were outside these three provinces, and then we created the polygons for the settlements in our working area. We saved this map as "Three provinces". To convert a region into a polygon we did it with the command "Contorno" of the upper menu.



The creation of the polygons of the 73 provinces was very easy. We did the same with the councils, but in this case it was a bit more difficult because the polylines of the councils were not closed. And the most difficult step was closing more than four hundred settlements because we needed to use also the layers containing the councils and the cities. The provinces and cities were closed polylines, but not the settlements nor the councils. This was the hardest work in Autocad for us, because each council was plenty of settlements formed by open polylines or without polylines in that layer (e.g. when a border of a settlement was common with the border of a city) as it can be seen below.



This figure presents only the settlement layer. The polylines are not closed because they need to be joined to other polylines or to the province, council and city layers.

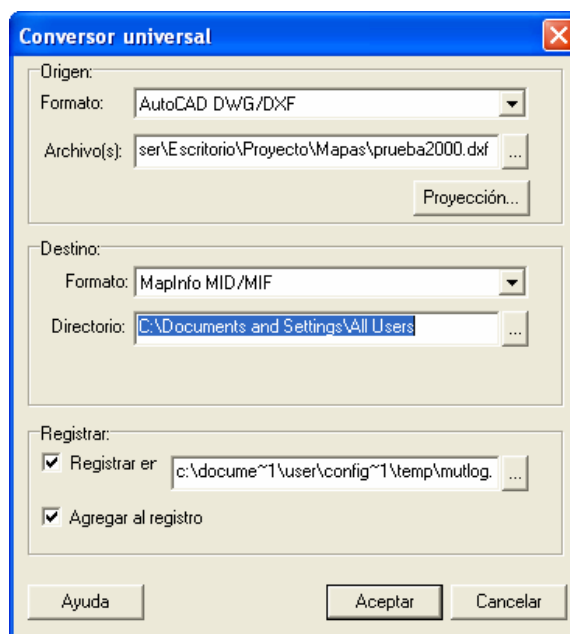
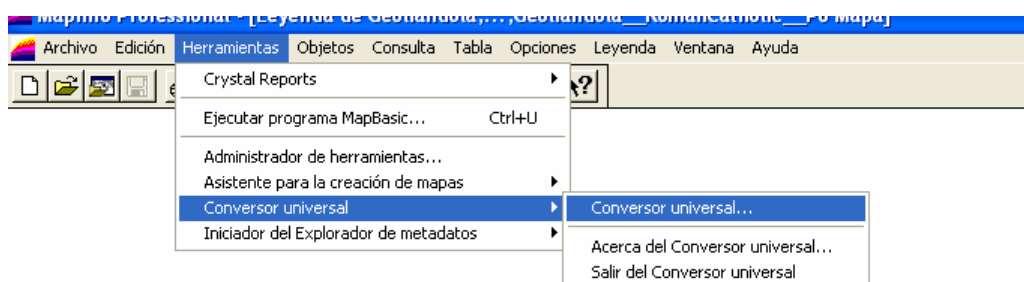


This figure shows all the needed layers on, so after it we could drawn new polygons in the actual layer based on these closed polylines.

Another problem was that some lines did not cross each other, and Autocad could not create these polygons. We had to check each one and to join some lines until they cross. Sometimes detecting this uncrossed lines was really hard work because with an usual zoom was not enough to detect the gaps between lines. Increasing the zoom a small gap appeared between the two lines: we had to repair this mistake to follow the work.

5th STEP: Saving the file and opening it in MapInfo

The following step was to save the file in DXF format to open it in MapInfo. At the beginning we had the file saved in CAD format but we needed to use an intermediate extension for working with the file in MapInfo. First, we chose the version of 2002 DXF version and MapInfo could not open it. The solution was to save it using the Autocad 12 DXF version. In MapInfo, we opened the file using the command *Universal Conversor*, and two new files were automatically created: the map file (.MAP) and the table file (.TAB).



6th STEP: Joining thematic data and graphic data in MapInfo

Finishing the previous phase we had a vectorial map in MapInfo and an Excel file with all the thematic data of population, nationalities and religions. It was the time to join both of them in MapInfo.

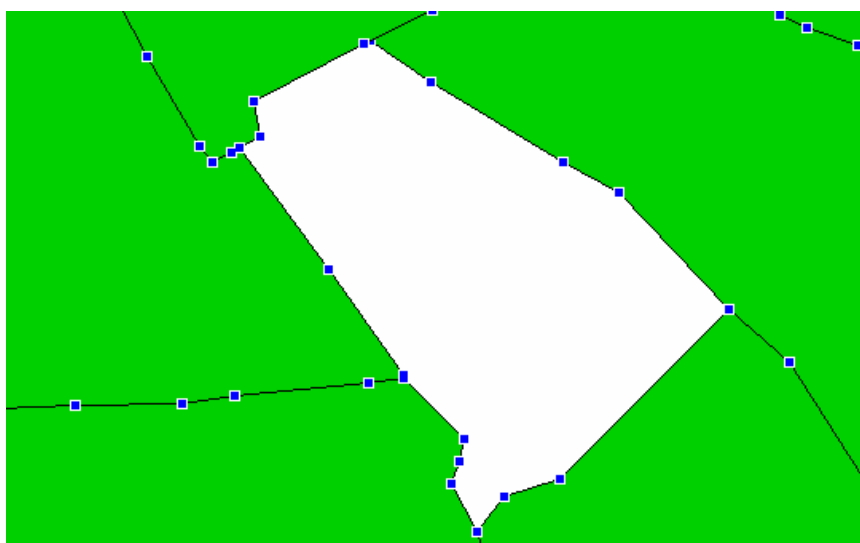
When a map is opened in MapInfo, a table is created automatically containing two columns called *Autocad elevation* and *Name*. The first one was without data, because the map in Autocad had not Z coordinates, and the second one belonged to the name of each element in the map and was empty because it did not contain any thematic data yet.

MapInfo has an option called "Open with" to open Excel files and other format. Before opening it, in the program appeared one window to choose the page of the file you need to open, it is also compulsory to decide if the first row of the file will be used as the title of each column or not.

