Visualizing Crime in India using Narrative Style

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Abstract— We propose a crime data visualization tool for the purpose of spreading more awareness about the crime scenario in India. Although there are many crime visualization tools, the task of deriving insights is left to the user who may not get all the useful insights on their own. Our system is aimed towards solving this problem by following a narrative style to assist the user in getting useful insights about various types of crimes. To demonstrate the usefulness of this tool, we apply it to visualize crime data on kidnappings and compare the performance of test subjects using our actual narrative style tool and a stripped-down version containing only the visualizations

Index Terms—Narrative visualization, annotations, crime data, scenes.

INTRODUCTION

There are many crime data visualization tools for exploring crime. Most visualization tools let the user explore the data on their own and draw observations from it which takes a lot of time, effort and expertise. There are chances that the users might miss some of the key points of the crime if left to explore on their own without any guidance. As a result, the general public may not be aware about the seriousness of many crimes. This is especially true of the crime scenario in India. In order to bring more awareness of crimes to the general public, we propose a system for crime data visualization based on a narrative style, which guides the user through the crime trends and also allows exploration of more facts about the crime in a self-discovery fashion through annotations and links to external sources.

Our visualization system is divided into scenes where each scene focuses on one important detail/observation that the author wants to bring to light about a particular crime. Our system can be plugged in with different types of crime data. For demonstration, we have taken crime data on kidnapping. The scenes represent the most prevalent and gruesome type of kidnappings. These scenes are backed up by annotations which help the user understand the scene and links them to articles and other resources for user to research and study about it more. For evaluation, two sets of participants are taken. One set of participants is given a version of the visualization tool without any narrative style and the other set of participants is given a version of the visualization tool with narrative style.

1. RELATED WORK

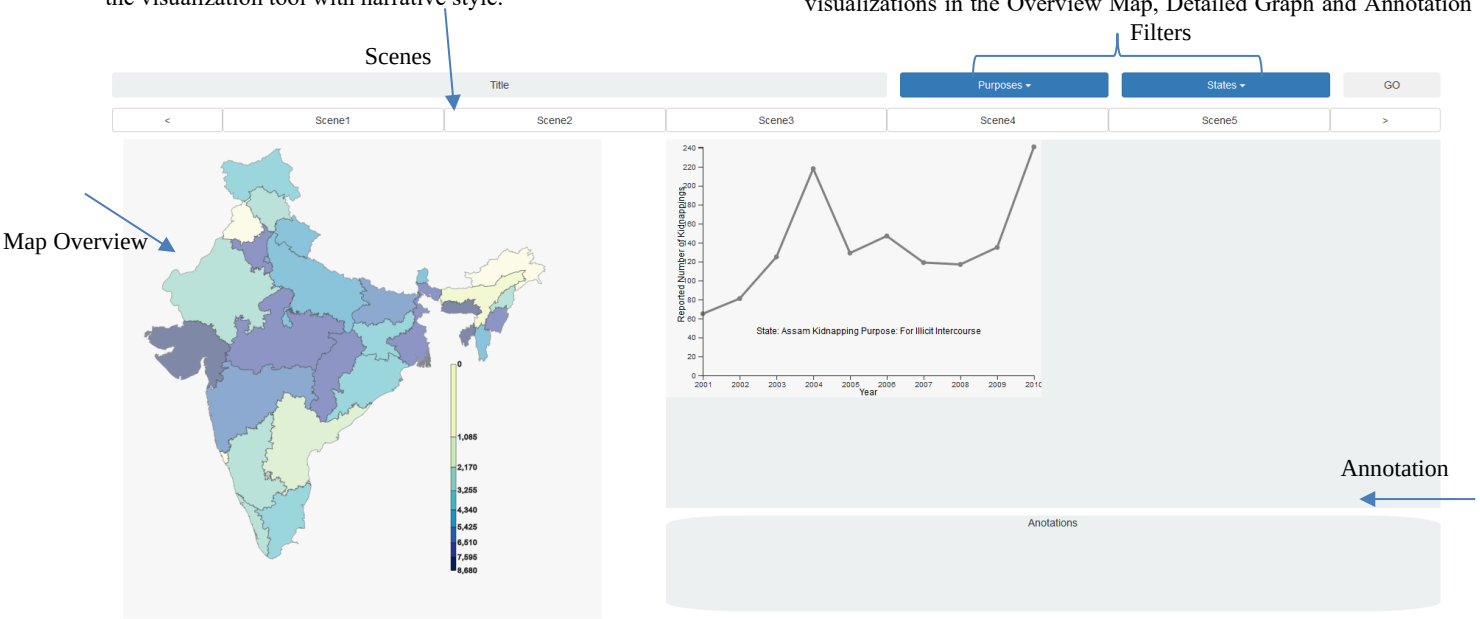
There are many visualization tools available for crime such as [4], which do not have any storytelling style associated with it. There are many benefits of narrative visualization and a discussion of various techniques has been done in [1]. Our focus is on visualizing Indian crime data. There are some visualization tools which visualize Indian crime data [2] but we couldn't find any which utilizes the power of narrative visualization. Crime data Visualization in Chicago PD [3] uses a narrative style and has different objectives on top which can be compared to our scenes. In [3] each objective/scene focuses on different data and there are different visualizations for each data and objective. Whereas, we persist the same Overview Map and Detail Graph (discussed in Section 4) throughout the visualization. Our attempt to the storytelling has a fixed starting point and ending point while allowing users to explore and analyse on their own.

