Intercontinental Geoinformation Days

http://igd.mersin.edu.tr/2020/

Cloud Based Disaster Management and Monitoring Information System

Mohd Mustaqeem *[1], **Sani Hasan** [1], **Mohd Saqib** [2] **Abdullah Talib** [3]

[1] *Department of Computer Science, Institute of Technology and Management, Aligarh, UP, India*
[2] *Mathematics and Computing Department, Indian Institute of Technology (ISM), Dhanbad, Jharkhand, India*
[3] *Department of Civil Engineering, Indian Institute of Science, Bangalore (IISC), India*

Keywords
Cloud Computing
Disaster
Remote Sensing
IoT
ICT

ABSTRACT

Natural disasters are by far destructive acts of nature for living beings. No one can stop natural disaster but the level of distraction can be reduced by using some precautionary measures. Here, in this paper, we are focusing mainly upon the after-effects management of any natural calamities by proposing cloud-based disaster management and information system. The primary goal of this application is to help to find lost people in disasters; cloud-based monitoring, real-time evaluation so that the help will reach at right time to the right person, statistical analysis in low cost and minimum time, emergency request receiver, and financial support to affected people and rehabilitation to needy people. Data uploaded regarding affected family members by the management team so that the organizations working for the rescue operation, police helpers etc. will help after seeing on information system.

1. INTRODUCTION

There are mainly two types of disasters one is man-made (technological, terrorism, violence and complex humanitarian emergencies. other is natural floods, earthquake, hurricanes, tornadoes, volcanic eruptions, tsunamis. (Mahar et al., n.d.). But our main focused is Natural disasters; the Natural calamities are the natural processes of the earth resulting in a hazard for the creature. it causes distractions of many ways like livelihood, economy, social, ecological, political, legal and outbreak of serious diseases plague. (Pile, 2001). There are lots of challenges people faces during the disaster, one of them is the food security challenge. (Ainehvand et al., 2019). Hospitals face safety, security and malfunctioning problem during natural disaster etc. In 26th January 200, The Gujarat Earthquake which was one of the most shocking events in India it drastically affects the economy and life. A post-earthquake scenario of Gujarat-Earthquake was rescued on the bases of relief and rehabilitation. (Shaw & Sinha, 2003).

Landslides are one of the main geological vulnerability in the Himalaya, in the northern part of the Indian subcontinent. On 23 September 2003, India was affected by Varunavat hill landslides, in Uttarkashi town, Garhwal Himalaya. (Sarkar et al., 2011). Floods are natural events that may catastrophic impacts on human's life. In 2019 August, Assam hit a flood, it misbalanced sustainability of agriculture, destroying standing crops, creating waterlogging, soil erosion and affecting large crop areas which ultimately affected human life. (Weekly, 2005). The studies show that the people live near gulf coast has high exposure to hurricane, Katrina and Rita, controlling for historically based hurricane risk and county population density, demographics, individual hurricane experience, and dispositional optimism. Data were collected in January 2006 through a mail survey sent to 1,375 households in 41 counties on the coast (n = 824, 60% response). (Trumbo et al., 2011). In April, and May 2011 Tornado hit the USA during spring and it was the historic hit, a series of major outbreaks of tornadoes affected hundreds of fatalities and thousands of millions of $US in damage. (Iii et al., 2011).

Predicting accurately the natural events like landslides, earthquake and volcanic eruptions is one of the most difficult tasks for scientists and researchers, it is a conflicting and confusing event. Volcanoes have created a spatial relationship with the human population in the global distribution

According to Christopher and Terry study that the almost 9%(455 x 10^6 people) of the world's 1990 population lived within 100km of a historically active volcano and 12 % within 100km of a volcano believed to have been active during the last 10,000 years. (Small & Naumann, 2001). On 11 March 2011, Japan was affected

* **Corresponding Author**

*(mohdmustaqeem34@gmail.com) ORCID ID 0000 – 0001 – 5055 – 5969
(sanihasan513@gmail.com) ORCID ID 0000– 0002 – 2725 – 3054
(msaqib.cs@gmail.com) ORCID ID 0000 – 0003 – 2125 – 2162
(abdullahtalib106@gmail.com) ORCID ID 0000 – 0002 – 2733 – 935X

