Mini Project - Palestine-Israel Conflict Fatalities

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Abstract

The purpose of this project is to develop a comprehensive and interactive data visualization solution that presents a detailed analysis of the Palestine-Israel conflict from 2000 to 2023. Utilizing a rich dataset compiled from various reputable sources, the project aims to offer an informative and accessible platform for understanding the complexities of the conflict. The visualizations are designed to cater to a diverse audience, including researchers, educators, policymakers, and the general public. The core objective is to provide an unbiased, data-driven perspective that illustrates the temporal and spatial dynamics of the conflict, including fatalities, incidents, and their socio-political context. This project leverages advanced data visualization tools and techniques to create a user-friendly interface that allows users to explore and interpret the data in meaningful ways. The ultimate goal is to foster a deeper understanding of the conflict and contribute to informed discussions and analyses.

Motivation and objectives

The ongoing Palestine-Israel conflict, with its profound implications on regional and global politics, has generated vast amounts of data over the years. However, this data is often scattered and presented in a manner that does not facilitate easy comprehension or analysis. The lack of a consolidated, interactive platform that can present this data in a coherent and insightful manner motivates this project.

With this information is possible to create rich and informative visualizations which allow the user to have an overview of the conflict and allow the recognition of patterns and trends in the data. By doing so, we hope to contribute to a more informed understanding of this long-standing issue.

Users and the Questions

To enhance comprehension of the necessary visualizations and their application, it is essential to identify and analyze the prospective users of the platform, along with the information they can derive from it.

Characterization of the users and their context

The platform will serve a diverse group of users. Academics and researchers focused on Middle Eastern politics and conflict resolution will find it useful, as will policymakers and diplomats working in related areas. Educators and students looking to grasp the historical and present aspects of the conflict will benefit from it. Journalists and media professionals needing accurate information for reporting will also find it valuable. Additionally, NGOs and humanitarian organizations involved in human rights and peacekeeping efforts, as well as members of the general public interested in the conflict, will find the platform informative and engaging.

Questions to Answer

With this project, we wanted to provide a coherent visualization application of the various facets of the conflict such as:

- **Historical Trends** - Visualize how the conflict evolved throughout the years and identify trends from the fatalities.
- **Demographic Details** - Visualize the age distribution of fatalities, and how it correlates with the timeline of events.
- **Gender Analysis** - How do casualties break down by gender, and what patterns emerge from this data.
- **Geographic Distribution** - What are the patterns of fatalities across different cities and regions within the conflict zone.
- **Conflict Intensity** - In what ways has the intensity of the conflict varied in different locales and times?
- **Casualty Causes** - What types of weaponry and violence have resulted in fatalities, and how does this vary by region and over time?

Dataset

As a data source, we used a dataset from Kaggle, titled **Fatalities in the Israeli-Palestinian**

Conflict. This dataset chronicles the conflict from the year 2000 until July 2023 meaning that information from the latest event is not available. The complete data is compacted in a single CSV file where each entry represents a fatality with relevant information where key fields include the date and location of each event, providing temporal and spatial context. Demographic information such as the age and gender of fatalities allows for demographic trend analysis. Additional fields detail the circumstances of each fatality, categorizing them by type of injury and identifying the involved parties.

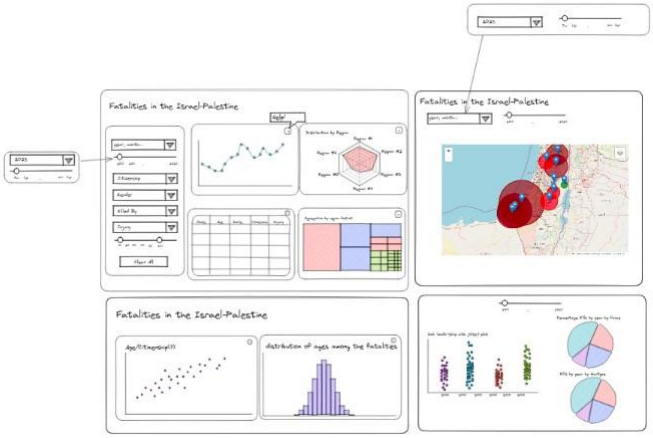
Visualization Solution

The final solution was achieved over several iterations following a user-centred approach. The first iteration consisted of the analysis of the dataset and the brainstorming of suitable visualizations to develop. Subsequently, a low-fidelity prototype hand-drawn was developed to be submitted to tests by our course colleagues to get external feedback and improve our initial solution. Each tester was challenged to solve simple tasks and rate them in complexity.