Now we had one map with its empty table in MapInfo, and another table with the thematic data in Excel format. In this table the columns are structured as character columns, although the information is numeric. We had also to convert the database in Excel to a file in MapInfo extension and the names of the settlements were in Hungarian. MapInfo could not read some of these characters like the ü or the ű.

7th STEP: Checking the regions.

For checking if all the polygons were created correctly we made editable the describable layer to make the respective changes. Then we changed the background style choosing the green colour for the region areas, and if a region was not created or it was opened, then they appeared without fill (in white colour). We started the creation of regions using the command "poligono" and making visible the nodes. Pressing the S key, the Snap option was activated, and we could create by hand the new polygons. Clicking in each node of the new polygons was a long process, but there were not too much uncreated polygons.



In some cases during our work in Autocad we also created twice polygons for the same region. This was a problem we had to solve because there were much more polygons. The solution was to find these repeated regions and delete them; and then packing the table for deleting the respective row from the table.

8th STEP: Geocoding

Geocoding was the most important step in this work to realize the joining of thematic and graphic data. In the geocoding is necessary to have one common column in the map table and in the thematic table. We used the settlement code for relating the map with the Excel table. But the map table was empty and we needed to introduce the settlement code in each row. The procedure was as follows: We clicked in each settlement on the map and we looked for its names in the atlas. Then in the Excel table we found the settlements code, and finally we copied this code to the row belonged to this settlement in the empty table. We had to do it with all the settlements.

The geocoding was successful, but we had some problems. Above some of them are listed: looking for settlements in the map to give them their code, we saw that in the Atlas some of the map polygons had not any settlement name. Perhaps the settlement was too small and it did not appear in the map, or it was a region belonged to another settlement with its main territory situated in another place.

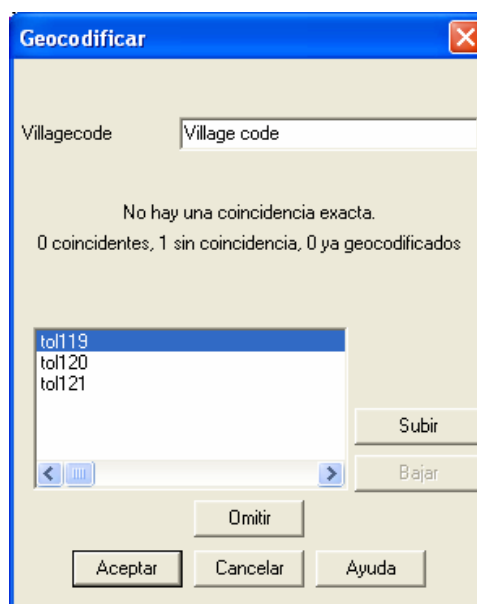
When we typed the thematic data from the Atlas we forgot some settlement. The consequences were some polygons without thematic data. Then we had to type these settlements with their data giving them a new code in Excel and typing also this code in the MapInfo table. The settlements were it was difficult to add a new one following this order, because we should have changed the codes of the rest of the settlements too, so we put them at the end of the table.

Some elements in fact were not polygons. Some of them were only a closed polyline or a small region between two polygons. The original map had been created in Corel Draw and was not prepared for using in a GIS, and this is why some mistakes. E.g. the creation of some small polygons or lines that are not visible in the scale needed for depicting the map, but visible with the zoom used in MapInfo. We also made same mistakes in the step "Creation of polygons in Autocad" and creating by hand the rest of the polygons with MapInfo. When these wrong polygons were detected the following step was deleting them and packing the table.

First of all, the geocoding was done in an automatic way and the result was a total of 420 settlements geocoded and 51 ungeocoded.



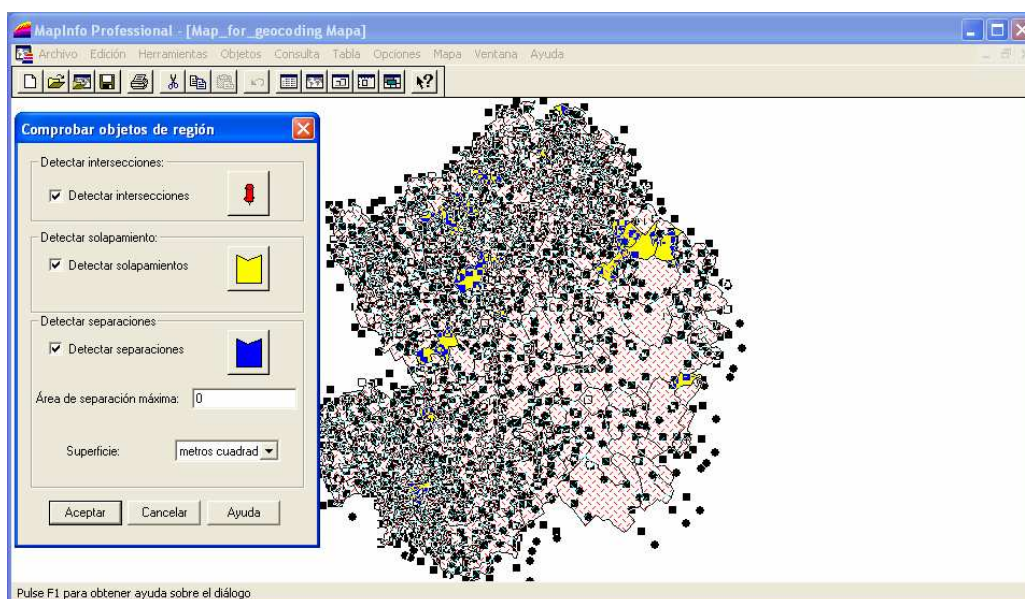
Because of this result we decided to repeat the process in an interactive way, one by one. Then we found all the problems explained before: Polygons drawn twice, settlements that were not in the map, wrong polygons, etc.



We deleted the wrong and repeated polygons and we did the geocoding with the rest. Only one problem remained: what to do with the regions that belong to one settlement.

9th STEP: Checking possible mistakes in the polygons:

MapInfo has a command called "check regions". First of all, the layer with the region objects must be editable. Then we selected all the settlements of the layer and in the upper menu we clicked the option for checking regions. In the picture below can be seen the window appeared after using this command, which checks the regions to detect intersections, overlaps and gaps.