Cite this study

Mustaqeem M, Hasan S, Saqib M & Talib A (2020). Cloud based disaster management and monitoring information system. Intercontinental Geoinformation Days (IGD), 200-203, Mersin, Turkey

by two big natural disasters earthquake and tsunami, which further transform into a new disastrous one, because its impact was on the Fukushima Daiichi nuclear power plant and the nuclear radiation start emitting from the plant which was too dangerous. It results in the economic crisis in Japan, financial markets, interest rates and the yen-dollar exchange rate but a slighter effect on the world trade and financial markets. It was also affected the U.S citizens and American co. working in Japan. (Nanto, 2011). Due to the above mentioned natural disasters and its dangerous effect we have to take precautions first if a natural disaster happened then the post measure should be taken that we are proposing a system.

The document is ordered as follows. "Overall Demonstration of the Model" explains working proposed model for the community. "Cloud-based disaster management and information system" describes the software description for developing prototypical cloud-based disaster management and information system. In "Proposed System Output Parameters" the procedural feature of the developed system is outlined along with the problems that may happen in the application execution. Three case studies are presented in "Case Studies" followed by the conclusion in "Conclusion".

2. OVERALL DEMONSTRATİON OF THE MODEL

This proposed Cloud-based disaster management and information system explain the major cloud-based model.

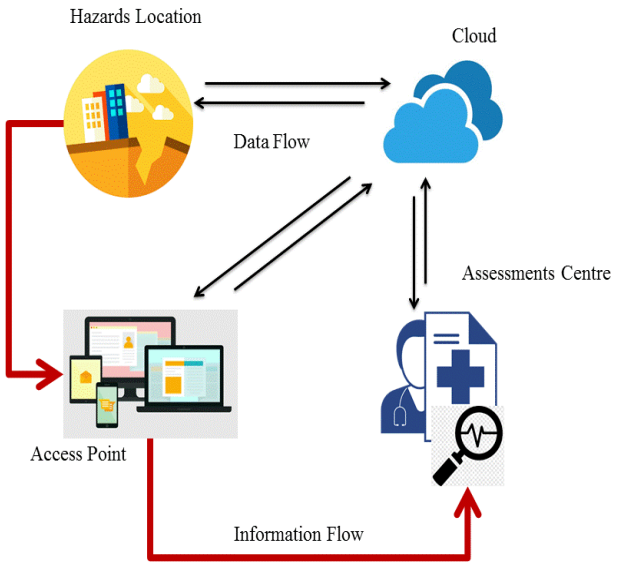

Figure 1. Overall Demonstration

Its main focus is to develop an effective and smart cloud-based disaster management and information system for affected people in the given area. Software is developed using Asp.net technology to have better graphic user visualization for frontend and for backend functions we have used C# language.

For the management of data and its manipulation, we have used MSSQL 2008, for computational and analytical work such as login (authentication), searching, and evaluation of data in regards of disaster information at multiple locations. The proposed system will tell about the people affected by natural hazards to the rescue team and other organizations so that they can detect them and provide necessary help; the proposed system will give real-time data. Apart with this, it will also help for direct financial access to the hazard-prone persons it will help to reduce the corruptions and other types of theft done by involved personalities. As shown in Fig.1.

In the given figure the dark black arrows show the cloud communication and the red arrows shows the information flow among multiple sources.

The system will manage their user through application performing a task such as manipulation of people data, places where the given hazard may affect in near future, financial help information provided by persons.

3. SOFTWARE DESCRİPTİON OF THE PROPOSED SYSTEM

Given section presents the detailed software explanation of the prototype system using multiple models for representing communication among entities, the diagram description, the organization and data flow among the involved actors etc.