With the feedback acquired, a functional prototype was developed with D3.js to build the visualizations and React.js to develop the UI. Achieved the functional prototype, the next step was to submit it to a Heuristic Analysis following Nielsen's ten usability heuristics.

Low fidelity prototype and user feedback

Having done the dataset analysis and the main questions defined, the next step was to develop the paper solution. In this initial solution, four pages were developed.

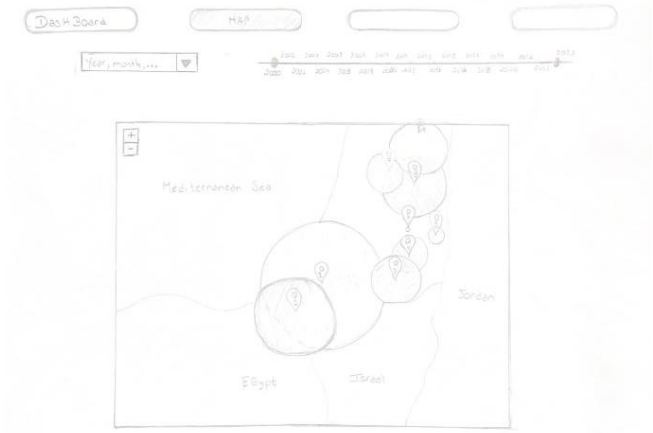


Picture 1 - First Prototype in Excalidraw Page 1

The first page was thought to work as the homepage of the website, where the main interactions would be. With this in mind, four visualizations were designed with the purpose of answering the Historical Trends, Demographic Details, Geographic Distribution and Casualty Causes referred to before. To have a more dynamic view of the data some filters were thought making the distinction between citizenship, gender, and time limit.

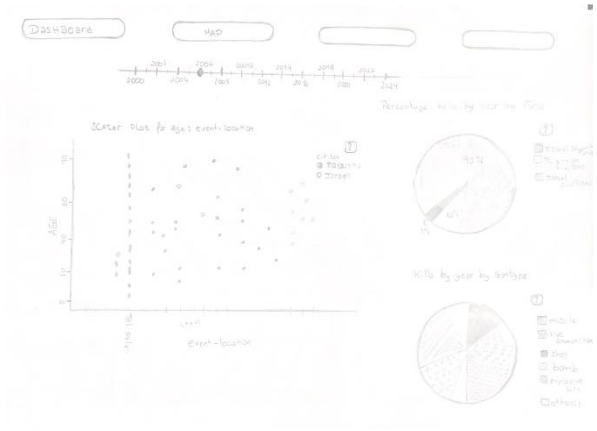
Picture 2 - Paper Prototype Page 1

The second page was designed to serve as a geographic visualization of the conflict highlighting the areas of more fatalities and to be filtered between time spans.



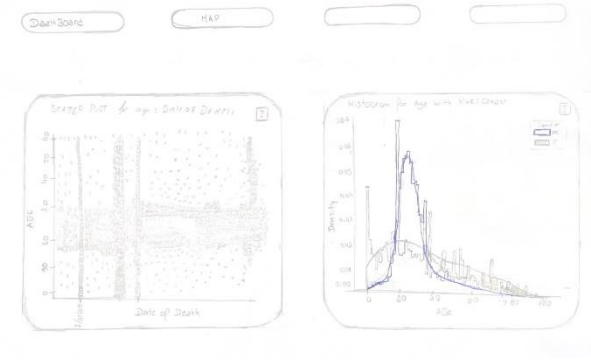
Picture 3 - Paper Prototype Page 2

On the third page, three visualizations were brainstormed: the first one would be a scatter plot to visualise the age fatality distribution over the various event locations, the second would be a pie chart to display the fatalities distribution by the military forces and another pie chart to display the distributions of weaponry used in the conflict.