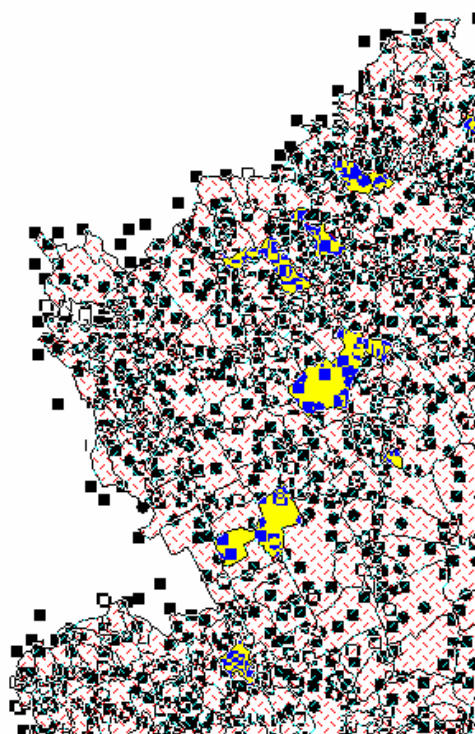
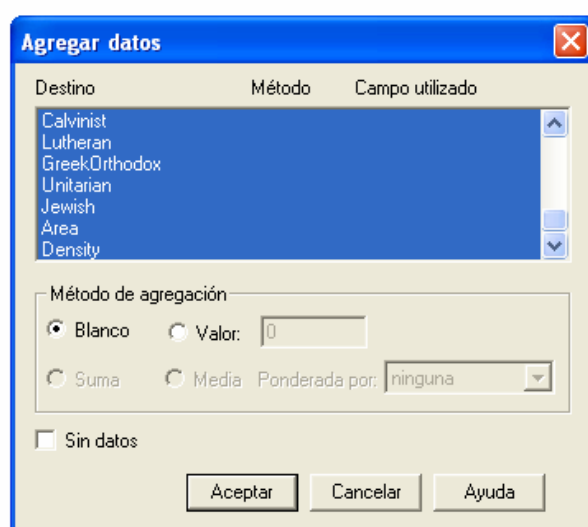


Most of the mistakes were overlaps. When the layer is editable and we are working with it it is possible to move a little bit one of the regions, and it can create intersections, overlaps and gaps. Sometimes these movements are clear to detect and undo them. But there are small movements not visible if the zoom is not very large. The solution was to delete these wrong regions and remaking them again by hand node by node.

10th STEP: Combining different polygons from the same settlement and deleting repeated polygons:

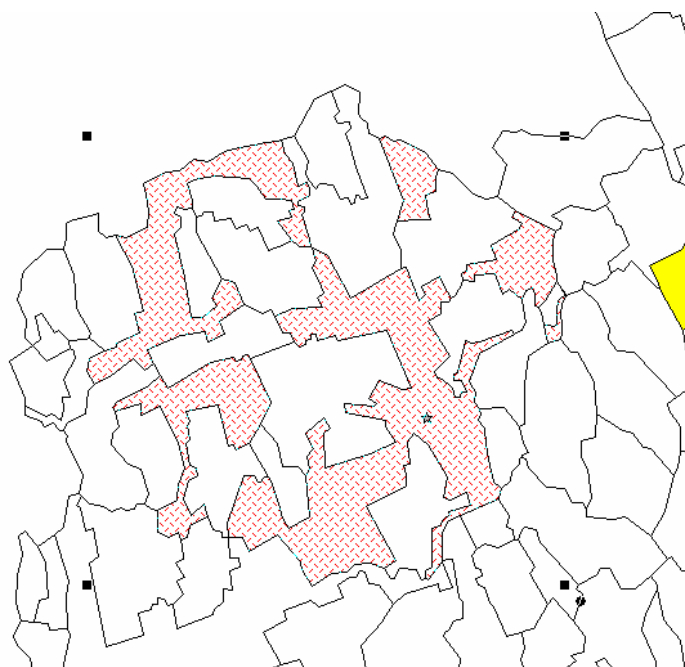
We had 17 settlements defined with more than one region and the total data related to the main settlement was also repeated in the table in each row related to each region. The solution was combining these areas. For example, the settlement *Majsamiklósvár* with the code *tol058* contained 8 different territories.

First, we made the layer editable and we looked for the settlements that were repeated. We selected one of these polygons and in the upper menu we clicked on *Objetos*<<*Establecer marca*, and selecting the rest of the regions of this settlement. Later we combined them with the option *Objetos*<<*Combinar*. In the next window we chose the option "Add the data without changes" for each column, because we wished to keep the original value and not the sum of all the values in each region. The chosen option ("Aggregation method: empty") can be seen below:



At the beginning we had eight rows of the same settlement and eight different polygons in the map. This could cause a distortion making the thematic maps, because the data were repeated several times but the settlement was only one. After the combination we got only one row with the data and the rest were deleted. In the map we had all the polygons combined like an object.

In the picture below appear the eight territories of Majsamiklósvár after combining them. Clicking in one of its regions all of them are selected automatically:



11th STEP: Changing the structure of the table for creating thematic maps.

After checking and solving the previous problems the last step was the creation of thematic maps, which is the main goal of the thesis. On one hand, we had the map of three provinces with their regions and the table belonged to this map. On the other hand, we had a geocoded table with the thematic information needed for creating the maps. At this point we found other difficulty: The original table was an Excel file saved as a MapInfo table. After saving it, the table was structured in character columns although the data originally was numeric. The solution was changing the structure of the table connected to the map. At first time we added new numerical columns to this table, and tried to update it transferring the values of the columns contained in the other table. It was impossible to transfer from character columns to numerical columns. Then we changed the type of the columns from numeric to character and we completed these columns using the values from the thematic table, and we modified the structure changing the type to numeric again. This step was successful because this table was modifiable and the data were numeric. Now the table was ready for the next step.