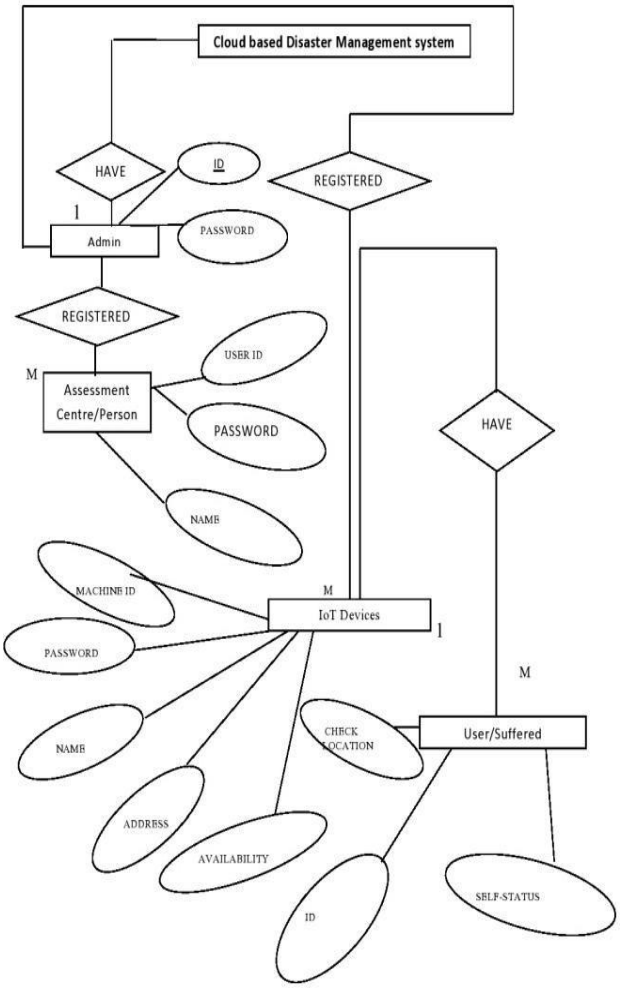

Figure 2. ER-Diagram

3.1. Entity-Relationship (ER) Diagram

In our ER-diagram representation relationships is given among multiple entities sets stored in the database. In the given information system three entities are involved:-

Admin: The "Admin" role will perform by any centralized user or higher authority to control the available as well as new information. This is managed by an authorized user or organization. The system user will provide the necessary information along with pictures and admin will verify and update the system accordingly. The "Admin" may have two major features "Admin Id" and "password" to login into the cloud-based system and performed all necessary works.

Assessment centre/person: The Assessment centre or person is registered by admin or higher authority with a unique USER_ID and an assigned a password which can be changed by Assessment centre or person. Moreover, attributes of Assessment centre or person are USER_ID, PASSWORD and NAME.

IoT device manager: The IoT device manager is registered by admin with a unique MACHINE_ID and assigned a password which can be modified by IoT device manager. Furthermore, IoT devices are MACHINE_ID, PASSWORD and NAME, ADDRESS and AVAILABILITY.

User/victim: A user or victim can add themselves in information system and it will have CHECK_LOCATION and SELF_STATUS attributes.

In the given Fig.2. The rectangle represents the entities Natural Disaster Management System, Admin, IoT devices and User/Suffered. Oval shaped represents the attributes possess by entities and diamonds represent the relationship among the entities.

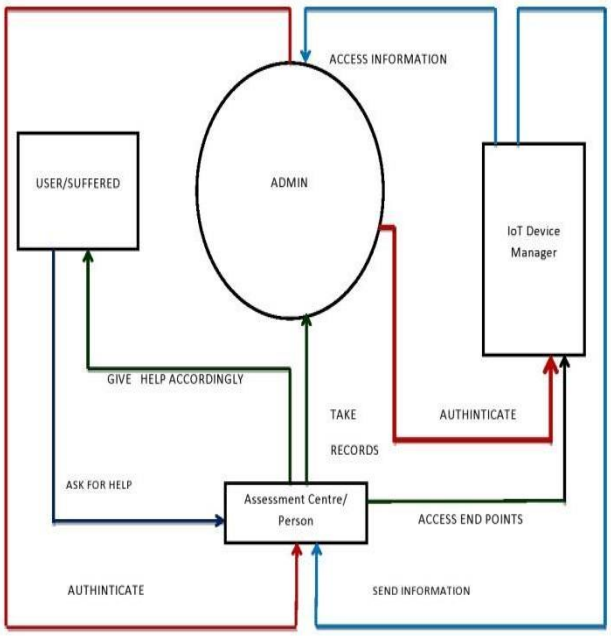

Figure 3. DFD of the Proposed Model

3.2. Data Flow Diagram

In our system, data will flow among multiple entities of the software. Organization of software modelling, a DFD can tell the data flow steps. In the cloud-based application, the Admin will authenticate the assessment centre or person if any suffered person or victim need any kind of help he/she may directly contact to the information system and assessment team will help them and the data will be updated into the system by admin. In the next phase If any IoT devices want to connect with the information system, it will first request from admin, Admin will give permission accordingly and the device can assess the granted information from the system meanwhile device can also send information to the assessment centre and the assessment centre finds the access endpoints and will keep the record of the IoT devices and send data to admin for evaluation.