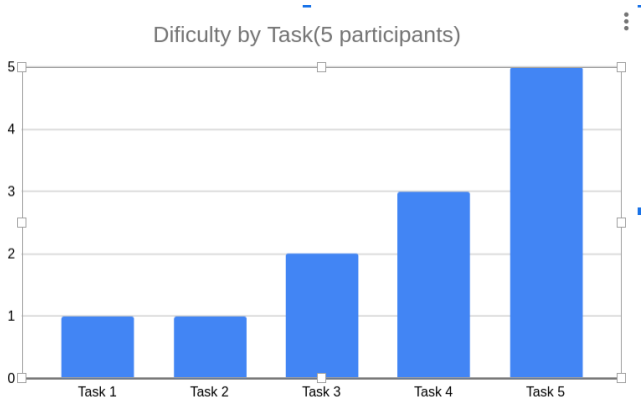
Picture 4 - Paper Prototype Page 3

Lastly, the fourth page is designed to have two plots to display the age distribution of fatalities through time to identify patterns in the dataset. The last visualization drawn was a histogram to display the difference in fatalities between males and females by their age.



Picture 5 - Paper Prototype Page 4

With the low-fidelity prototype ready, we presented to our colleagues to perform a usability evaluation through a series of tasks which included the identification of patterns in the dataset and the use of filters.



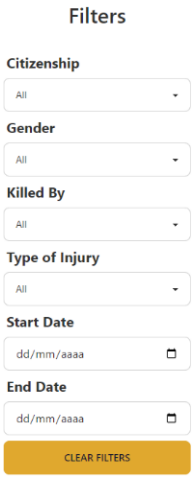
Picture 6 - Form Result from the users who performed the tasks

Functional prototype

The feedback acquired in the last iteration provided useful ideas that were not thought of in the first stage. The idea that got more interest from the testers was the filtering feature and during tests, several users asked if it would be possible to make all the visualizations filtered.

Filters

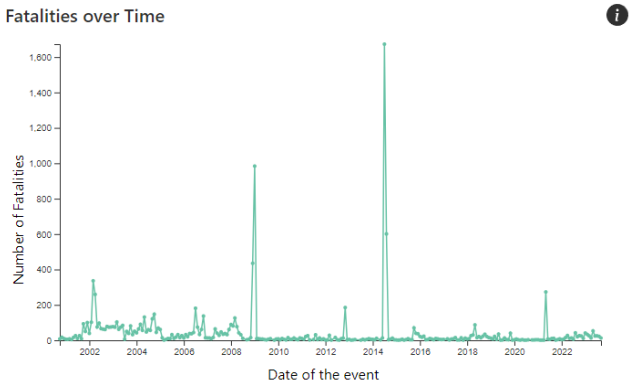
This idea of global filtering made us rethink the design of the application, centralizing all the visualizations on the same page. Firstly, we rethought the filters to be implemented, and most of the filters were kept with just a simple change where the start date and end date instead of being a range it was transformed into two inputs that allow a more precise definition of the desired date. With this change, the need for a filter between months and years was discarded.



Picture 7 - Filter box

Fatalities over Time

This plot displays the number of fatalities in the Israel-Palestine conflict over a specified time period. The vertical axis represents the number of fatalities, while the horizontal axis represents the date of the events. Spikes in the graph likely indicate specific incidents or escalations in the conflict that resulted in a higher number of deaths. Users can analyze patterns over time, observe periods of increased conflict intensity, and identify any trends or anomalies in the data.



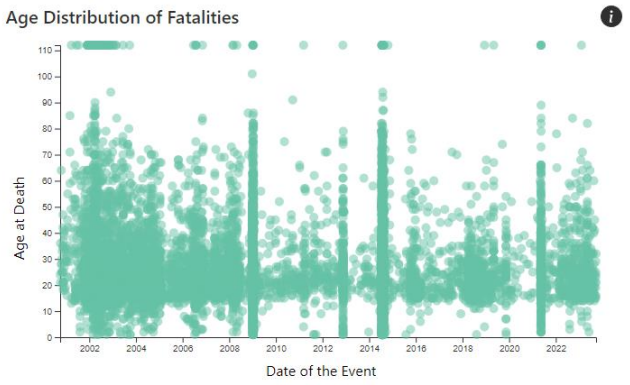
Picture 8 - Line Plot of Fatalities over time

Age Distribution of Fatalities

This scatter plot illustrates the age distribution of individuals who died in the Israel-Palestine conflict, plotted over time. Each dot represents a fatality,

with the vertical axis showing the age at death and the horizontal axis indicating the date of the event.

The clustering of dots at specific ages may indicate demographics that are more affected during certain times. This visualization helps understand the impact of the conflict on different age groups over the specified period.



