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A Literature Survey on "Disaster Monitoring & Alarming System for Mountain Foothills"

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Abstract: ***Preventing the disaster before it occurs and alerting the people in prone area is today's major need. The mostly occurred natural disasters in India are landslide and flash flood in the mountain area like Uttarakhanda. The use of Disaster monitoring and alarming system is to save human lives as well as to inform the ministry within the fraction of seconds about disaster and to provide the rescue team in prone area. It takes 4 steps like landslide detection, upstream downstream counting, ringing alarm and sms sending. The problem of disaster monitoring techniques is they are used to detect only one disaster at the time. If any other disaster occurred at that time people are unaware about the fact. The aim of this paper is to learn about the techniques which are used to monitor landslide and flash flood together and also to inform the people before disaster occurs via alarm in prone area and sending sms on each other's mobile.***

Keywords: landslide detection, upstream, downstream, alarm, sms sending

1. Introduction

Natural disasters such as landslide flash floods are a worldwide phenomenon, which occurs frequently in mountain areas and leads to destructing the whole villages and human lives. The most dangerous disaster occurred at 16 and 17th June 2013 after massive rains at Uttarakhanda [23]. Several landslides has been occured due to this heavy rain. Water of Alaknanda and Mandakini River was loaded with sediments, rocks, stones and sand. The landslides and flash floods by the rivers caused to breach the roads/highways buildings and other infrastructure that came in its way. Due to this disaster more than 1lac people would have died.

Several towns have become the destroyed town where there are spoilage all around and bad smell of the dead human and animal bodies. Due to the unequalled continuous rains for more than two days in Uttarakhand were resulted into the Landslides first and finally to the floods, and the result of this was destroyed cities, killing the devotees and also local people those who were cached in the disaster. The heavy rains resulted in large flash floods and huge landslides. Entire villages and communities such as Gaurikund, about 14 km before Kedarnath and Ram Bada, a central point between Gaurikund and Kedarnath, have been obliterate almost completely, while the Sonprayag suffered huge damage and loss of human lives[23].

The recent disaster occurred in Maharashtra, Pune district. This was occurred at 30/07/2014 in Malin village. The landslide was occurred by massive rainfall that had started the previous day, with the Malin village receiving heavy rain on 29 July and the cloudburst continuing throughout the following day. The environmental loss that resulted in the disaster is supposed to have had several reasons. Another reason observed as donating to the disaster was deforestation. The main cause was volatile agricultural practices which donated to instability of the hills. Also the manufacture of the adjacent Dimbhe Dam before 10 years was considered as a major reason. The unbalance of the mountain was because of the manufacturing activities, which are often done with careless analysis of environmental consequences.

However, impact of disasters such as landslide and flash flood can be reduced by effective Disaster Monitoring System and timely dissemination of Disaster warnings to citizens. This paper explores the proposed Disaster Monitoring and Alarming Systems for Mountain Foothills, and also describes the limitations and advantages of such a system.

2. Literature Survey

A. Sensor Networks for Flood Detection:

In this research, the advantages of a wsn are taken to benefit weather monitoring stations [2]. Many sensor stations main duty is measure and send parameters through a wireless network server [2,4]. WSN have been used for flood detection in Honduras, which is affected by heavy and massive rain and hurricanes. The network was designed as a 2-tier architecture, a short-range communication tie-up within an 8-km range as a single-hop network in the 900 MHz band and an inter-cluster communication network with a radio-range of up to 25 km in the 144 MHz band[3]. The authors of the paper did not mention data transmission or the warning methods used. However they mentioned as main problems: the protection of the system from environmental and human loss, suitable coverage of the zone at risk and effective prediction. Presented a prototype of an early flood warning system .The system used sensor networks installed in flood defenses. All the relevant information and simulation results are fed into a decision support system that helps flood managers to make informed decisions in the case of an emergency [3].

