IN4089 - Data Visualization - InfoVis Project (2021)
T. Höllt (Editors)

Short Paper

Visual Insights into the European Migrant Crisis

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Abstract

One of the biggest, most controversial news topics of the last decade has been the European Migrant Crisis. In this paper, we have identified problems in the reporting of the crisis, and try to bring solutions to these problems using dynamic data visualisation. We elaborate on our process towards choosing suitable graphs and setting the right boundaries on our data. The results show that our implementation succeeds at its task, but also contains sufficient points of improvement for future work.

1. Problem analysis

The European Migrant Crisis (EMC) has been a major topic of debate in Europe for the last decade, as thousands of migrants have died trying to reach European mainland [Cri]. An overwhelming amount of the European population is dissatisfied with how the EU handles the crisis [Pou20]. Complicated problems such as the EMC ask for scientific, balanced reporting. Visualisation can effectively convey data of the crisis, and is therefore often used by newspapers to support their stories. Static graphs, however, can only show parts of the problem at once. A dashboard with dynamic graphs that sheds a light on different aspects of the EMC can provide for a fuller comprehension of what is actually going on. Furthermore, a problem that arises with the extensive news coverage of the crisis is that the human aspect of the migrants is lost in the continuous stream of numbers. This undermines our ability to judge the crisis accordingly.

In this paper we present our contribution to solve these problems using data visualisation. To target all the problems, we asked ourselves the following questions:

1. How can we best show where the migrants originally come from and what their entrances to Europe are?
2. What is the best way to represent the main countries of origin of the crisis?
3. How can we counter the tendency to see the migrants as just numbers using data visualisation?

In the following chapter, we will present our answers to these questions and substantiate our chosen methods. We will then evaluate our results, after which we shortly discuss some limitations and possible improvements.

2. Justification

We first had a brainstorm session to identify the aspects of the EMC we wanted to represent. This resulted in 3 aspects that were connected to the questions, for which we had to find data and implement suiting graphs. Because of the urgency of the EMC for over a decade, a lot of data has been gathered. Namely the UNHCR had a database from which we got an extensive amount of information. We then set the boundaries of our problem domain. In the following subsections we will first explain those boundaries. Then we will talk about our chosen graphs, and justify why these are best suited in our case.

2.1. Problem domain

The first choice we faced was what countries to include in our data. The EMC started largely due to conflicts in parts of the Middle-East, Asia and Africa. Examples of these are the Syrian civil war, the rise of ISIS, terrorist groups in Nigeria, and human-rights abuse in Eritrea [BFH*98]. Because of this, we decided to focus on the countries belonging to the Middle-East with the inclusion of Afghanistan and Pakistan [Wik21], and on the countries belonging to the African continent [Wor]. A full alphabetical list of the countries included can be found in our appendix.

After this, we had to make a decision on what years to include. Articles use different years for the beginning of the EMC, but a much used year is 2011 [Fak16], which we also picked as initial point. Because we also wanted to show the increase in migration when compared to the situation before the EMC, we visualised our data from 2009 to 2020.

2.2. Migration routes

The first question we wanted to answer is that of the main entrance points to Europe. We chose to use a map of a portion of the world, to show the actual routes that migrants take. The justification for this is easy, as it is the clearest way to show a geographical route. We additionally made the map dynamic, so that it can show the migration routes through the years. We also wanted to visualise what the main routes are by scaling the arrow size on the routes that are most

prominent. With these additions, we tried to show the impact that events such as the Syrian civil war have on migration routes. Note that these visualized routes remain averaged abstractions based on literature, and do not represent scientifically obtained geographical data.

2.3. Main countries involved

Besides showing the main migration routes to Europe, we wanted to provide insights into what countries are the main countries of origin, and what the most popular destinations of the migrants from those countries are. A couple of graphs for this purpose were discussed. One of them was a pie chart for the countries of origin, to show the relative proportions. However, we also wanted to show the possible increase and decrease in migration over the years. Because of this, we chose to represent the countries of origin in the form of a stacked bar chart. This way, both the trend of migration over the years and the relative proportions can be visualised, as can be seen in Figure 3.

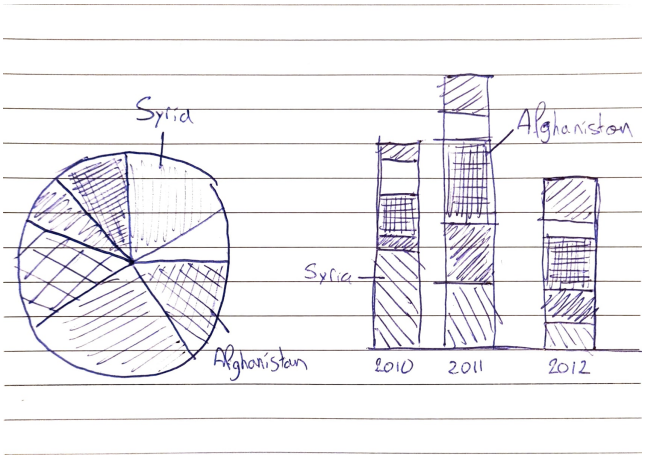

Figure 1: *Sketch used during the decision making process. In this case we chose the stacked bar chart, so that at all times the increase and decrease over the years is visible.*