Picture 9 - Scatter Plot of Age Distribution of Fatalities

Fatalities Record

This table presents a record of individual fatalities in the Israel-Palestine conflict. It includes detailed information such as the name of the deceased, date of death, age, gender, citizenship, location of the incident, and the party responsible for the fatality. The table is meant to provide a humanizing element to the data by acknowledging each person as an individual, which can often be lost in large datasets. This record can be essential for human rights documentation, journalistic reporting, and historical archiving.

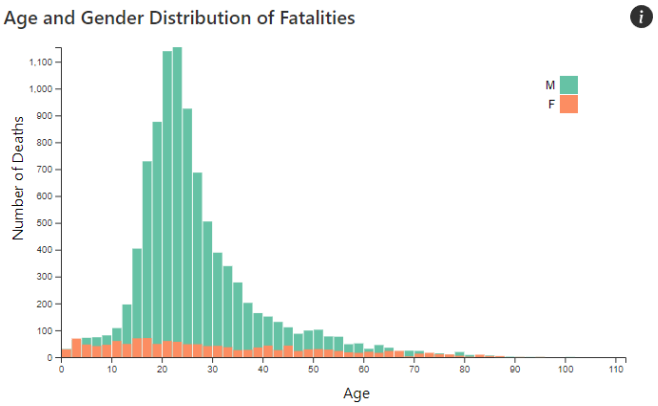
Fatalities Record

Name	Date	Age	Gender	Citizenship	Location	Killed By
'Abd a-Rahman Suleiman Muhammad Abu Daghash	2023-09-24	32	M	Palestinian	Nur Shams R.C.	Israeli security forces
Usayed Farhan Muhammad 'Ali Abu 'Ali	2023-09-24	21	M	Palestinian	Nur Shams R.C.	Israeli security forces
'Abdallah 'Imad Sa'ed Abu Hassan	2023-09-22	16	M	Palestinian	Kfar Dan	Israeli security forces
Durgham Muhammad Yihya al-Akhras	2023-09-20	19	M	Palestinian	'Aqbat Jaber R.C.	Israeli security forces

Picture 10 - Fatalities Record

Age and Gender Distribution of Fatalities

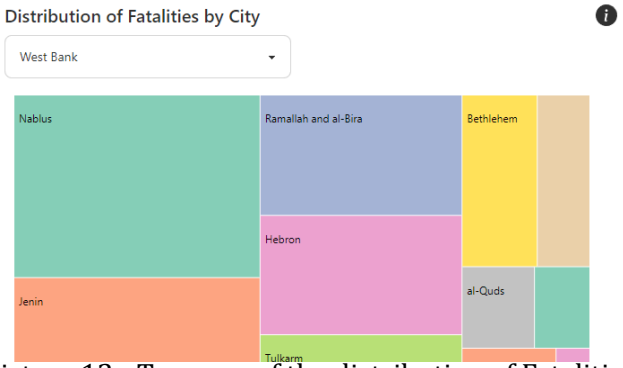
This bar chart shows the number of fatalities in the Israel-Palestine conflict by age and gender. The horizontal axis represents age, and the vertical axis shows the number of deaths. Different colours in the bars represent gender, allowing for a visual comparison between male and female fatalities across different age groups. This graph can help in understanding how the conflict impacts different demographics and may be useful in policy formation and humanitarian efforts.



Picture 11 - Histogram of Age and Gender Distribution of Fatalities

Distribution of Fatalities by City

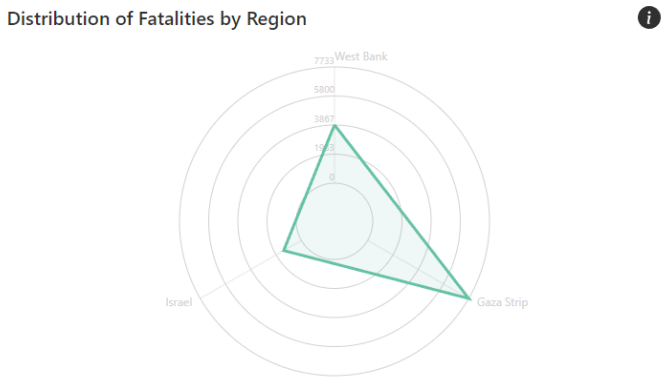
The treemap represents the distribution of fatalities by city within a selected region, such as the West Bank. Each block's size is proportional to the number of fatalities in that city, with colours assigned randomly for visual differentiation. This visualization helps to identify the areas with the highest incidences of fatalities and can guide resource allocation and further analysis of the conflict's urban impact.



