Visualizing the Relationship Between Immigration and Terrorism

Tom van den Bogaart, Iason de Bondt, Kewin Dereniewicz, Joran Iedema, and Tom de Jong

University of Amsterdam, Amsterdam, The Netherlands

Abstract. This work explores the relation between immigration and terrorism through an information visualization. The core of this project is an interactive geographical visualization. This visualization enables the viewer to further explore this relation, with respect to factors such as religion, income, education, terrorist groups, and the motivation behind the attacks. The project aims to create more understanding of the complex dynamics of terrorism. Furthermore, this project can be used to investigate the validity of a number of claims that are expressed by the mainstream media.

1 The Concept

During the last two decades, Western Democracies have experienced a rise in the popularity of populism. Many populist parties feed of the public fear for Islamic terrorism.

Populist parties generally argue that terrorism is correlated with immigration from Muslim countries. The current study uses information visualization to investigate whether there is any validity to this claim. The research question that this study aims to answer is: "What is the relation between immigration and terrorism?". The motivation of this project is to understand the complex dynamics of immigration and terrorism.

1.1 The Visualization

As discussed by Guo et al (2006) it is difficult to address terrorist attacks from an information visualization point of view. This is due to the fact that some patterns can only be shown by depicting one dimension at a time. Therefore, the current study uses a number of layers, to depict the different variables that are important with respect to migration and terrorism.

First Level Visualization This study's main visualization consists of an interactive geographical map. The number of deaths as a result of terrorism will be shown as a heat layer, whereas immigration flows are shown as arrows. At the first level visualization, and throughout the deeper layers, users are able to change the time interval.

Second Level Visualization From the top level visualization, users can select individual countries, immigration flow, and specific terrorist attacks. Selecting any of these aspects takes the user to a deeper layer of the visualization.

Countries. When a country is selected, the user is taken to a new visualization that provides an in-depth overview of the relation between immigration and terrorism in that country. This view on the one hand visualizes aggregated data on terrorism in that country, showing the groups, sort of attacks, and general motivation behind these attacks. On the other hand, the type of immigration is shown. For instance, what motivated the migration, and what is the overall religion and level of education of the immigrants.

Immigration Flows. When an immigration flow is selected, a visualization of that particular flow is presented. In this visualization, characteristics such as the reason of the immigration flow, religion, income, and age are depicted.

Terrorist Attacks. Upon selecting a specific terrorist attack, a visualization of that terrorist attack is shown. For instance, the number of innocent deaths, terrorist deaths, terrorist group, the motivation behind the attack, and the type of attack are visualized.

Third Level Visualization After completing the above visualizations, our group aims to add a third level to the visualization. For instance, upon selecting a country, we want to enable the viewer to select a city within that country. Similar options will be added for the *Immigration Flow* and *Terrorist Attack* layers.

2 The dataset and the variables

2.1 The dataset

There are two datasets that are going to be used in this project - *Global Terrorism Database* (GTD) and *UN International Migrant Stock* (UNIMG).
The first one includes systematic data on international terrorist incidents that have occurred in the last 46 years and includes more than 170,000 cases.
The second one contains detailed information regarding international migrations for years 1990, 1995, 2000, 2005, 2010, 2015 and 2017.

2.2 The Variables

The GTD dataset contains over 100 variables. Each incident has various information such as the type of the attack, target, location, whether it was a success, summary etc.

The most relevant variables to our project include:

- Time
- Country
- City

- Coordinates
- Attack Type
- Target Type
- Terrorist Group Name
- Number of casualties

The UNIMG dataset contains numbers of people who migrated from origin to destination country in a given year. Variables include:

- Year
- Origin
- Destination
- Number of people
- Income
- Religion
- Age

3 Description of the data gathering process

3.1 Gathering

The GTD dataset was retrieved from the website of the National Consortium for the Study of Terrorism and Responses to Terrorism (START) in excel format [2]. The UNIMG dataset was accessible on the website of the United Nations in an excel file [3]. We extracted relevant information to a csv file.

3.2 Integration of different sources

Both datasets contain different information. They are, however, oriented in time and space which allows for merging them.

3.3 Cleaning of the data

This work's aim is to visualize a global state per country. As such, the data in both datasets need to be filtered and aggregated per country. To make the visualization the d3.js Javascript library is used. The d3.nest function is used to group the data in an array of objects, where each object has a key property. With the key function values of the individual variables can be returned.

The UNIMG dataset contains additional information such as grouped countries which needs to be removed. For the GTD dataset we need to set a threshold to filter out migrations of small groups of people. In order to visualize the type of attack and the type of target, some columns in the dataset will be merged together.

References

1. Clarke, F., Ekeland, I.: Nonlinear oscillations and boundary-value problems for Hamiltonian systems. Arch. Rat. Mech. Anal. 78, 315–333 (1982)
2. https://www.start.umd.edu/gtd
3. http://www.un.org/en/development/desa/population/migration/data/estimates2/estimates17.shtml