12th STEP: Creation of thematic maps

Creating a thematic map in MapInfo requires just three steps:

1. Choose the type of map

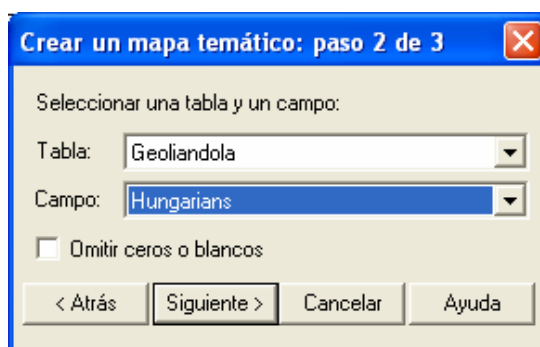
We opened the *Map* menu and we clicked *Create Thematic map* . For this example we chose *Ranges*.



Now we clicked *Next* button to display the next step.

2. Select a table and a data field

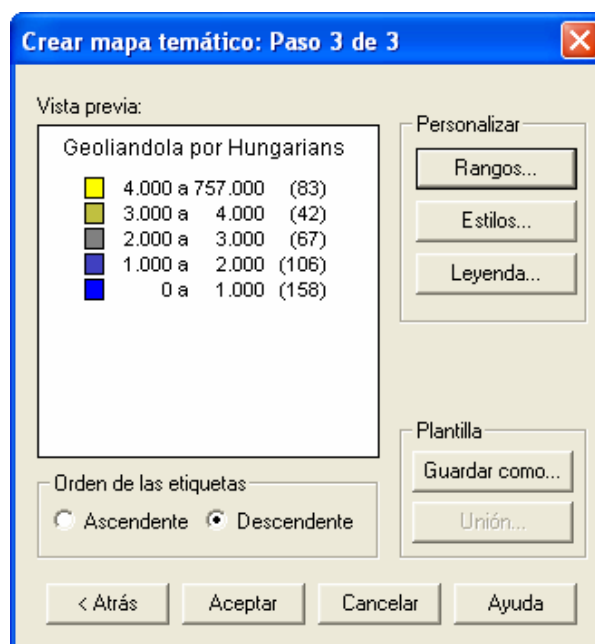
Then we chose the *table* and *data field*. To display the Hungarian population we selected *Geoliandola* as the table and *Hungarians* as the field.



There is a checkbox labelled *Ignore Zeros or Blanks*. If our data table has zero values or blanks in a record, checking this option these polygons will be represented without colour or with the colour of the basemap (if it has one).

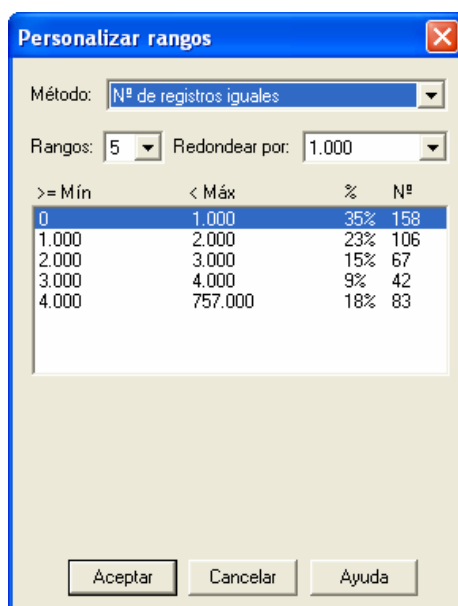
3. Preview the results, make any changes and display the map

This step can be also divided in three parts:



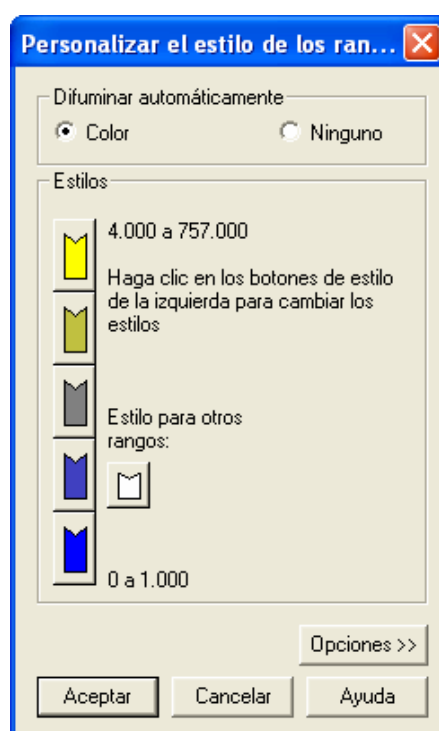
1. Determination of ranges

Ranges allows us to select the method to categorize our data, determining the number of ranges (categories) to be used and how will be rounded the minimal and maximal value in each category.



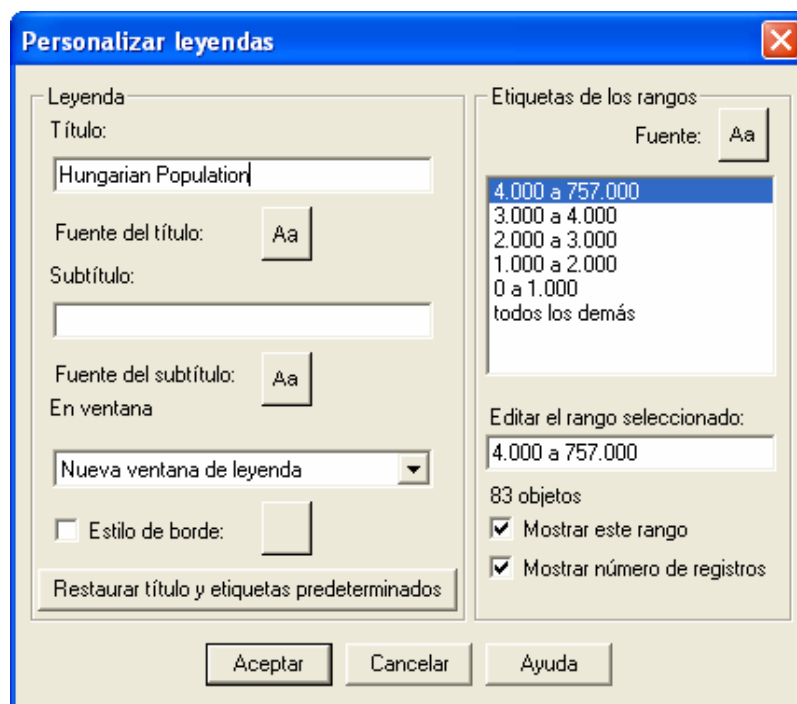
2. Selection of styles

Clicking the *Styles* button the *Customise Ranges Styles* dialog box is displayed, this box allows us to select the area colours to draw on our thematic map:



3. Making of legend

This option allows us to determinate the appearance of the legend. This dialog box let us to change the font properties of the title, and we can also add a subtitle determining its font properties too.