B. Early Warning system:

Early warning (EW) is "the system used to reduce the impact of disaster which means it works as a preventive system.[3]" It is the combination of three main entities, (from International Strategy for Disaster Reduction (ISDR), United Nations (UN), 2006):

1) ***Risk Knowledge***: Risk assessment provides essential information to set priorities for mitigation and prevention strategies and designing early warning systems.
2) ***Monitoring and Predicting***: Systems with monitoring and predicting capabilities provide timely estimates of the

potential problems faced by mankind, economies and the territory.

3) ***Disseminating Information***: Communication systems are needed for delivering warning messages to the potentially affected locations to alert local and regional governmental agencies. The messages need to be ethical, reproducible and easy to be understood by authorities.

C. Web Based and GIS-Based Flood Warning:

A case study of a flood prediction system for the Demer basin (UK) has been presented by state[3]. This system uses a web-based method[3]. Data is accumulated in real time from hydrological survey stations and processed with a group of server nodes, and then the consequences are made acquirable on client nodes in the control room and via remote access. This gives operational managers swift, fact-based, real-time flood prediction and facilitates the decision to issue an alert [3].

3. Objectives

As there are many villages, cities that are located at the bottom of a hill. These places are prone to landslides, and those places are at risk of avalanches. So to prevent such disasters we have come up with an idea that could not only provide an alarm but also bring down casualties. Landslides causes destruction within seconds so by just keeping an alarm that would warn people wouldn't help to save their life. Also not only it would be monitored by the local server but also by National Disaster Centre (NDS), in case of an emergency, rescue team can be sent as soon as possible. So this alarming and warning system will make help people to saves their Lives Instantly. The SMS module also makes a big help to message to the peoples which are coming to this kind of landslide affecting area.

4. Proposed System Block Diagram

Block Diagram Description

Array of Mirrors:

These mirrors are placed in landslide prone area.

Laser Grid:

The laser beam is focused on to these mirrors and laser grid is formed.

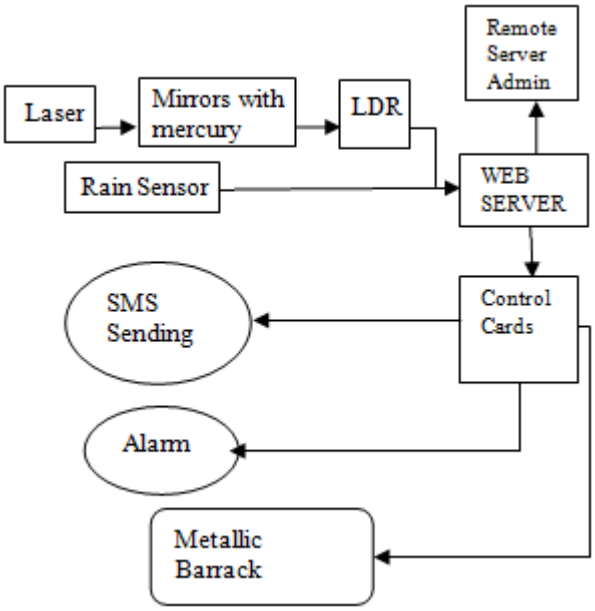

Figure 1: Block Diagram of Disaster Monitoring and Alarming System for mountain and foothills

Web server:

It is basically a normal pc with windows XP using its I.I.S utility. It is the heart of the landslide monitoring and defence system which monitors and controls the entire architecture.

Control Card:

This is unit which controls the movement of the barriers as well as the alarm system.

- *Alarm system:* It is basically situated in the town village or city to alert the people about the occurrences of the land slide.
- *Power circuit:* This unit provides power to the interface and control card.
- *SMS sending Module:* It will provide the system that will send an SMS on mobile to the people in such kind of area.
- *LDR:* It stands for (Light Dependent Register) it will reflect on the mirror for detection of landslides on the mountain surface.

