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Research Article

Modelling and Analysis of Modern Grid based on Disasters

Aadil Hamid Dar[1], Kiranpreet Kour[2]

[1]M.Tech Scholar, [2]Assistant Professor, Department of Electrical Engineering, Desh Bhagat University, Punjab, India.

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Corresponding Author:
Aadil Hamid Dar, Department of Electrical Engineering, Desh Bhagat University, Punjab, India.
E-mail Id:
aadilveeri9@gmail.com
Orcid Id:
https://orcid.org/0000-0003-0957-8186
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A B S T R A C T

As unpredicted, large-scale, and out of control events, natural disasters can cause overwhelming costs to a society's infrastructure. The possible interruption in electric service is not simply a matter of inconvenience since in our modern societies this could disrupt many services our everyday lives depend on. Any trouble in critical municipal infrastructures such as water cleanliness and sewage plants, hospitals and emergency services, telecommunication networks, and police stations will add to the damage and distress during the event, and may severely hinder any post-disaster recovery efforts. The purpose of this paper is to provide a mathematical framework for the study of the interaction between natural hazards and the power grid. The outcome of this study can be used in any mitigation technique during the design or operation stages. Recent natural disasters have created growing considerations concerning power offer availableness and raised doubts about the potential of typical power grids to sustain procedure thus very important social services.

Keywords: CRT, DER, EUC, ETIS, GSM, GIC, MCEER

Introduction

The opportunity of exploitation micro-grids as the simplest way to boost power offer availableness during natural disasters because of their contact on micro-grids operations throughout disasters and their aftermath, the analysis presents a unique approach that focuses on evaluating lifeline performance and their quantitative impact on the micro-grids availability. The conferred methodology conjointly considers the result of superimposed native energy storage due to their significance for reducing the consequence of lifeline dependencies-an important issue touching micro-grids throughout disasters and variability of renewable energy sources because it is predictable that the majority micro-grid house owners and operators might not achievable be specialists in power systems or count with intensive process capabilities, and easy availablilty calculation approach is conferred and mentioned. Recent natural disasters have formed growing considerations concerning power offer availableness and raised doubts about the potential of typical power grids to maintain operation thus very essential society services-e.g., food refrigeration cycles, water provision, health care, communications, monetary services, oil purification, and others-are not interrupted throughout disasters and in their aftermath. The capability through these disasters is that because of bulk power grids giant geological layout, combined with their centralized generation and management architectures, typical facilities are fragile systems within which harm to but 1st class mail of their elements will cause intensive high-incidence outages thus it can be expected that giant areas could expertise high power grid outage chance the analysis considers this a lot of exacting case of essential masses, like in military bases, information centres, or hospitals, wherever horribly high power availableness is needed as a result of the period of time prices tend to be high even so, the analysis also can be extended to standard masses, as indicated as a part of the discussion one in each of the same observationsuneven harm distribution-provides a way out for a standard concern once exploitation micro-grids for powering a vicinity area throughout disasters: micro-grid power sources will themselves be broken too.

Problem Formulation

A Smart Grid is a combination of Electrical & Communication infrastructure using the latest technologies of IT within the existing network of electrical engineering through an automated process. Smart Grids are digitally enabled to obtain and distribute information to enhance the reliability, efficiency, and sustainability of electrical devices. Disasters like earthquakes and floods are very common in human life and affect the power supply to a great extent. The research is about how to manage the power grids typically during such situations to enhance the reliability and efficiency using the latest technology trends.

Methodology

In this system we are using some sensors Pike Ultrasonic Sensor, Tire Sensors, and Vibration Sensor to detect any change in environmental conditions. The system or grid consists of three outputs represented by areas; these outputs are actually output power supply to various areas. If at any stage earthquake is detected by vibration sensor and output power supply from grid to various areas will be turned off automatically, so that no casualties or loss of property will occur. The system contains GSM and LCD with help of these the department or admin of power department will get know about condition of earthquake via notification. If earthquake came the department will get notified about power to shutdown, if they did not respond after some seconds of time the power will turn OFF automatically. The system contains Ultrasonic Sensor which will calculate the level of water and will notify the level of water to the admin via LCD and if water level raises above danger level the department will be notified about that via GSM Technology and department or admin will take and action to turn OFF power supply or not, the system also contains Flame Sensors to detect any flames in grid to ensure security. If any fire got catch in grid station the department members will get notified about the fire on grid station.