After doing some changes to the legend, we returned to the Layout window. Sometimes the legend did not appear on the layout and we had to add it by hand.

3.2.- Used Software

The programs used in this work are the followings:

Corel Draw (.cdr)

Corel Draw is a program for graphical design . We have not used this program but the original map was exported from Corel Draw to Autocad and later to MapInfo. This is a program used for drawing better than for cartography or GIS. Prof. Zentai Laszlo used Corel Draw to make the map for the historical Atlas, and it was structured in polylines, not in regions.

Excel (.xls)

This was the first program we used to type all the thematic data from the Atlas in a table. This program is used for working with different kind of databases. In our case we used Microsoft Excel only for storing the data and we did not make any operation. At the beginning we made only one database with the settlements of the three provinces ordered alphabetically. Later we separated the table in three parts(each province separated)and ordering it according to the province.

Autocad (.dwg)

Autocad is one of the most famous CAD software over the world. We have used different versions depending on the used PC. In one laptop we had Autocad 2000 and in the other one Autocad 2004, but there are quite similar and both versions contains the commands needed for our work. We used this program to work with the graphic data imported inDXF format from Corel Draw.

MapInfo (.map, .tab)

MapInfo is a Geographic Information System (GIS) software we used to create our application. This program has some different versions. The one which is in our laptop is the 7.5. in Spanish and the one in the computer of the university is the 7.0 but there are not too much differences between them and we had not any problem with this.

The GIS programs are divided in two groups: Raster and vectorial programs. MapInfo is included in the second group.

All data is stored as table (*.tab) files. These tables can contain just data values or data which has associated graphical data (symbols, lines etc.). Tables can be layered to build up composite map. The layers can be ordered as you wish and new layers can be added or removed as required. You can import your own data, either points (with coordinates) or thematic. Maps can also be customised changing the point and lines styles, the polygon fills...

Word (.txt, .doc)

Microsoft Word 2000 is a word processing program that allows us to create, publish, give format and print document. Microsoft Word is one of the word processing programs more sold and used at world-wide level. We have used this program to write this thesis and to explain all the steps we have followed.

PowerPoint (.pps, .ppt)

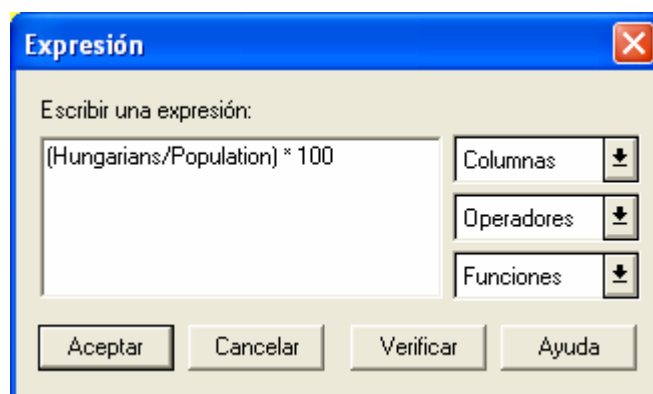
Powerpoint 2000 is the program of graphical presentations more used at present. It is included in the application package Office 2000, developed by Microsoft Corporation. Powerpoint 2000 allows us to create slides, transparencies, texts, diagrams, etc. All this can be included easily in a presentation with a logical order and an attractive appearance, composing our project presentation.

4. RESULTS

4.1.- Making the thematic maps

MapInfo offers several options (areas, diagrams, points, etc) to create thematic maps, but the selection of an appropriated method of thematic representation depends on the kind of data and the needed result. In our work we have done some examples of thematic maps with the different data about religion and nationalities.

First we made some thematic maps about each religion, but the results were not right because the most populated settlements were obviously the ones with the greatest amount of the selected religion. Considering it we decided to use the area of each settlement to calculate density of population. We added two new columns to the table, named *area* and *density of population*. The new problem was that *area* was not a real measure, because the map had not got geographical coordinates and the areas of the regions were not the real ones. We ruled out this option and we decided to create thematic maps calculating the *percentage* of each religion or nationality. In this example we can see how to put the expression to obtain the percentage related to the Hungarian population.



In the appendix we introduce some example of thematic maps can be created.

- 1.- The first map shows the percentage of Roman Catholics in each settlement using a range map and different green colours, from dark to light depending on the percentage.
- 2.- The second map uses also ranges for showing the percentage of Jewish people in each settlements.

3. The third is a zoom of the south of our working area representing by ranges the percentage of Hungarians, including also the names of the villages.
4. This map is a piece of the pie chart which shows in the pie the amount of Hungarian, Slovakian and German people, in red, blue and green. We chose this area because there were people of the three nationalities and the example is better.
5. The fifth map is a grid map of the percentage of Jewish people. The maximum value is 23 % and the minimum 0 %. The names of the villages are included but the polygons are almost invisible because only with colours and names of settlements the result is more understandable.
6. This is a bar chart of the amount of Hungarian people, in red colour. The example is also a zoom of a piece of the map.

4.2.- Purpose for other future analysis

In this thesis we have done just the previous work of a GIS application, joining the thematic and graphic data, ready for using in the application. After that we have included some examples of thematic maps which can be created using these data. But there are more purposes for future analysis.

There are several options for the creation of thematic maps. The first step is choosing the column or expression we are going to use in the map. For example, creating a map about the amount of Hungarian offers different possibilities. The map can be created just using the column "Hungarians" , the percentage of Hungarians as we have explained before, or the density of Hungarians per km².

