Migrant Boats

A geo-temporal analysis and visualization of migrant boats, those were trying to leave Isla Del Sueño and reach U. S. during 2005-2007.

Contact

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Domain, Task and Dataset

This particular task is taken from the VAST challenge 2008 and this specific task was given as a mini challenge. This task was based on an event happening in Isla Del Sueno. Ferdinando Catalano who was the editorials manager of El Tiempo, the major newspaper of Isla del Sueno wrote a manifesto. In short the manifesto tries to promote an idea where family is the main driving force in the society. According to his manifesto government will exist to give social services but will not be able to have authority over the families. Another important part of the menifesto was that the boys will have all the decision making powers of the family. This idea spread in Isla Del Sueño and government of Isla Del Sueño started crack down against the activist of the manifesto during the years 2005-2007. As a result the activist fled from Isla Del Sueno by boat to U.S. which has the same "dry foot wet foot" rule for the people of Isla Del Sueno as they have for the people of Cuba. This means if they can land on U.S. then they will get immigration but if they are caught in between then they will be pushed back. This was a brief background from where the task was generated.

The main task is about the visual analysis of the migrant boats who tried to flee from Isla Del Sueno over the three years (2005-2007). The task is based on some specific data that were recorded during the interdiction collected by U.S. coast Guards as well as from other sources of illegal landing on shore. The data has the following fields-

EncounterCoords: Where the migrant boat was intercepted or where it landed, in longitude-latitude format.
RecordType: Interdiction (the Coast Guard intercepted them) or Landing (the boat made it ashore).
Passengers: Number of passengers in the migrant boat.
USCG_Vessel: Name of the Coast Guard who was involved in the interdiction.
EncounterDate: Date when the boat was interdicted or landed.
RecordNotes: A list of passenger names.
NumDeaths: The number of migrant deaths.
LaunchCoords: If known, the starting latitude and longitude of the boat.
VesselType: Either a "Go Fast", a Raft, or a Rustic vessel which was used by the migrants.

Based on these data our task is to find some visual pattern on the choice of landing places of the migrant and how they evolved over three years of time. Find geographical pattern of interdiction and give information about the migrants' success

rate of landing. This type of visual analysis can have diverse uses. For this particular problem this visualization could give the coast guards information of the probable landing places of the migrants. Again they can get an idea about how their interdiction has influenced the migration pattern or it at all had an effect.

The three specific task assigned in the mini challenge were-

1. Characterize the choice of landing sites and their evolution over the three years.
2. Characterize the geographical patterns of interdiction over the three years.
3. What is the successful landing rate over the time period?