As the list of countries belonging to Africa and the Middle-East is extensive, we decided to set boundaries on what countries we explicitly would show. For the countries of origin, we decided to show those countries that for at least one year were responsible for more than 6% of the total immigration to Europe, where the countries of our problem domain account for the total. The list of countries that this cutoff produces is justified by the extensive coverage of those countries in articles about the EMC. The other countries are combined into a single category called 'Other'. A category called 'Unknown' was also responsible for more than 6% of the total migration during multiple years in our data, which is why we decided to also explicitly show this category.

2.4. Humanize migrant statistics

The last question that we wanted to answer is how the numbers about migrants can be brought out of statistical anonymity using data visualisation. This can be tricky, as data visualisation by definition is a way to easily present numbers to people. For this task, we found inspiration in the beautifully visualised video *The Fallen of World War II* [Hal16]. In this video, the presenter compares WWII casualties between countries by stacking little illustrations of a person on top of each other. The effect is that the viewer gets a grip for the staggering amount of deaths during the war, especially on the Russian side, while the illustrations also trigger the viewer emotionally. We decided to use a similar representation for the amount of migrants that went missing or that died during attempts to cross the Mediterranean Sea over the years, by representing them with a cross. With this, we wanted to achieve a similar effect; making the visualisation both informative and thought-provoking.

3. Evaluation

Overall, the map showing the migration routes worked well. The different years showed different popularity in the routes, where a tumultuous year like 2015 properly displayed an enormous increase in routes from the Middle-East. Other interesting observations were that the Western Mediterranean route only became popular after 2017. The scope to which the map represented the true change in traffic was limited, as the increase in migrants was so big in 2015 that we needed to use a minimum and maximum scaling factor to prevent the arrows from completely covering the map. Nevertheless, the map does a good job at showing what migration routes were used differently and with different intensity over different years.

The stacked bar chart performed as we expected. It clearly shows the peaks in 2015 and 2016, coming mostly from Syrian refugees, which conforms with the routes on the map. Because the corresponding bar appears only when arriving at a given year, the chart provokes an element of surprise in the viewer.

The representation of the people that died or went missing during their crossing of the Mediterranean Sea is harder to evaluate, as the impact that it makes differs per person. The graph does, however, succeed in conveying the order of magnitude of the amount of people that die or go missing there.

4. Discussion

While we are generally pleased with how our data visualisations worked out, there is however still enough room for improvement. Certain improvements that could be made are better implementations of routes based on data covering country of origin, as the routes are now based on literary sources. Furthermore, the speed of migration would be a very suitable visual aspect to integrate. However, the current data for this was insufficient to give a reliable view on this. A difficulty was also to properly scale the arrow vectors due to the enormous amount of migration in 2015, which was eventually done with the minimal and maximal scaling factor. An omission in the map visualization is a possibility to view absolute numbers, for example by hovering over different routes. This would enhance the informational potential of the map, whereas now for reference the stacked bar chart has to be consulted for an indication of more absolute migration numbers.

References

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[Cri] Refugee crisis in europe: Aid, statistics and news: Usa for unhcr. URL: https://www.unrefugees.org/emergencies/refugee-crisis-in-europe/. 1

[Fak16] FAKHOURY T.: Securitising migration: The european union in the context of the post-2011 arab upheavals. *The International Spectator 51*, 4 (2016), 67–79. doi:10.1080/03932729.2016.1245463. 1

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[Pou20] POUSHTER J.: European opinions of the refugee crisis in 5 charts, Aug 2020. URL: https://www.pewresearch.org/fact-tank/2016/09/16/european-opinions-of-the-refugee-crisis-in-5-charts/. 1

[Wik21] Middle east, Dec 2021. URL: https://en.wikipedia.org/wiki/Middle_East. 1

[Wor] Countries in africa:. URL: https://www.worldometers.info/geography/how-many-countries-in-africa/. 1