But the map has not geographic coordinates so the measures in the map are not real. Mapinfo automatically calculates the cartesian area of all the regions but this area is not correct. Giving the coordinates to the map would be possible to calculate the real area of all the settlements and then dividing the population by this area we could know the density of population and the density of Hungarians, Germans, Catholics, Jewish... of each settlement. This is one purpose for future analysis of the data.

The second step is the selection of the kind of map we needed. There are 8 different options: Prisme map, bar chart, graduated, dot density, ranges, grids and pie chart. Depending

on the data will be better to use one or the other. In another analysis we can include examples of all the options and say which ones are appropriated and which ones are not, and why.

Adding new columns to the map, as for example the elevation, the temperature, the precipitations, the roads or the hidrography... the possibilities will be much more. These data are not just usable for creating thematic maps, but also for decising the best location for an enterprise, a campsite, a new road...

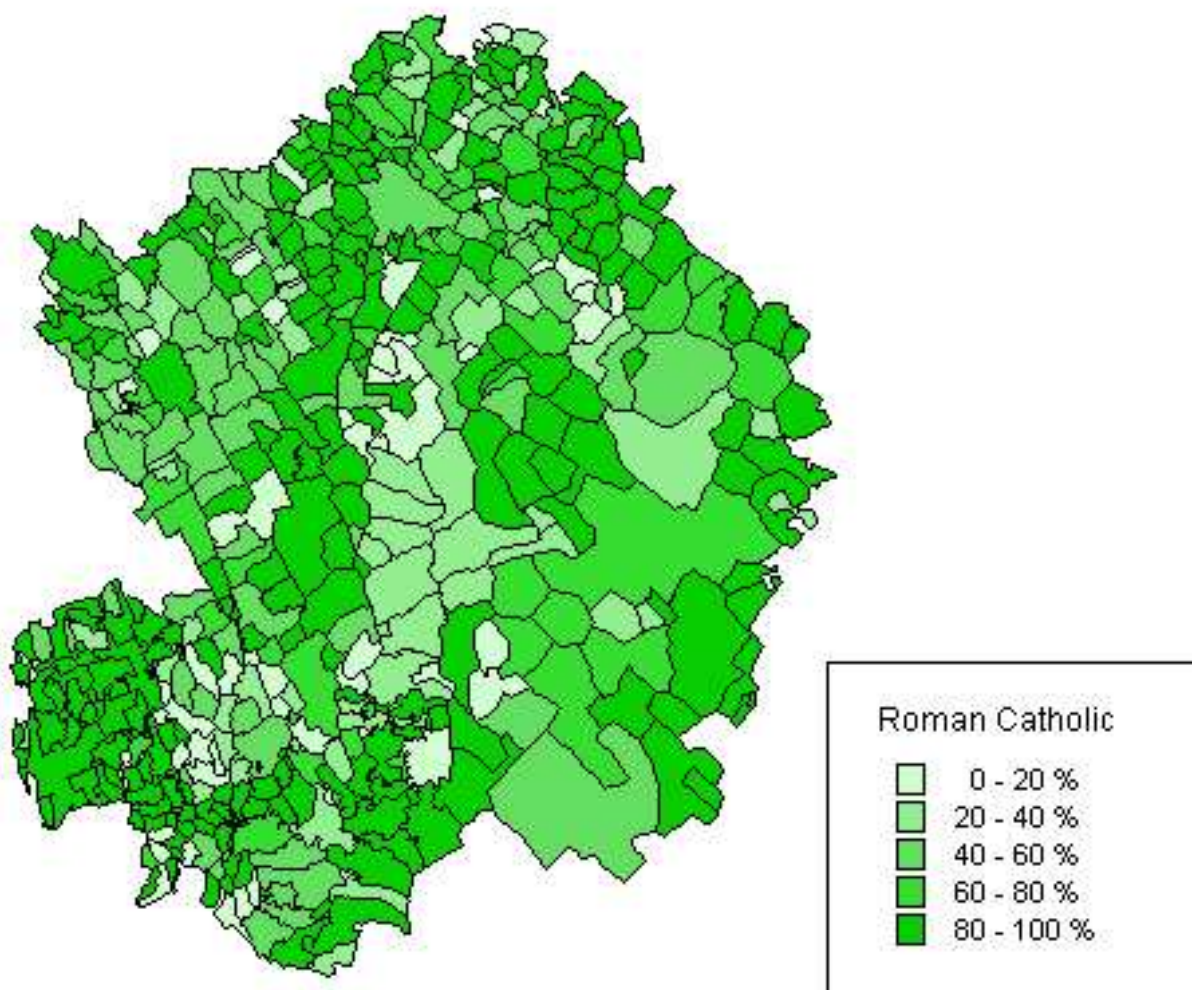
The most interesting purpose in our opinion is looking for this kind of information about religion and nationalities but the current data. Then is possible to compare both data and analyse this information with the help of the thematic maps. Using the maps is really easy for any user to realice about the changes of population and religious groups in the last century, comparing the same map in 1914 and nowadays.