5. Data Flow Diagram

The following diagram shows that there are mainly 4 classes of the data flow of Disaster Monitoring and Alarming System. Which are as below:

1. Landslide Detection
2. Water level counting
3. SMS sending module
4. Alarming System

1) *Landslide Detection:* In proposed system of Disaster Monitoring and Alarming System for mountain and foothills we are going to use laser monitoring. Through which we are using high density digital laser, mirrors with mercury, and LDR. Which are placed on the top of mountains. Laser will continuously keep focusing on mirrors, mirrors reflect that laser beam to LDR. If communication goes proper our LED will glow. If communication link breaks then LED will not glow this means that Landslide is occurred. Remote admin will

inform to Disaster ministry and SMS sending module and Alarming module will come in use here.

2) *Water Level Counting:* For water level counting in Disaster Monitoring and Alarming System for Mountain and foothills we are going to use Rain Sensors. Through which we are continuously counting the water level. Remote Admin will keep the record of increasing or decreasing level of water. If the level is normal then no action will be taken. If the Level increases to high level this means Flash flood is occurred. Remote admin will inform to Disaster ministry and SMS sending module and Alarming module will come in use here.
3) *SMS Sending Module:* If any disaster occurred main role of Remote Admin is collect all the contacts from database and send SMS to people that disaster has been occurred in prone area please leave the place as soon as possible.
4) *Alarming System:* If any disaster occurred, Remote Admin rings the Alarm in disaster prone villages. And inform to the ministry to send rescue teams.

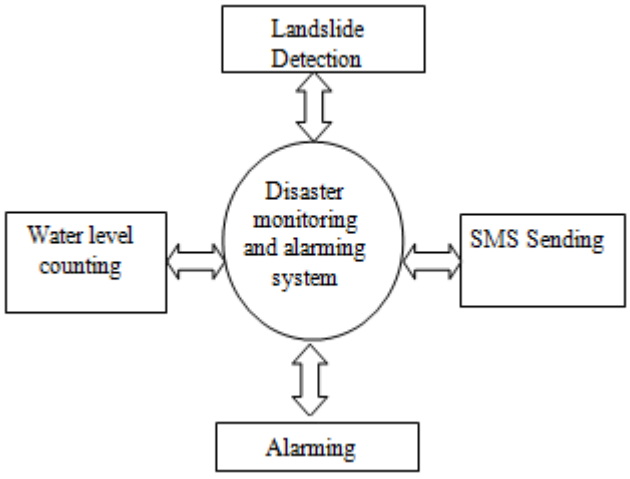

Figure 2: Data Flow Diagram of Disaster Monitoring and Alarming System for Mountain and Foothills

Table 1: Result of Disaster Monitoring System

Year	*Disaster Monitoring Systems*		
	Name of the Paper	*Authors*	*Results*
2014	Poster Abstract: Water Level Estimation in Urban Ultrasonic/Passive Infrared Flash Flood Sensor Networks Using Supervised Learning[1]	1.Mustafa Mousa 2.Christian Claudel	Water-level estimation using ultrasonic and passive infrared sensors.[1]
2012	An Appropriate Flood Warning System in Context of Developing Countries[3]	1.Saysoth Keoduangsine 2.Robert Goodwin	An Appropriate Automatic Flood Warning System using SMS.[3]
2012	Wireless Sensor Network for Landslide Detection[4]	1.Maneesha V. Ramesh 2.Sangeeth Kumar 3. P. Venkat Rangan	Using Wireless Sensor Network for Landslide Detection.[4]
2011	A Wireless Sensor Network for Weather and Disaster Alarm Systems[2]	1.Cholatip Yawut 2.Sathapath Kilaso	Developing devices and tools to manage, display and alert the weather/ disaster Warnings using the advantages of a wireless sensor network system in mesh topology.[2]

6. Conclusions

The paper reviews different methods for disaster monitoring. After reviewing different techniques it is observed that no single technique can monitor all the disasters and there is no alerting system for the villagers in mountain and foothills area. So, designing system which will monitor the landslide as well as flash flood in mountain area and alerting the people by using alarming system and sms sending system will contribute to prevent human, economical and social loss.

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