Appendix

Additional images

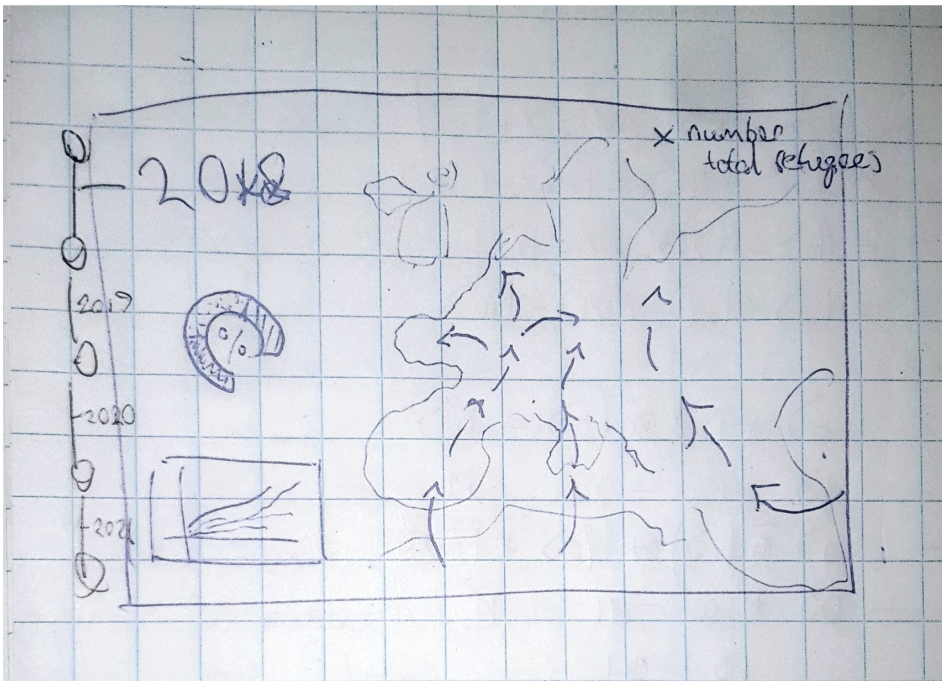

Figure 2: *Prototype of the dashboard we envisioned.*

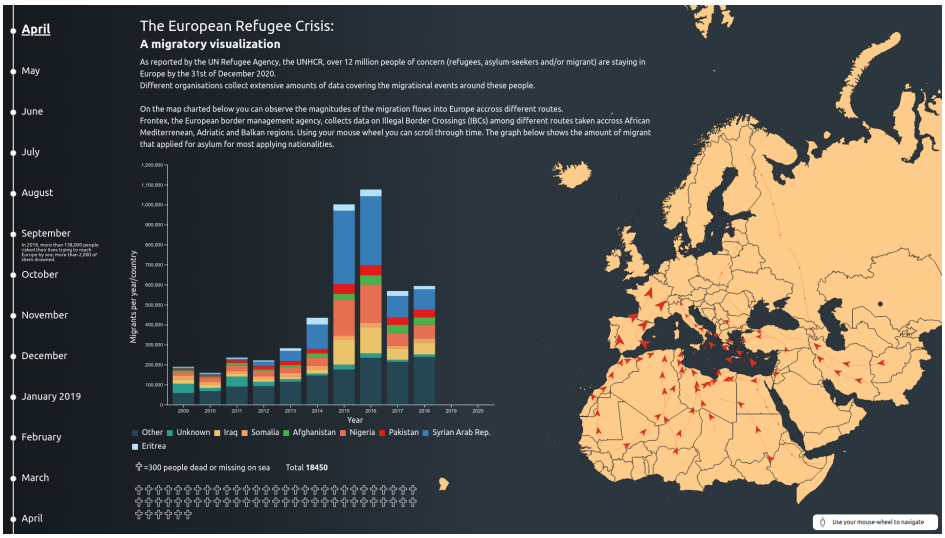

Figure 3: *The final dashboard that was developed.*

Data sources

Organisation	Chart	URL
Frontex	Map	https://frontex.europa.eu/we-know/migratory-map/
UNHCR	Stacked bar chart	https://www.unhcr.org/refugee-statistics/
UNHCR	People missing/dead in Mediterranean Sea	https://data2.unhcr.org/en/situations/mediterranean/location/676

Countries of origin included

Africa	Middle-East	Also Included
Algeria	Akrotiri and Dhekelia	Afghanistan
Angola	Bahrain	Pakistan
Benin	Cyprus	
Botswana	Egypt	
Burkina Faso	Iran	
Burundi	Iraq	
Cabo Verde	Israel	
Cameroon	Jordan	
Central African Republic	Kuwait	
Chad	Lebanon	
Comoros	Oman	
Congo	Palestine	
Côte d'Ivoire	Qatar	
Djibouti	Saudi Arabia	
DR Congo	Syria	
Egypt	Turkey	
Equatorial Guinea	United Arab Emirates	
Eritrea	Yemen	
Eswatini		
Ethiopia		
Gabon		
Gambia		
Ghana		
Guinea		
Guinea-Bissau		
Kenya		
Lesotho		
Liberia		
Libya		
Madagascar		
Malawi		
Mali		
Mauritania		
Mauritius		
Morocco		
Mozambique		
Namibia		
Niger		
Nigeria		
Rwanda		
Sao Tome & Principe		
Senegal		
Seychelles		
Sierra Leone		
Somalia		
South Africa		
South Sudan		
Sudan		
Tanzania		
Togo		
Tunisia		
Uganda		
Zambia		
Zimbabwe		