I will be using the data set provided with the VAST mini challenges. Here I present a partial data set of the same. The whole data set is synthetic data.

```
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    -80.33100097073213,25.10742916222947</EncounterCoords>
  <RecordType>Interdiction</RecordType>
  <Passengers>23</Passengers>
  <USCG_Vessel>Ironwood</USCG_Vessel>
  <EncounterDate>2005-04-24</EncounterDate>
  <RecordNotes />
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  <LaunchCoords>
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  <VesselType>Rustic</VesselType>
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Personal Expertise

I don't have any previous expertise in this area. I got interested in geo-temporal analysis during the info visualization course. As I am not affiliated with any kind of research which could provide me geo-temporal data set I had to pick this perticular problem from VAST challenge 2008 which happen to come up with some specific task and data.

Proposed Info Viz Solution

Solution for choice of landing sight

To solve this particular problem I have decided to take into account some of the interdiction points which took place very near the shore. To set a standard I have decided to take five miles from the shore and take the interdiction points within these areas to give weight to the nearest landing sight. Thus taking both landing points and interdictions (as mentioned above) I will mark a definite area in the map which is a preferable landing sight. For solving this I have decided to use colour code to show the corresponding year. As there are three years I will need seven colours to show any combination of years and mark the landing sights using those colour coding. These colour coding will be extended to show seasonal landing point. I will give names to

each of the possible landing zones. This will be used for solving the success rate problem.

Solution for Geographical pattern of interdiction