Results

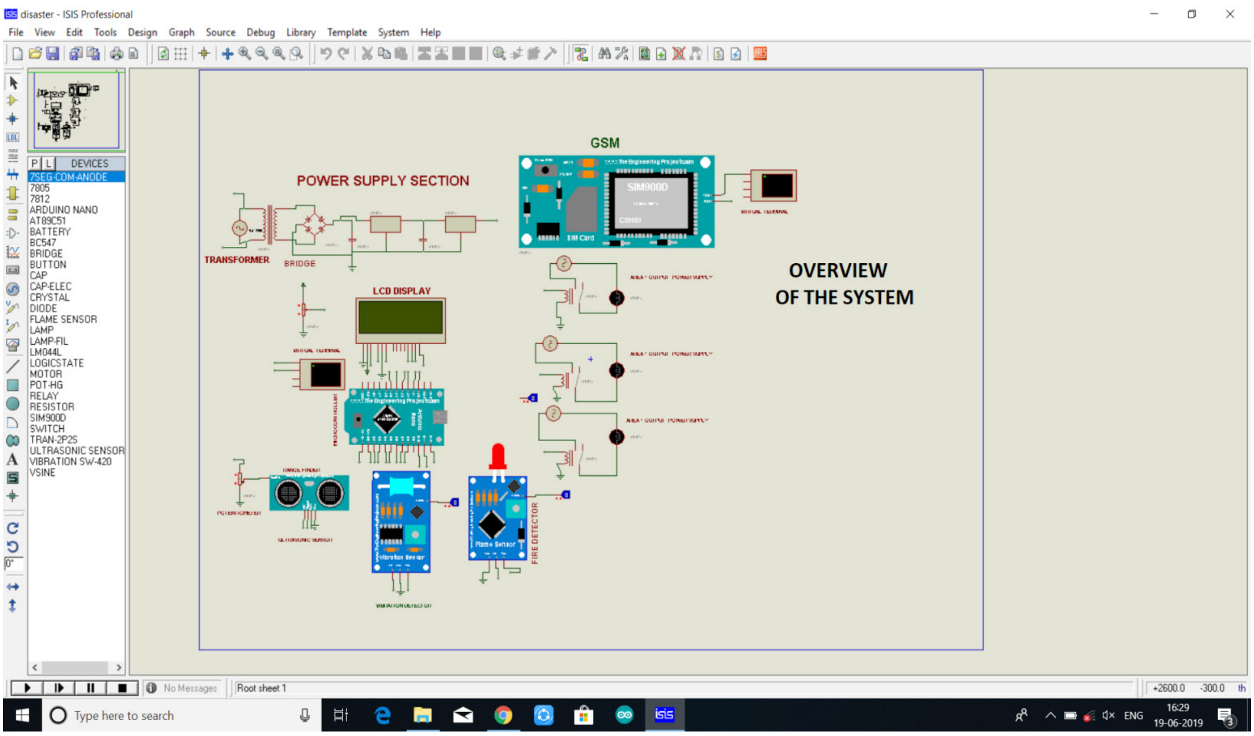

Figure 1.Overview of System

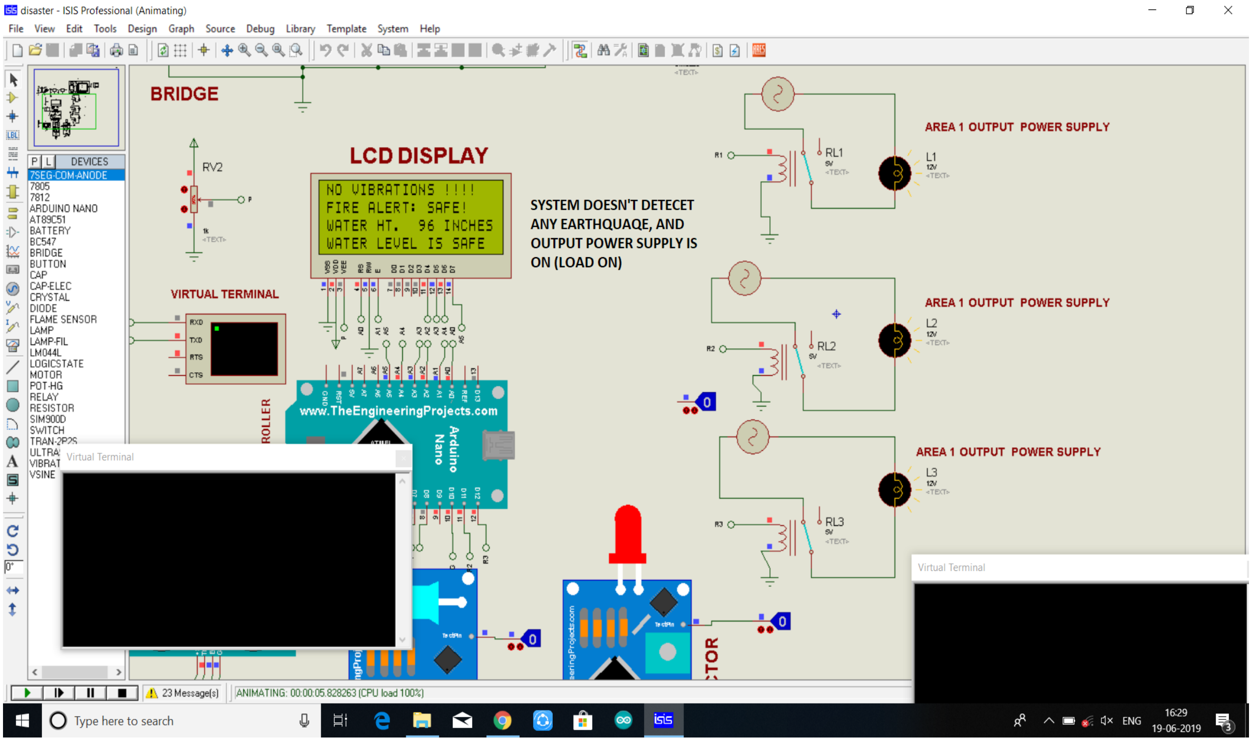

Figure 2.When No Earthquake is Detected

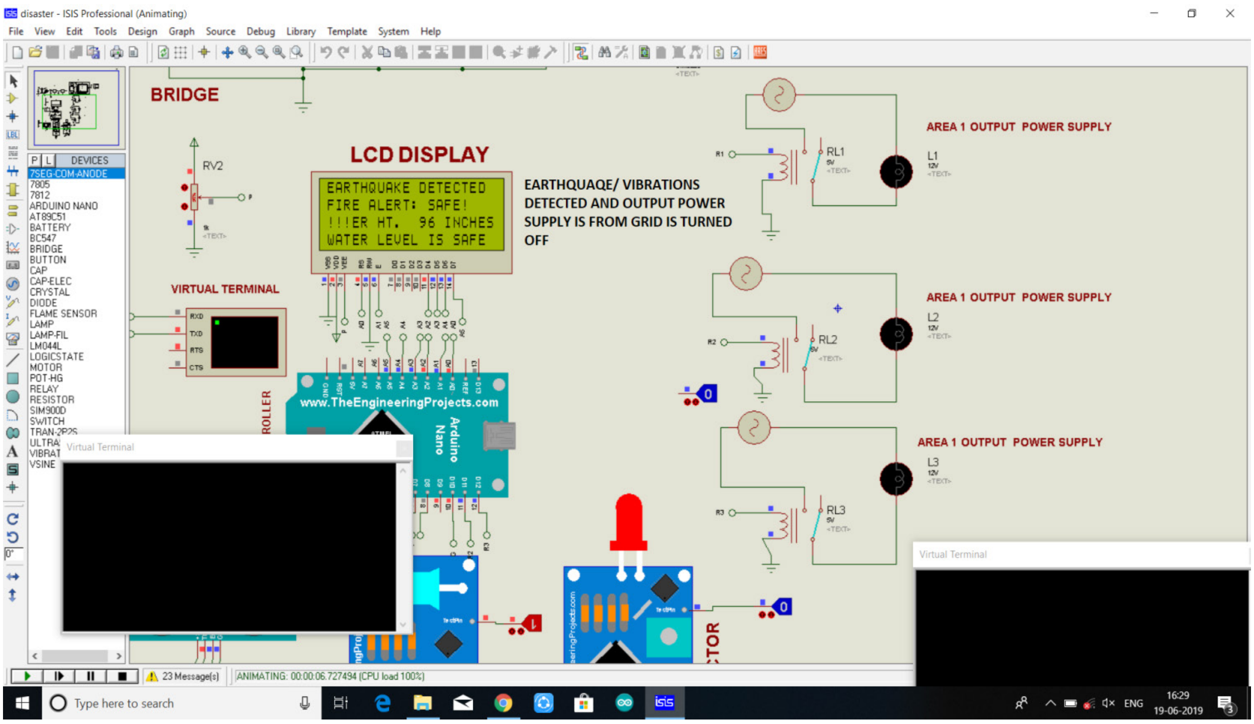

Figure 3.Earthquake Detected Power Turned OFF

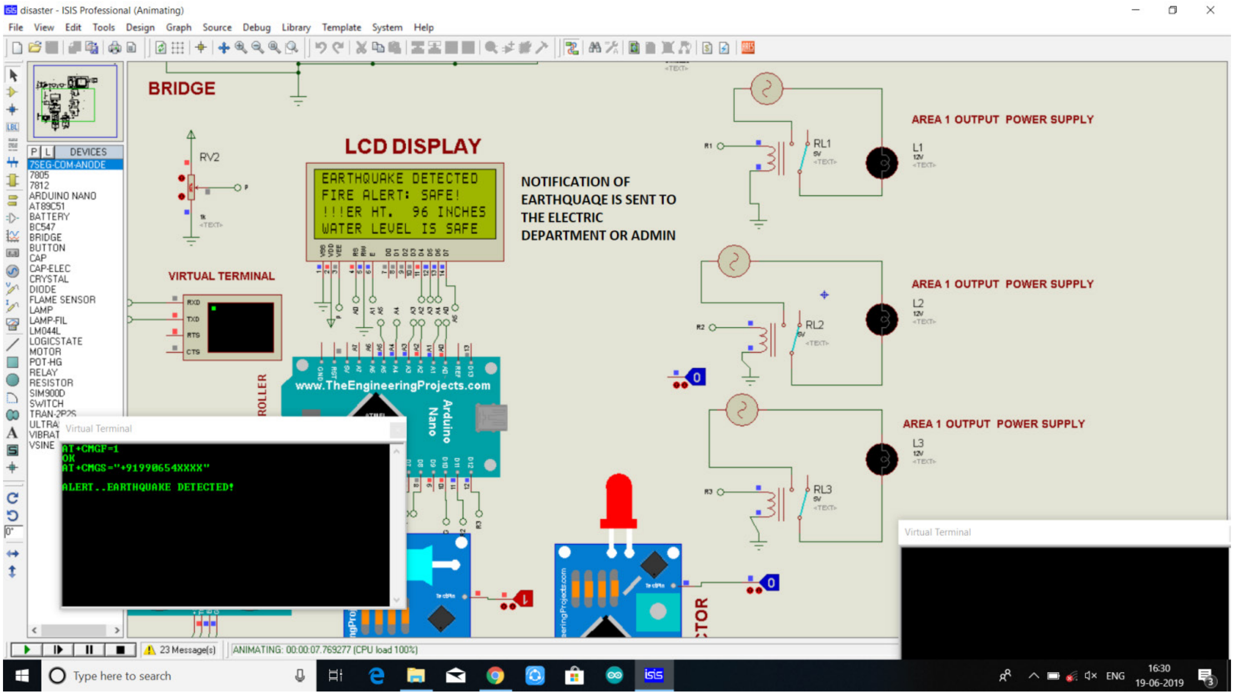

Figure 4.Notification Sent to Department

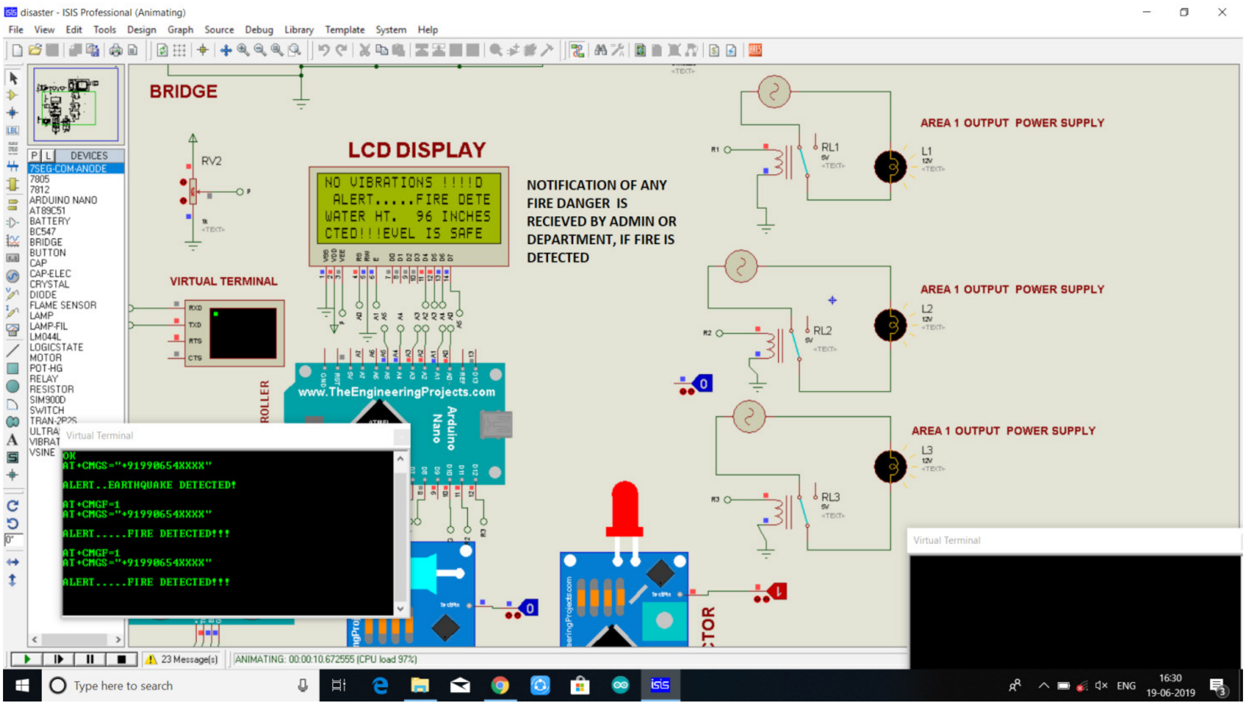

Figure 5.Notification about Fire Danger

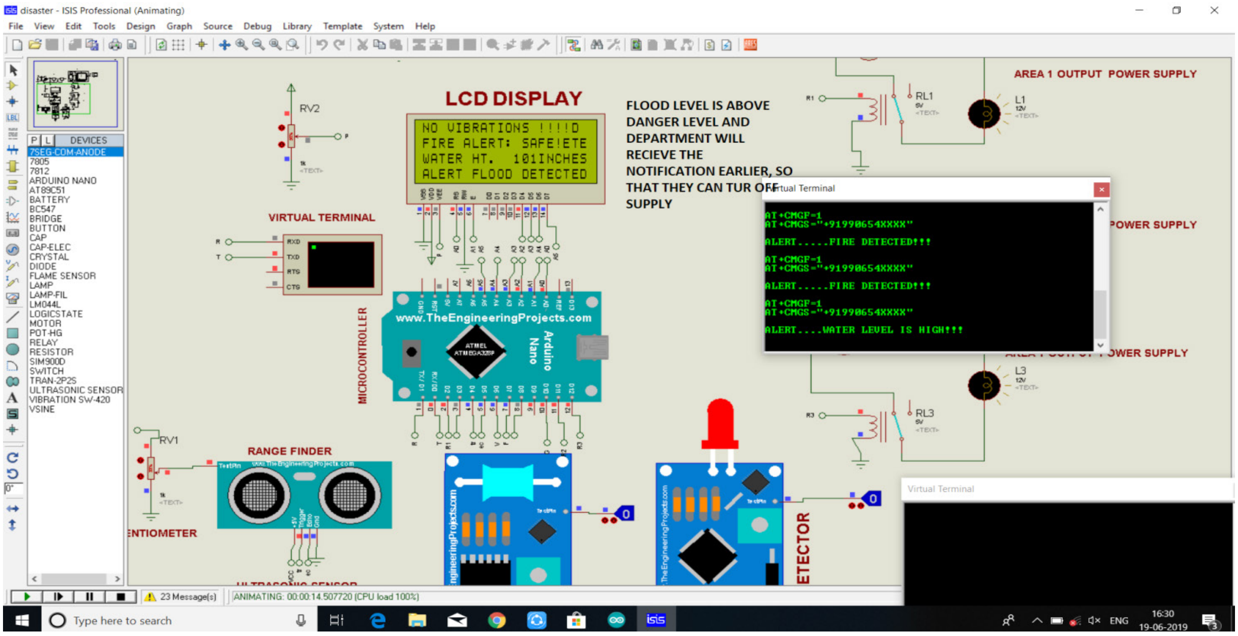

Figure 6.Flood Level Notification

Conclusion

Power grid reinforcement against natural hazards can be performed during operation stage or design stage. In either cases, vulnerability assessment against potential disaster events is an integral