5. BIBLIOGRAPHY

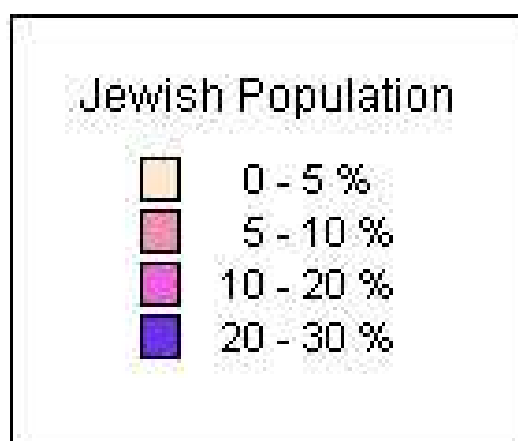
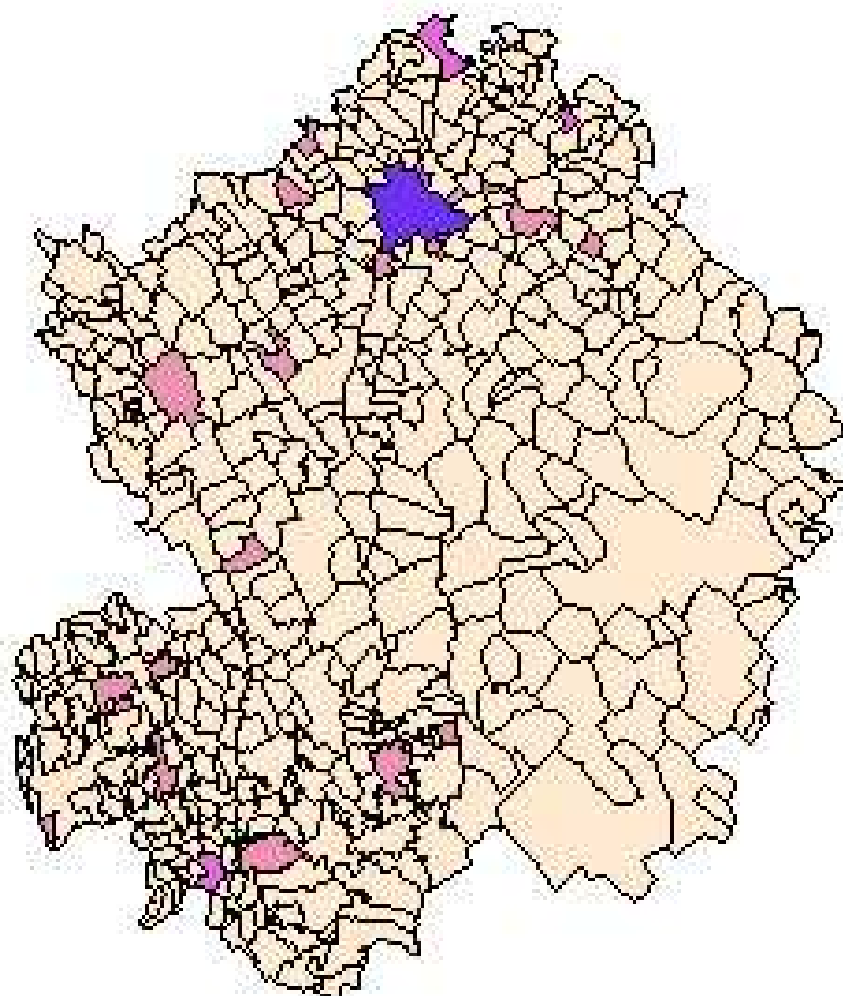
- A Történelmi Magyarország Atlasza és Adattára 1914 ("Atlas and Gazetteer of historical Hungary in 1914")
- http://www.bodley.ox.ac.uk/guides/maps/mi_guide.pdf
- <http://www.empresas-hungaras.com/Hungria2/espanol/Historiahungara.html>
- http://en.wikipedia.org/wiki/History_of_Hungary
- http://es.wikipedia.org/wiki/Imperio_Austro-h%C3%BAngaro
- <http://www.gotohungary.com/history/history.shtml>
- http://www.hungria.org.br/historia_de_hungria.html
- <http://terkeptar.elte.hu/edit/>

