Geospatial Technologies for humanitarian cause– Saving & Sustaining lives

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Abstract

The individuals and the institutions need to recognize the potential and the limit of geospatial technologies in such a way that it serves the humanity - saving and sustaining lives. New innovations and breakthroughs have broadened the horizon and numerous tools, methods and approaches have empowered this system. There has been advancement in data collection, visualization and analyzing tools. For instance, the use of deep learning and Artificial Intelligence has automated the mapping process which then would have taken years to accomplish. There has been geometrical progression in gathering, storing, processing and delivery of geospatial data in mediums like PCs, wireless sensor network and cloud computing (Timo Lüge, 2014). The geospatial tools, mindsets and context must be used to reshape the geospatial governance through upgraded analytical tools from optimized hot spotting to spatial regression for hypothesis on humanitarian need and aid (Reliefweb, 2019).

Keywords: geospatial science, humanitarian, saving lives, technology

Introduction

The increasing duration and intensity of disasters caused by conflicts and climate change is having an impact on physical, social and biological environment directly affecting health, well-being and survival. 315 natural disaster events in 2018 alone took 11,804 death, over 68 million people affected and US$131.7 billion in economic losses across the world (Natural disasters, 2018). The appropriate geospatial toolset through innovative and creative mindset must address the ongoing humanitarian crisis caused by conflicts and natural disasters.

The crisis map after 2010 Haiti earthquake has examples of reaching to people who are in need through operational response. It's an innovative thought but technical side needs to strengthen for preparedness. Similar case is of UN core mission - OCHA providing humanitarian assistance to people in need using GIS for camp management, early recovery and reconstruction, education, emergency shelter, health, IT and communications, nutrition, protection, and water and

sanitation (ESRI, 2019). Similar cases of UNWFPA's effort on supporting women birth injury having access to life-restoring surgical treatment; UN's core mission - Peacekeeping planning and operations etc. all demonstrate an example of GIS not just as a tool but the voice of the unheard, unable and un-aided people and population.

Geospatial Technologies in Humanitarian Context

The geospatial technology itself evolved from a humanitarian context - Charles Picque mapped the number of deaths due to cholera on the map using color gradients. Later John Snow explored the cholera outbreak in Soho, London and discovered the relationship between the outbreak and contaminated source of water supply. Similarly, geospatial applications for social action is required to enhance efficiency and effectiveness caching the ongoing revolution in technologies. It needs to be predicted (as far as possible), planned and projected in the ground. The same story of losing life and becoming victims to the same calamities frequently due to the lack of preparedness is intolerable. Something effective with these modern geospatial technologies is need of today's humanitarian call. An effective mitigation and preparedness strategy can be devised, efficient rescue operations can be launched keeping in view the build back better approach for speedy recovery and rehabilitation with these technologies.

If Ebola outbreaks again in Africa, it can be planned as - mapping the area of outbreak and its proximity using Artificial Intelligence which produces the roads, buildings etc. which is a base map; the incidents should be reported using GPS enabled mobile forms; navigation for the planning and operations using mobile GIS and prediction using the model in an online environment having enhanced analysis capacity with optimized visualization and cartography.

Broader insight into the GIS and humanitarian context
Table 1 Different cases of GIS serving as humanitarian tool

Sn	Case study	Description
1	Cholera outbreak (1854 by John Snow)	The unexpected outbreak of Cholera struck the Soho area of London on August 31, 1854. 127 people died from the infection over the course of three days, and by September 10 more than 500 had died. Approximately 600 death reports were obtained and mapped by Snow in conjunction with the pumps in the area. John Snow eliminated the handle after analysing using various mapping techniques. The local cholera outbreak soon came to an end after the removal of the pump handle.
2	Ebola outbreak (Luge, T., 2014)	In March 2014, in response to the Ebola outbreak in southern Guinea, MSF-Switzerland sent a dedicated Geographic Information Systems (GIS) officer to Guinea. The maps created for response became the foundation for many other maps. It is an example that showed

		coordination as well as expectation management can be improved using GIS.
3	Haiti earthquake (Dunn Cavelty, M. and Giroux, J., 2011)	7 magnitude 2010 Haiti Earthquake affected three million people with death toll estimated from 100,00 to about 160,000. Patrick Meier is an internationally recognized thought leader on humanitarian technology and innovation started a crisis mapping which helped to map the need and delivering the support. It later became an operational planning tool. It later supported on long term recovery and rehabilitation.
4	Great East Japan Earthquake (Hara, Yusuke, 2015)	9.0–9.1 magnitude earthquake hit Japan on 11 March 2011 causing nuclear accidents, primarily the level 7 meltdowns at three reactors. It caused 15,897 deaths, 6,157 injured, and 2,532 people missing. A model users' returning-home decision-making was created using a discrete choice model and clarify the factors quantitatively. It used home behavior data and geo-tagged data nd tweets.
5	Syria conflict (Wired, 2018)	Syria's civil war began during the Arab Spring of 2011 as a peaceful uprising against the President of Syria, Bashar al-Assad. It has since escalated continually being tested as the world experiences the horrors of modern warfare. Small activist-entrepreneur group is developing a sensor network that listens to warplanes and warns people when and where the bombs are going to fall through tracking and providing the locations aftermath.

Way Forward

Geospatial innovations are relevant in a wide range of fields - healthcare, public health, archaeology, data science, etc. New innovations and breakthroughs have broadened the scope and this process has been driven by various tools, strategies and approaches. Frameworks for gathering, visualizing and analyzing data have been developed. With innovations in the sectors, it's applications in wider scope serves the cause. For instance, in food security the integration of GPS mapping tools, software to analyze data, sensors and robots to care for the plants enhance the time management, enrichen the healthy crops productivity with less chemical usage (Digest, 2019).

The geospatial technology being a powerful tool as standalone and even more powerful when integrated with other scientific innovations e.g. GeoAI (Geospatial Artificial Intelligence), mobile computing using 5G in conjunction with optimized sensors for tracking, medicine delivery using drones in places of difficult terrain etc. The integration would help to reduce the

difference between capturing processing interpreting, and providing an easy-to-understand, coherent real-world representation to the assistance.

Conclusion

Whether it's human or nature induced natural disaster or conflicts because of political tensions, the innocent lives are to suffer. There is the necessity to enroot geospatial technology within the scope of general public so as to take benefits from it. Awareness generation and collaboration among the stakeholders (both governmental and non-governmental sector) is necessary and they should be encouraged to use the technology for prudent decision making. This technology can provide a better learning and sharing platform with feed-back mechanism among the GIS enthusiasts, governments, industries and academicians (Ficci).

Three dimensional visualization with the aid of GIS has become nowadays and in the days to com the horizon of GIS will be broadened by integrating it with virtual reality, augmented reality and mixed reality towards the path of Artificial Intelligence and Machine Learning (Fleming S.D., 2019).

The geospatial tech savvy professionals in humanitarian, education and other sectors are hungry for advances but they also need to think out of the box. The technology should be visualized from the humanitarian perspective as well. The possibilities of saving and serving humanity that can help to do more with being more contextual and application based cannot be neglected.

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