To solve this pattern I will use two different map visualizations. In the first approach I will use small multiples to show the differences of interdiction in each year separately and side by side. These maps will show both the interdictions that took place in that year and the preferable landing sight during the same. The interdiction points will be from the lat-long data and landing sight will be taken from the landing sight solution. Then use the same approach to see the seasonal patterns. I would like to take three seasons into account dividing the year into three. This whole representation will help to figure out whether the interdiction has influenced the changing of landing sight over the years. In the second approach I will try to figure out whether the coast guard has changed their guard pattern from the interdiction data. For this I will use the map and plot the interdiction points in the map according to the year of interdiction. Then mark the probable guarding area of the coast guards. Again using small multiples seasonal and yearly trend will be shown.

Success Rate for landing

For showing the success rate of landing I will use bar charts. The bar charts will represent the success rate in a yearly and seasonal manner. Each bar chart will have three categories each for the years 2005-2007. I will also represent the success rate according to the landing sights taken from the landing sight solution. The success rate will be calculated by taking into account the total number of attempts and the successful landing in a particular area.

Scenario of Use

After the data loading the user will have options to see the solution of any of the tasks assigned. For the landing sight problem the user can select yearly or seasonal pattern or named landing sights. For the interdiction pattern they can choose two options first to see the influence of interdiction on landing sights and second options is the guarding pattern of the coast guards. These options will come up with seasonal and yearly pattern. For the success rate option the user can select to see yearly success rates, or the success rate depending on the specific landing area or the seasonal success rate.