6. APPENDIX

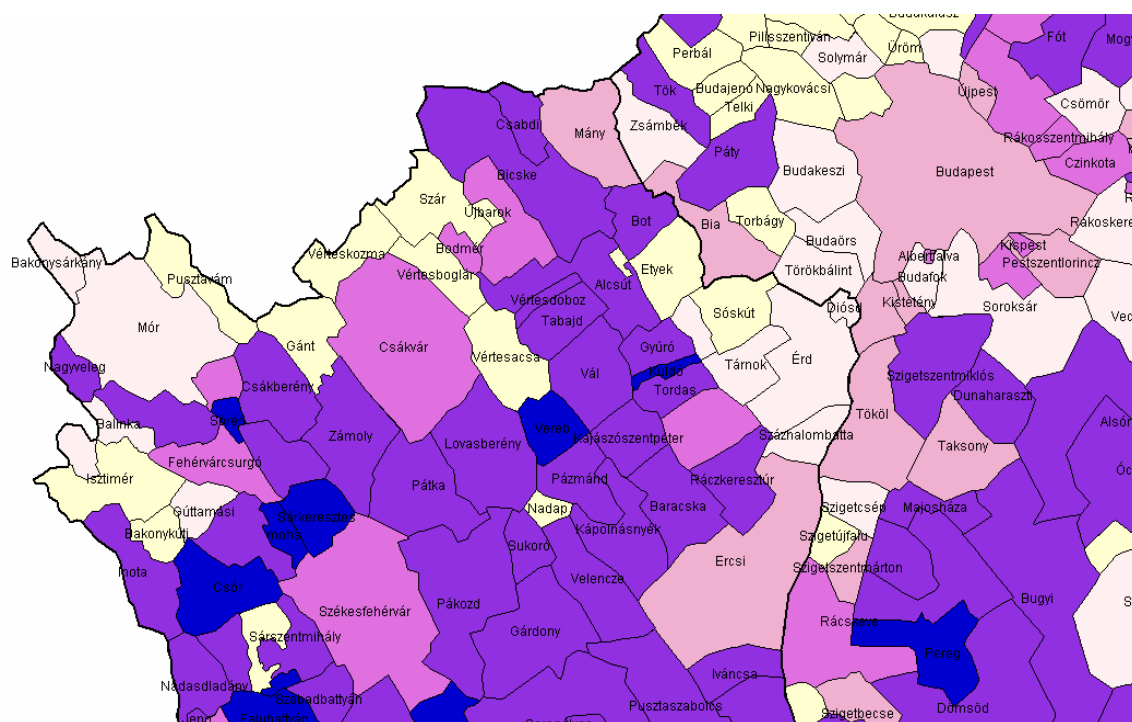
1. Map



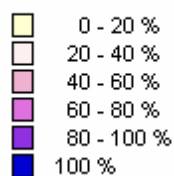
2. Map



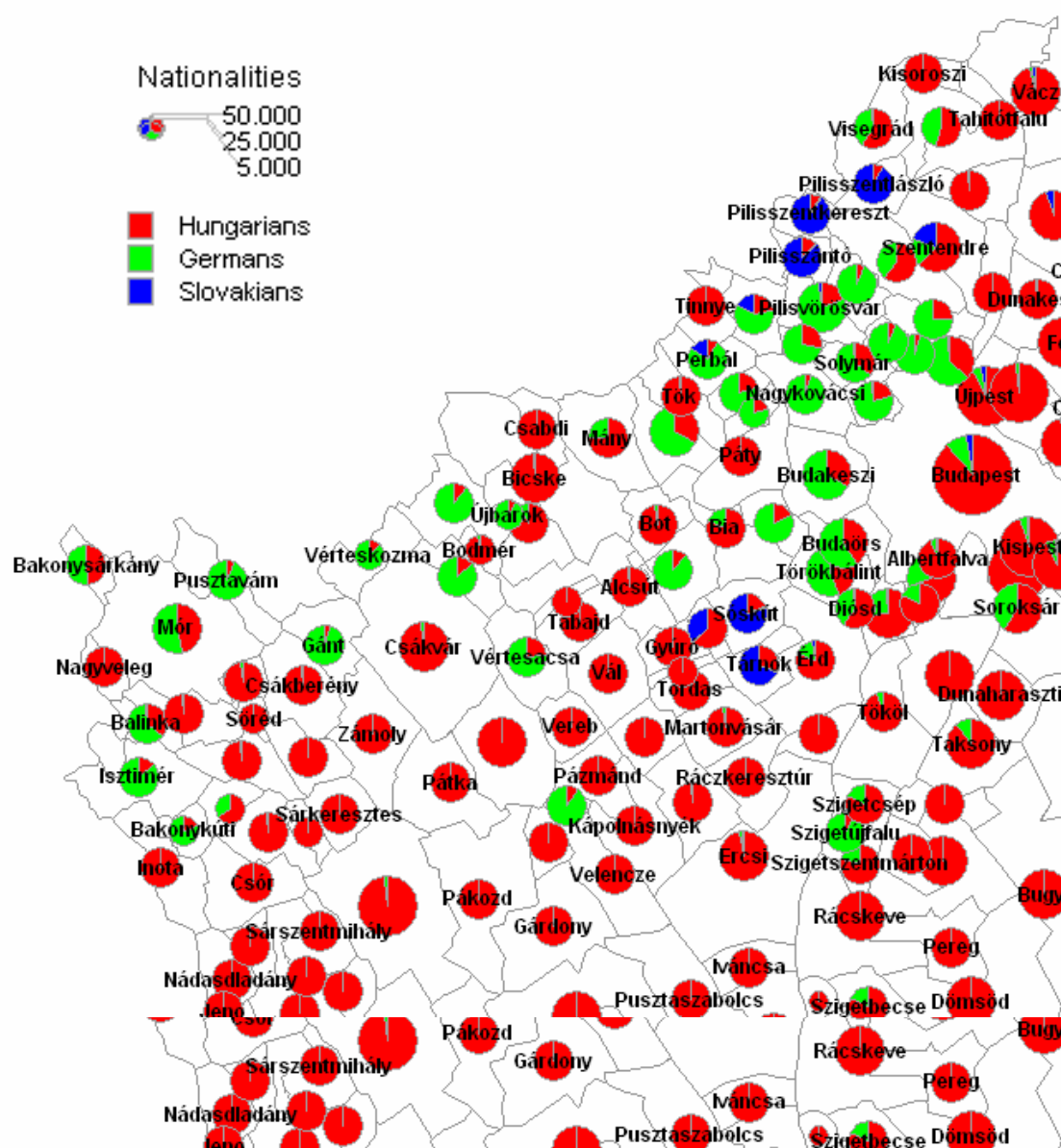
3. Map



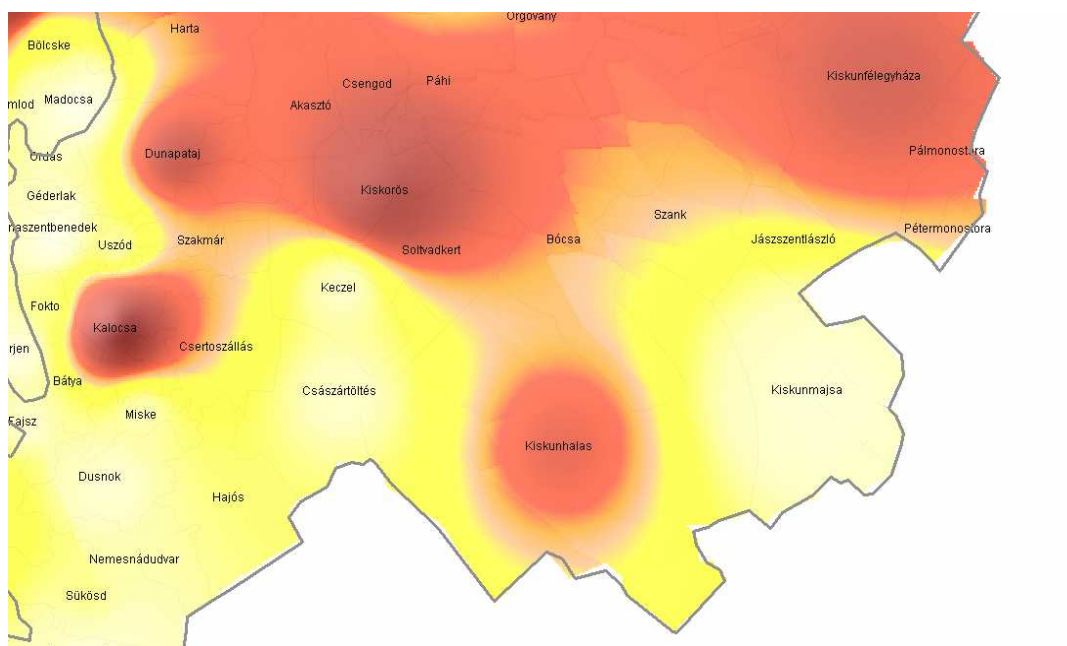
Hungarian Population



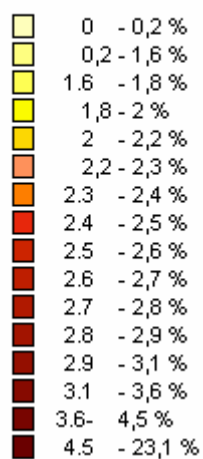
4. Map



5. Map



Jewish percentage



6. Map

