G15 Report: Nature resource conflict in peace agreement based on PA-X and ACLED database

Introduction

The main theme of this project is the natural resource conflict in the peace agreement. We aim to find connections between different factors (other types of conflict, trade ..etc)and natural resource conflict. The result would be visualized through unity software and modeling software (Rhino, C4D, 3Dmax). Finally, some of the consequences of the long-term conflict in Africa(especially Sudan and Congo) would be expressed, allowing people realize the seriousness of natural resource conflicts, and call on people to protect natural resources and reduce waste.

Introduction to Database

The starting point of our analysis is the PA-X database, which is a peace agreement database. By searching for the peace agreement in it, users could also locate the region and time of the conflict. After the research in PA-X is completed, the main analysis data will be exported from the ACLED database according to our target area and timeline. We will analyze the data from the overview to the details, including timeline, conflict types such as border conflict, possible influencing factors, and future expectations. If we find that the number of samples in our target area is too small, we will search for relevant paper data as a support. Our specific steps are shown in Figure 1

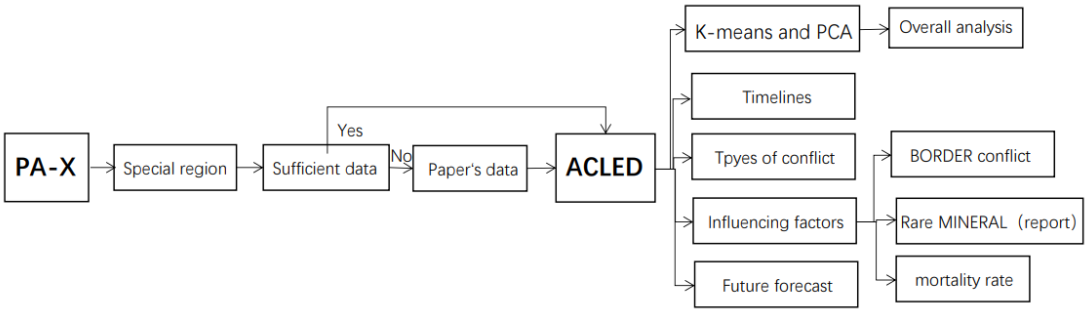

Figure1.Research process flow chart

Algorithm

Followings are a list of algorithms used in the research according to the order.

Principal component analysis (PCA)

In this project, we use principal component analysis (PCA) to do dimensionality reduction. This algorithm can preserve the principal data patterns and components though some dimension of data is missing. The original data is 4-dimension, and we reduce its dimension to be 2 for clustering and visualization.

K-Means

In this project, we use K-Means because of its efficiency and low learning cost. After testing, the most suitable k is 6. So, in the overview analysis data was divided into 6 clusters.

Random forest

We use the random forest to select the best features to analyze. The algorithm is used to feature importance assessment. Look at the contribution of each feature to each tree in the random forest, then take the average value, and finally compare the contribution of different features.

Standardization

In this project data standardization is mainly used to deal with the situation that the data in the feature vector is very scattered and simultaneously prevent the small data from being swallowed by the big data, that is the absolute value. Z-score standardization is a standardized method based on the mean and variance of the data. The normalized data is a normal distribution with mean of 0 and variance of 1.

Findings

The proportion of violent conflicts in Africa is much higher than in other regions

We focus on the cluster with most countries. In that cluster, 36 percent of countries are from Africa,

while around 20 percent are from Asia, 10 percent approximately are from Europe and others are from separate different regions. From this result, we could image that countries in Africa are more likely to have the same types of conflicts especially four types we selected. If we classify 155 countries into 6 different degrees of dangerous place, countries in Africa are have large chance to be the same degree.

Proportional relationship of peace agreement ＆ conflict

The data in ACLED has demonstrated the comparison between the number of all conflicts and the number of all peace agreements has been signed around the world from 2017 to 2020. After the standardization process, the line graph in our project has illustrated an overall escalating trend of both the number of conflicts and peace agreements in the end of each year from 2017 to 2020. Although the number of peace agreement has increased, the number of conflicts has increased with an even faster calculated growth rate. Therefore, we can hardly conclude that the conflicts will decrease along with the increase of peace agreement according to the graph, nevertheless, we can conclude that the ratio generally maintains flat, resulting in a relatively balanced environment of peace in the world.

NatRes conflict ＆ Border conflict

We focus on the comparison between the number of natural resource related conflicts and the proportion of border related conflicts. According to the result chart, the specific country which has the more natural resource related peace agreements, the border related issues would be more proportion. We could image that the countries in Africa which have the natural resource related conflicts have the more probability on the issues of border.

Conflict mortality

The country with the greatest reported death number in Africa is Nigeria, which holds a record of 60701 death number and accounts for 20% of death in total. The most 10 countries added up to a percentage of 85.8 in Africa, which indicates a correlation between death roll and country. With conflict dataset in Africa, using regression tree, we can predict the number of deaths based on its properties including year, region, time, conflict type and so on.

Consequences of prolonged conflict

In the research of Chad R. Wells, they claim a large number of conflicts have affected the prevention and control of local epidemics. The isolation rate of patients has been reduced by more than 40%. Because of long-term violent conflicts, more patients cannot get timely isolation and treatment, which is fatal to the spread of infectious diseases. Their research points out that when severe infectious diseases are attacked, long-term conflicts in Africa will be especially fragile. Their article, published in 2019, shows that the conflict in the Congo has continued until recent years.

Modeling process

Old -man import：This function can import the picture to the bottom of the modeling software for real-time presentation (import three views and calibrate if necessary). The picture itself cannot be modified, allowing the modeler to continuously adjust the modeling content according to the picture. This project modeling uses This method guarantees the accuracy of the model. However, due to technical limitations, the modeling software currently only supports 11 control point editing, so the details may be different from the pictures exported by python, but the overall trend remains the same.

Multi-view correction: In order to ensure that the model can be positioned correctly according to the map position, the modeler will correct the position of the model from at least two perspectives (usually the top view and the front view). During the unity import process, it will be imported together with the bottom correction image to ensure accuracy.

Unity programming

The programming and packaging of the Vuforia engine can be completed on the official website. This project has applied for a license, 5 target pictures, 4 of which are high-recognition target pictures, which are used in step 1.2.4 of the project.

Reflection a future development

The model is not sufficiently interactive, and the overall process is long and complex. During user testing, it was difficult for users to understand the project, and it is suggested that subtitles or language explanations should be added at a later stage.

The interaction flow should be designed with more touchpoints, so that the user gets the same visual experience when exploring different routes, and appreciates the brutality of violent conflict and the significance of peace. Therefore, at a later stage, more "target images" should be added to trigger the same model side-by-side, which may involve more complex programming, but during the panel discussion, it was felt that this feature is an important way to enhance the player's comprehension and fluency in conveying information.