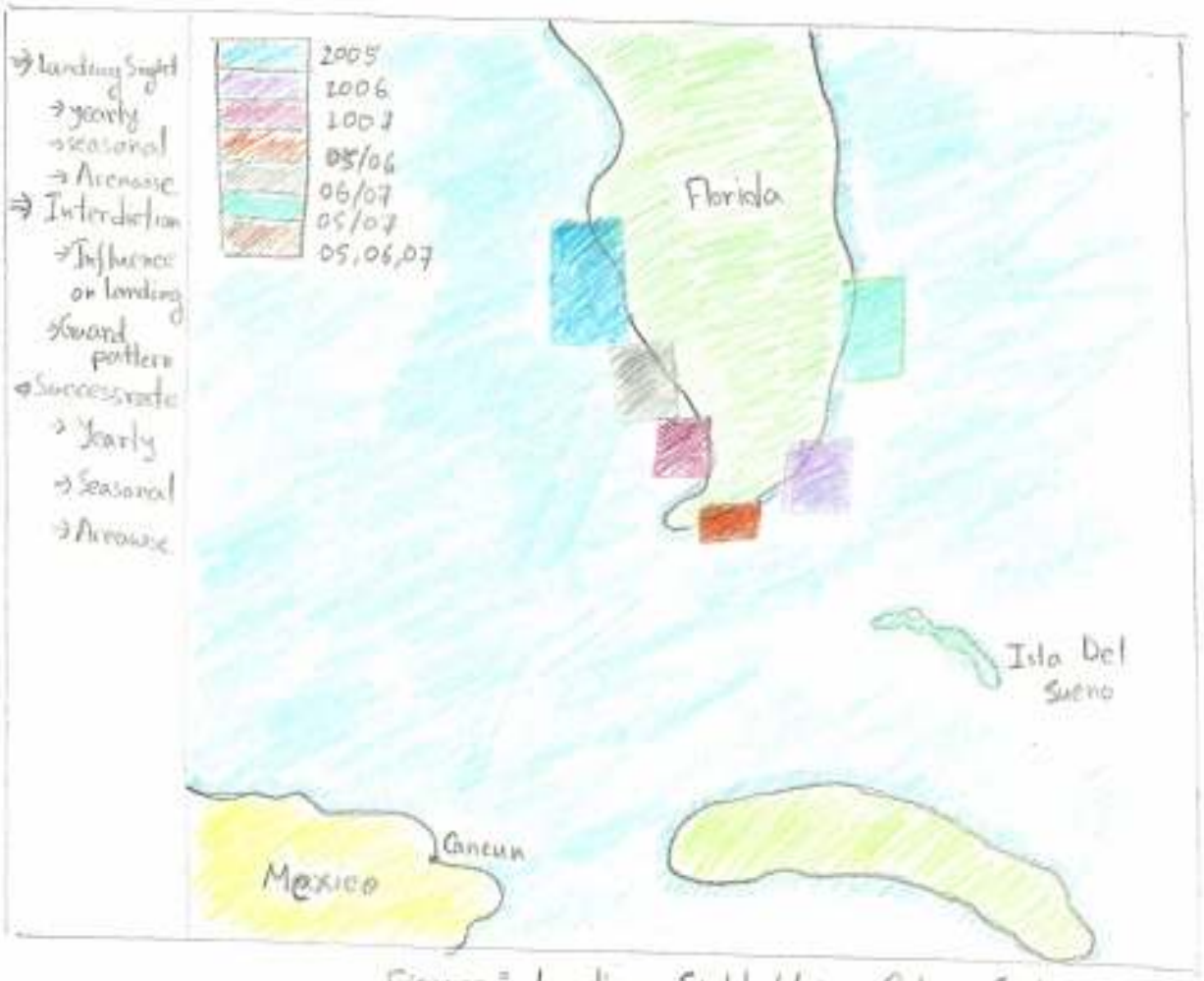
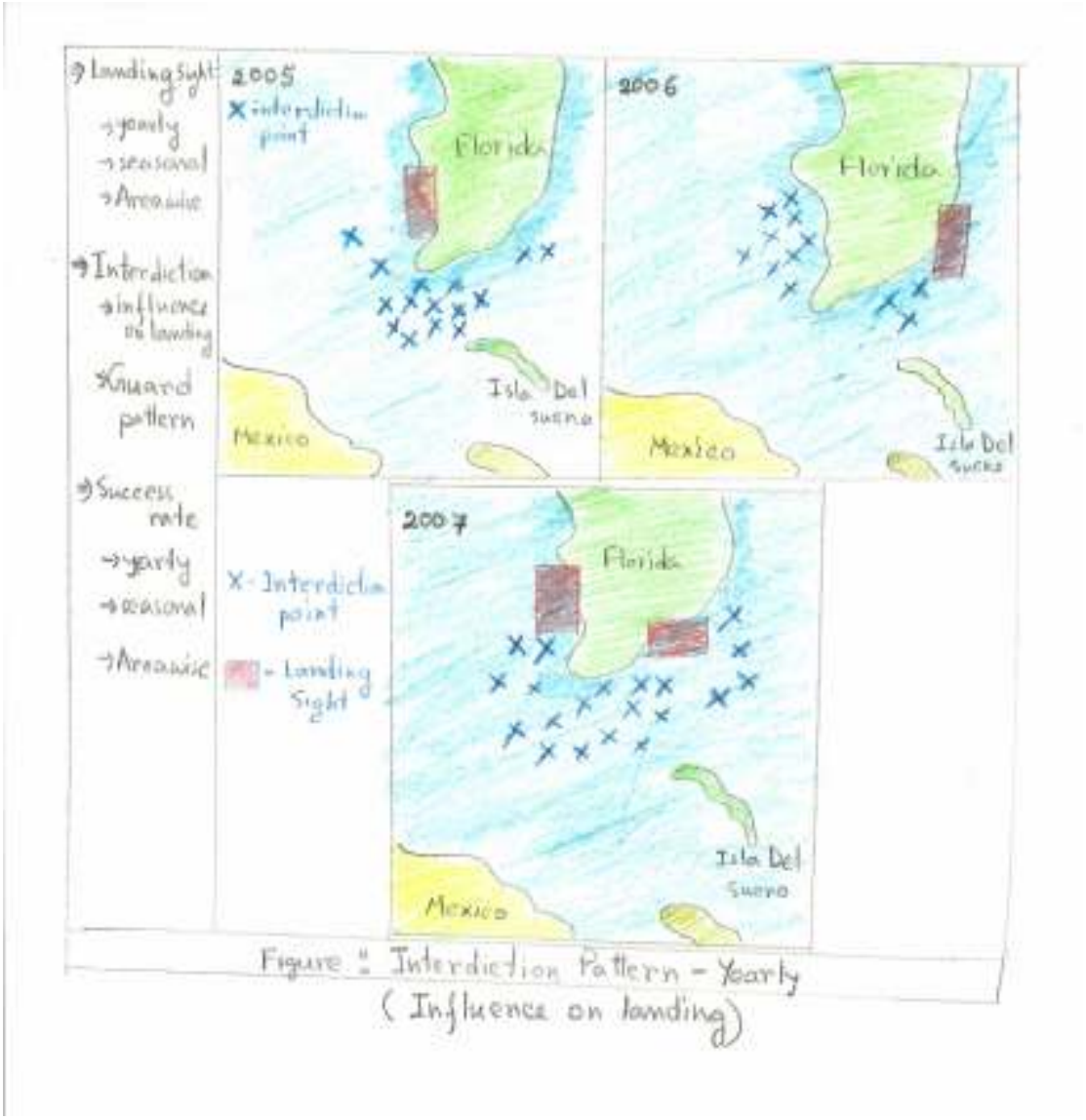


Figure: Landing Sight Using Colour Code



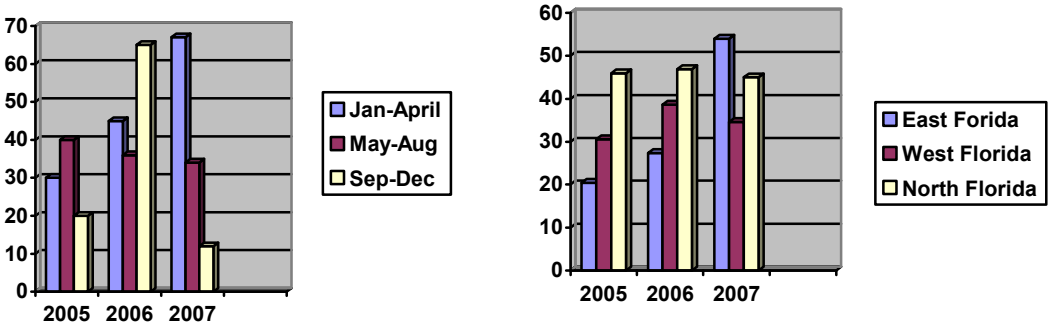


Figure: Success rate visualization

Implementation Approach

I would like to use google earth, google docs and geoVista studio for implementation.

Mile Stones

November 7: The landing problem solved.
November 11: Refinement on landing sites and statistical analysis of the landing problem solved.
November 16: Project updates.
November 21: The interdiction pattern problem solved.
November 24: Success rate finding and fine tuning of the project done.
December 4: Final papers done.
December 14: Final presentation.

Previous Work

The previous works related to this problem are mainly the VAST challenge 2008 entries. There were mainly two types of approaches to solve the migrant boat problem. One is visual analysis using maps and the other one is not directly from the maps but by using statistical graphs. Some tried to use both kind of visualization to solve the problem. I would like to mention works from those entries which have similar approaches with my proposed solution. In one winning work the VRVis-ComVis team used a map of Florida to show the landing points and interdiction points. They used the geographical distribution of data and bar charts to analyse more deeply into the problem. They had an idea of finding seasonal trends which I like to use in my analysis. There is another work by PARVAC group. They also took the combined approach of solving the problem but mainly focused on the map visualization. They tried to identify the distinct landing zones from the maps. I also like to take this approach for the landing sight of the migrant boats.