part of the solution. A generic mathematical model was proposed in this work as a framework for analysis. Components identified as weak and susceptible links can then be nominated for reinforcement or be operated at reduced levels. The proposed model is based on simulation developed using Proteus software for circuit designing and Arduino for logic building. In future the complete the complete model will be transformed into real hardware based project. The modern need is IOT and in this regard a web application will be developed for monitoring, locating, detecting and classifying in disasters location.

As we know today mobile users are more and more hence the future underground and overhead fault detection system will be synchronised with a platform independent mobile app instead of IOT Gecko.

Refrences

1. Burger A, Kennedy TOWG, Andrew T. Crooks, Computational Social Science of Disasters: Opportunities and Challenges, 2019.
2. Korean J. Soc. Hazard Mitig., Assessment of a Grid-Based Wind Disaster Risk for Climate Change Adaptation, 2019.
3. Qi X, Li WPL, Kong L. A Fast DC Fault Detection Method for Multi-Terminal AC/DC Hybrid Distribution Network Based on Voltage Change Rate of DC Current-Limiting Inductor. 2018.
4. Deka D, Vishwanath S, Baldick R. Topological vulnerability of power grids to disasters: Bounds, adversarial attacks and reinforcement, 2018.
5. Patel HR, Shah VA. Fault Detection and Diagnosis Methods in Power Generation Plants - The Indian Power Generation Sector Perspective. *PDPU Journal of Energy & Management,* 2017.
6. Gündüz N, glu SK, Lehtonen M. Impacts of Natural Disasters on Swedish Electric Power Policy: A Case Study", Sustainability, 2017.
7. Karagiannis GM, Chondrogiannis S, Krausmann E etal. Power grid recovery after natural hazard impact. 2017
8. Guo R, Pu Yang, Xu Pan et al. Study of the Fault Diagnosis Method of Control Systems Based on MCCSAP-SO-SVM. *Journal of Computers* 2017: 28(5)
9. Organization for Security and Co-operation in Europe. Protecting Electricity Networks from Natural Hazards", 2016.
10. Kwasinski A. Quantitative Model and Metrics of Electrical Grids' Resilience Evaluated at a Power Distribution Level,3: 2016.
11. Chen YWC, Wang J, Baldick R. Research on Resilience of Power Systems under Natural Disasters. *IEEE* 2015.
12. Mohagheghi S, Javanbakht P. Power Grid and Natural Disasters: A Framework for Vulnerability Assessment. *IEEE,* 2015.
13. Deka D. Student Member, IEEE,Sriram Vishwanath, Senior Member, IEEE, "Structural Vulnerability of Power Grids to Disasters: Bounds, Adversarial Attacks and Reinforcement. 2015
14. Mohagheghi S. Power Grid and Natural Disasters: A Framework for Vulnerability Assessment, 2015.
15. Executive Office of the President. Economic Benefits of Increasing Electric Grid Resilience to Weather Outages 2013.