Picture 12 - Treemap of the distribution of Fatalities by city

Distribution of Fatalities by Region

This radar chart compares the number of fatalities in different regions, such as the West Bank and the Gaza Strip. Each axis represents a region, and the plotted shape shows the relative number of fatalities in each area. A larger area covered by the shape indicates a higher number of fatalities. This chart can provide insights into the geographical spread of the conflict's impact.



Picture 13 - Radar Chart of Distribution of Fatalities by Region

Types of Weaponry Used in the Conflict

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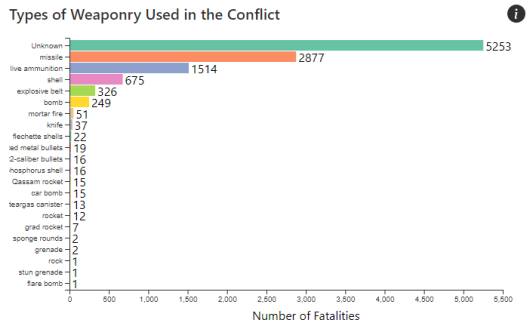
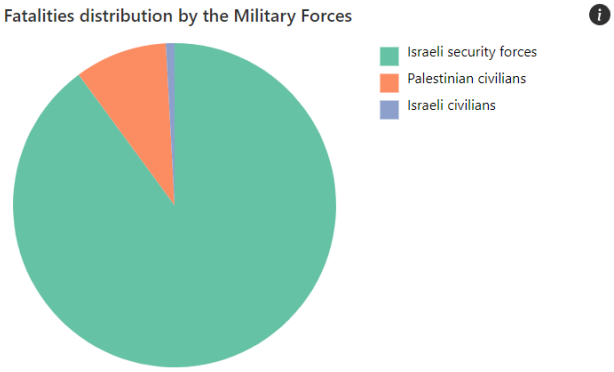


Picture 14 - Barplot of Types of Weaponry Used in the conflict

horizontal bar chart illustrates the types of weaponry used in the conflict and the associated number of fatalities. The horizontal axis shows the number of fatalities, and the vertical axis lists the types of weapons. The length of the bar represents the fatality count attributed to each weapon type, highlighting the lethality and prevalence of different weapons in the conflict. This visualization was previously thought of as a pie chart but due to the disproportional amount of data between the labels.

Fatalities Distribution by the Military Forces

This pie chart presents the distribution of fatalities by different military forces involved in the conflict. The chart segments represent groups such as Israeli security forces, Palestinian civilians, and Israeli civilians. The size of each segment shows the proportion of total fatalities attributed to each group, which can be critical for understanding the dynamics of the conflict and its human cost.



Picture 15 - Pie chart of Fatalities distribution by military forces

Implementation challenges

During the development of the solution, the main issue faced was the combination of React with D3.js and the management of the margins and place of elements within the visualization. In our low fidelity prototype, we drew a map which was not possible to achieve due to the lack of GeoJson to do the map in a legible and useful way - all the files found couldn't draw the land desired in detail.

Picture 16 - Combination of two GeoJSON files

Evaluation and changes in the prototype

Having concluded the first implementation of the functional prototype we and an external colleague conducted a heuristic evaluation following Jakob Nielsen's 10 Usability Heuristics for UI Design. There were found several issues which without the evaluation would not be possible to find.

The most relevant issue was the impossibility of the filters scrolling through the visualizations making it impossible to change them without scrolling back to the top of the page. The visualization of weaponry was thought to be developed firstly as a pie chart, but the large quantity of weaponry made us change the visualization into the bar plot shown in Figure 14. Some minor issues such as a lack of titles or information about the visualizations were handled after this issue.

Finally, ten participants were challenged to use our platform and rate its usability following the System Usability Scale (SUS) and the final result was an impressive score of 92 meaning that our solution accomplished its purpose of being simple to use.

Conclusion and Future Work

The accomplished solution fulfilled most of the objectives we defined at the beginning of the project, being a coherent a simple way to analyse the data from the conflict without unbiased information.

Regarding future work, there are some aspects of the visualizations that could be further improved such as implementing a zoom feature for the plots with a large amount of data being displayed (e.g.line plot); another issue to be addressed is the attempt to create our own GeoJSON file mapping of the region and improve the filter performance to make the page faster.

References

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