In the given Fig.3. the circle shows the ADMIN, the square represents USER/SUFFERED, rectangle shows Assessment centre/person and IoT devices, the dark red lines represents authentication of assessment centre or person and IoT devices from the admin. Blue and black line shows the necessary help, data access and send.

4. SIGNIFICANCE AND RESULTS

The process of rescuing Natural disaster via traditional and conventional is time-consuming, robust, biased and less effective with high cost**.** Therefore, the demand of today is a cloud-based effective and efficient management system which can be developed by trending technologies e.g. Cloud computing, IoT, ICT (information and communication technology). In the proposed model we have developed a cloud-based disaster management system to rescue the suffered people from the natural system, the advantages of this model are as follows:-

- When the disaster occurs, many times it happens that the help is not reached to people on correct time due to which they highly suffered but now our proposed system will provide help on time.
- If the system is present they are not easy to access and use we have developed such kind of system which is easy to use and maintain for a layman also.
- We can easily see that the given systems are too costly to use but we have designed a cost-effective system.
- We have seen many times in the world that if there is any kind of financial help is provided to victims, it does not reach to them properly. Our proposed system will provide such kind of platform that it will remove corrupted middle persons so the financial help will directly reach to the needy person.

5. CONCLUSION

Wearable devices, cloud computing, ICT, many other trending technologies have made disaster

management very convenient, efficient and cost-effective. In the proposed model

We have demonstrated disaster management and monitoring system cloud computing which provide a more effective way to tackle natural disasters compare to the conventional and traditional methods. We have explained the overall idea of the system in the form of ER-diagram and DFD. As we know in, ICT is growing very rapidly and empowering many fields there is a huge opportunity that we can apply trending technologies to tackle such destructive circumstances e.g. Artificial Intelligence can enhance capabilities of such information system and convert in an expert system.

REFERENCES

Ainehvand, S., Raeissi, P., Ravaghi, H., & Maleki, M. (2019). Natural disasters and challenges toward achieving food security response in Iran. *Journal of Education and Health Promotion*, *8*, 51. https://doi.org/10.4103/jehp.jehp_256_18

Iii, C. A. D., Carbin, G. W., & Brooks, H. E. (2011). *The tornadoes of spring 2011 in the USA : an historical perspective*. *2010*(April 1974), 88–94.

Mahar, P., Lynch, J. A., Wathen, J., Tham, E., Berman, S., Doraiswamy, S., & Maina, A. G. K. (n.d.). *Disasters and their Effects on the Population : Key Concepts*.

Nanto, D. K. (2011). *Japan?`s 2011 Earthquake and Tsunami: Economic Effects and Implications for the United States*. DIANE Publishing Company. https://books.google.co.in/books?id=Ih7Hip-RcgAC

Pile, K. W. (2001). Disaster planning and management. *Pulp and Paper*, *75*(11), 20.

Sarkar, S., Kanungo, D. P., & Chauhan, P. K. S. (2011). Varunavat landslide disaster in Uttarkashi, Garhwal Himalaya, India. *Quarterly Journal of Engineering Geology and Hydrogeology*, *44*(1), 17–22. https://doi.org/10.1144/1470-9236/09-029

Shaw, R., & Sinha, R. (2003). Towards Sustainable Recovery: Future Challenges After the Gujarat Earthquake, India. *Risk Management*, *5*(3), 35–51. https://doi.org/10.1057/palgrave.rm.8240155

Small, C., & Naumann, T. (2001). The global distribution of human population and recent volcanism. *Global Environmental Change Part B: Environmental Hazards*, *3*(3), 93–109. https://doi.org/10.3763/ehaz.2001.0309

Trumbo, C., Lueck, M., Marlatt, H., & Peek, L. (2011). *The Effect of Proximity to Hurricanes Katrina and Rita on Subsequent Hurricane Outlook and Optimistic Bias*. *31*(12). https://doi.org/10.1111/j.1539-6924.2011.01633.x

Weekly, P. (2005). *Flood Damages and Sustainability of Agriculture in Assam*. *40*(26), 2723–2729.