2. VISUALIZATION DESIGN APPROACH

This section details our narrative based design. The layout of our design consists of the following components - Scenes, Overview Map, Detailed Graph, Filters and an Annotation box.

2.1 Scenes

This is the key element of our design. Each scene focuses on one of the major reasons for a particular crime, in our case - kidnapping. The visualizations in the Overview Map, Detailed Graph and Annotation



box change based on the scene selected and they tell the user a story about the selected crime purpose.

2.2 Overview Map

The map shows the total number of kidnapping cases on a state level. It is a choropleth where the color intensity increases based on the number of cases in each state. The map displays data according to two parameters - crime purpose and year. The crime purpose may be defined by the scene selected. When the user interacts with our tool by changing the crime purpose or state/year, the data presented by the map gets updated and the map zooms into the state which has been selected for study. State selections on the map via a mouse click updates the Detailed Graphs and Annotations to show data for the particular state.

2.3 Filters

Two filters are provided in the layout. These filters are dropdowns that allow the user to select the state, crime purpose and year. As a user changes the values using a filter, the data in the Overview Map and Graph Layout gets updated.

2.4 Detailed Graphs

This section shows different graphs such as line graphs for yearly trends of the crime and bar graphs for the number of cases based on gender and age. This combination of map and graphs provides an overview+detail of the data. This section gets updated on user interactions with the map, filters and scene selection.

2.5 Annotations Box

The annotations box is another key feature of our design. It contains text that provides a description of the scene. It introduces the crime purpose and talks about the key highlights for the selected scene. It is meant to serve as a guide to the user to discover the key highlights in the graphs. It is also meant to help users get more knowledge about the crime by providing links to external resources.

3. Evaluation

This section details our participants and evaluation process.

3.1 Participants

The participants for our project evaluation are the general audience where these audiences are varied in both their ages as well as in the field of expertise. The study has chosen general audience as their users because our tools is meant to spread general awareness.

3.2 Evaluation Procedure

Our proposed system follows a narrative style where the goal is to guide the user towards understanding the various trends occurring in crime. In order to test the efficacy of this narration-based visualization system, we will conduct a study with two different versions of our system -one with the narrative style and another without any narrative style. We intend to take two separate groups of participants and each group would be assigned to work on only one of the tools. The users will be allowed to explore the visualization for a given time frame (5 minutes). After allowing the user to explore on their own. A user feedback will be collected.

The user after answering the questionnaire, will be given a feedback form where it consists of two parts. The first part consists of the user giving user-ratings depending upon the task's usability and interactivity. The second part consists of the user giving the feedback in the form of information that the user has found while interacting with the data. The two feedbacks - of users with narrative visualization and of users without narrative visualization - will be compared to gauge, how much information the user was able to get out the visualization and how it aligns with what the author wanted to convey.

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Link to demo: https://skilltern.in/infovis

Future Milestones

Our current progress in this project is that we have completed the ideation and basic structure of the interface. In the next steps we are going to add more scenes, and conduct research for the content to include in the storyline annotations. We are in the process of adding more bar charts and line charts to show state-wise comparison of the statistics of the crime. We intend to relate it to different filters for a pairwise analysis.

We also have to conduct evaluation, according to the procedure we mentioned previously. Design improvements that may arise corresponding to evaluation which would be treated as feedback inputs and corresponding modifications would be included in the improved system in subsequent weeks. Finally, the reporting, documentation and other final touches to the project will be provided in the last week.

Project Component	Tentative Dates
Researching storyline content	Ongoing - 10th Nov
UI implementation	Ongoing - 10th Nov
Addition of more scenes	Ongoing - 18th Nov
Evaluation	11th Nov - 18th Nov
Design Improvements	18th - 25th Nov
Report and Documentation	25th Nov - 2nd Dec

Team member roles and contributions

Contributions for the work done so far:
Adil: Ideation. Created the dashboard UI, Integration of Map to dashboard, Integration of line chart to Dashboard.
Saurabh: Data Cleaning, Integrated line chart with data. Ideation
Abhijit: line chart UI. Ideation.
Sai: Created the dashboard UI, Evaluation

Contributions for the future work:
Adil: Scene additions, selection of important stories, report creation
Saurabh: Implement work in D3, addition of more charts, creating stripped version of tool for evaluation, report creation.
Abhijeet: Scene additions, Implement work in D3, addition of more charts
Sai : Conducting Evaluation, curating content for annotations

Team Reflection:

The biggest challenges we faced so far were - cleaning and processing the data, implementing the layout for the narrative in javascript, creating the choropleth map with

interaction. The next challenges we are facing are in selecting the correct stories to show to the user, to provide a good narrative experience. We also need to curate enough content for the annotations to aid the users in self discovery. Adding more charts for showing comparison between the states and presenting on-demand details for this comparison is also another challenge as it requires linking different graphs with different axes.