Visual Analytics Applied to the Prevention of the Catastrophes from Natural Disasters

Alejandro Bautista Ramos (b14aleba@his.se), Fisnik Turjaka (a10fistu@his.se) and Ilona Heldal (ilona.heldal@his.se)

School of Informatics, University of Skövde, Skövde, Sweden

1. Motivation

Current climate changes are leading towards new te-chniques to better address the prediction of climate findings of potential disaster zones and traces of affe-cted areas touched by phenomena.

Figure 1

(Left) Tracking map of hurricane Odile in the northwest Peninsula of Mexico during September 2014. (Right) Debris and disruption after the storm left the city of Cabo San Lucas.

Modern tools such as Visual Analytics (VA) offer a prominent path to a better data interpretation, that is, by employing interaction and easy to use capabilities on natural phenomenon impacts in different countries.

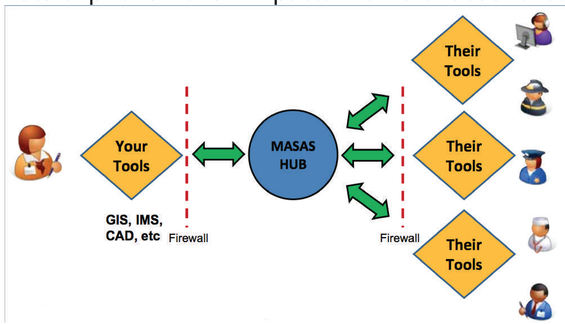

Figure 2

Flow of information between the different emergency management community.

2. Objective

Describe the usefulness of the modern Visual Analytic tools such as their functions and capabilities on climate prediction and prevention of disasters for governments.

3. Methodology

A literature review of the visual analytic tools applied to natural disasters and situation awareness with focus on already useful tools such as MASAS, CDA and CIM.

4. Examined tools

Canada's Multi-Agency Situational Awareness System (MASAS) project

The MASAS project is intended to assist government in case of disaster and emergency situations with useful flow of information for emergency management agen-cies .

Figure 3

MASAS Canadian project which is intended to distribute situational awareness information about weather and prevention of disaster events.

In 2011, the MASAS project was deployed during the flood season on the provinces of Manitoba and Yukon. MASAS was successful at delivering information about the roads that were not accessible due to the floods; in addition, MASAS was an easy-to use tool because offi-cials from different provinces were able to act at the moment without delays when using this tool, few hou-rs of training were necessary.

Virtual Globes tool: The Context Discovery Application (CDA)

Virtual Globes (VGs) refers to the global awareness of the disaster situations derived from natural phenomena or humanitarian crises.

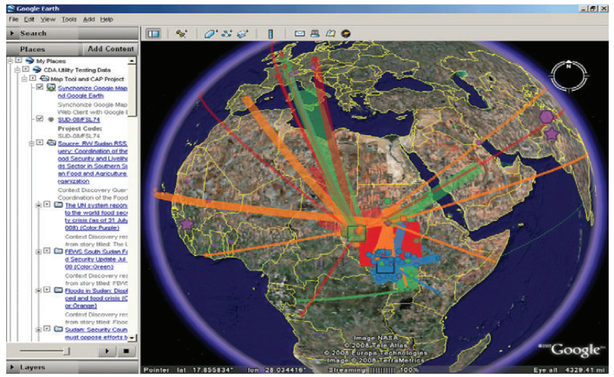

Figure 4

CDA renderings about the global scale disasters happening in Sudan. (Screen shot taken from the article *Situation Awareness and Virtual Globes: Applications for Disaster Management by Tomaszewki, B. 2011*).

The CDA assists the situational awareness zones of disa-sters by defining a map about the beneficial and prejudicial impacts that some areas affect one country. As it was claimed by the United Nations digital service for the coordination of Humanitarian Affairs, ReliefWeb, the ev-aluation of the CDA proved to be an eminent and pow-erful tool for the benefit of humanitarian disasters.

Coastal Infrastructure Management (CIM) in North Carolina,USA

The CIM is a suite of different displays of the same data set where users are able to switch between different displays in order to change perception of visualization.

CIM's main function is to analyze existing coastal infra-structures based on rich coastal data; decision makers can determine potential risk zones of hurricanes. Data acquisition, data cleaning and analytics, and interacti-ve data visualization are sent through 3D stereoscopic graphics. According to the evaluations made by coastal guards, this tool offers the capability to monitor with great depth the costal infrastructure changes and it pr-ovides a better understanding of the "oceanic develo-pment from multiple aspects".

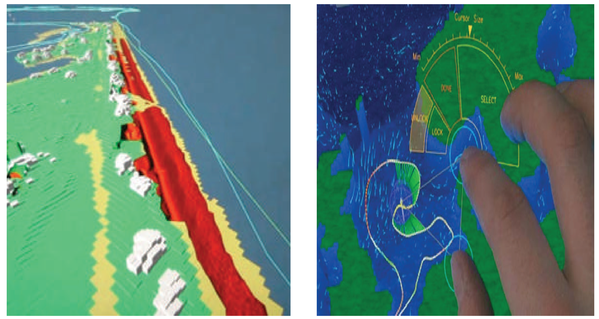

Figure 5

(Left) Triangulated model mesh of the coastal region. (Right) "Pantograph"multi-touch technique used to visualize water bodies .

5. Learned lessons

Project	Applied	Technology support	Usefulness for governments
MASAS	Establishing a be-tter emergency collaboration in flood seasons.	Open source colla-boration tools.	Common ground for understanding alerts, common lo-cation in incidents.
CDA	Uncover what, where and when disasters occur on the globe.	Google Earth and web mapping sys-tems.	Understanding nu-merous locations that affect a parti-cular place.
CIM	Discovering risk zones in coasts in-frastructures du-ring hurricanes.	Pantograph multit-ouch techniques.	Trace out coastal regions that could pose a threat in hurricane season.

6. Conclusions

The VA tools presented in this work have been used ma-inly by government agencies in their respective countr-ies to manage disasters. Because the tools proved to be effective to curb some catastrophies from natural disast-ers, we recommend that other governments start deve-loping or adopting this type of tools. This last suggesti-on can be achieved through collaborations between the disaster management experts and research agenci-es. The tools proved that security and reliance on data is part of the design process, a common structure for the intended users such as used in MASAS should be considered and, lastly, a collaborative awareness bet-ween users is intended.

7. Acknowledgment

The main author would like to thank the support of the Erasm-us Mundus Lamenitec Programme for the financial scholarship.

8. References

[1] Fekete, J., Wijk, J.V., Stasko, J., & North, C. (2008). The Value of Information Visualization. doi:10.1007/978-3-540-70956-5_1

[2] Pagotto, J., & O'Donell, D. (2012). Canada's Multi-Agency Situational Aw-areness System – Keeping it Simple. Proceedings of the 9th International ISCRAM Conference – Vancouver, Canada, April 2012.

[3] Tomaszewski, B. (2011). Situation awareness and virtual globes: Applica-tions for disaster management. Computers & Geosciences.

[4] Wang, X., Butkiewicz, T., Cho, I. & Wartell, Z. (2012). Towards Utilizing He-terogeneous Analytics Interfaces in Coastal Infrastructure Management. Technical Report CVC-UNCC-12-15.