

Safety in Hilly Regions by using WSN & IoT

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Abstract – The hilly regions are more prone to accidents due to the sharp turns, accidental curves and the uncertainty or unfamiliarity of the road. Landslides, floods, bridge break, etc. makes the things even worse. Tourists also, along with the residents face problems and suffer due to the aforesaid reasons. GPS/GSM systems also don't work properly in these regions. This paper discusses a module which aims to monitor and enhance the safety in hilly areas by using Wireless Sensor Network and Internet of Things. Wireless sensing network (WSN) employs self-powered sensing devices at the locations sensitive to above mentioned reasons and then these sensors send information to the server about the possibility of a mishap and thus giving a warning signal to all so that timely help can be provided and the actions can be taken in order to prevent the mishap or at least reduce its consequences.

Key Words: Wireless Sensor Network, Internet of Things, Road Safety, Hilly Areas, Node MCU

1. INTRODUCTION

The brisk increase of automobile traffic resulting in congestion in the hilly areas has disrupted the smooth flow of traffic. Every year, it is observed that the rate of accidents and mishaps in the hilly areas keep on increasing. These areas are also very much prone to landslides, bridge breaks etc. A lot of trouble is faced by not only the residents of these areas but also the tourists. The problems faced by tourists are worse as they are unaware of the surrounding region. The tourist factor cannot be ignored as these hilly places are definitely a hotspot destination and hence are crowded with public. Also, some of these regions are pilgrim centers which attract a lot of devotees every year. The GPS/GSM systems are also not reliable in hilly areas and hence ensuring the safety and minimizing the occurrence or effect of the above undesirables is a must.

A lot of technologies have been explored for use in systems used to monitor the safety in hilly regions. Technologies like wireless sensor networks, VASNET [1], Vehicular ad-hoc networks, Cloud Computing, IoT and Machine to Machine Communication among many have been employed in systems aimed to reduce these unfortunate events.

In this paper, we are going to discuss a module which addresses these problems using Wireless sensor network and IoT. The device will be used to warn the drivers and various resorts as well along with the city officials about the

accidental curves, landslide, flood, bridge break so as to ensure the safety of people and to minimize accidents.

The rest of the paper is organized as follows; Section 2 discusses some of the previous approaches while the proposed work has been illustrated in Section 3. Finally, we conclude in section 4 by also stating the future possibilities.

2. LITERATURE SURVEY

A lot of research has been done and is still underway in these aspects. Some of them are discussed hereafter.

Machine to machine (M2M) communication in intelligent transportation is discussed in [2]. M2M is a technology which interconnects components like sensors, vehicles, road infrastructures and wireless networks. Its objective is to solve problems like road congestion, mishaps and high vehicle fuel consumption. It also states that M2M used in intelligent transportation systems (ITS) improves road safety and efficiency. Here, the Vehicular ad-hoc networks (VANETs) play a major role. It also devised some M2M architectures. The applications include traffic light control, fleet management and smart grid systems.

VANET was integrated with Cloud Computing Services in [3]. This combination supports many of the real time applications such as vehicle tracking, lane changing, accident detection etc. The paper proposed TMaaS: Traffic management as a service in vehicular networks by using the integrated model of VANET and Cloud Computing Services. It also discusses a hardware prototype for vehicular speed and location tracking, efficient lane changing and accident detection on real time basis.

The various Applications of Wireless Sensor Network in Intelligent Traffic System are reviewed in [4]. It discusses the goals set up to increase the efficiency of actual systems and how the diversified use of Vehicular network makes it a popular choice in helping in developing an efficient system to control and manage smooth traffic flow and that it is capable of bringing revolutionary changes in transportation system.

3. PROPOSED WORK

The module discussed in this paper involves the use of WSN and IoT. It mainly focuses on accidental points like curves or sharp turn and also on the landslides and bridge

breaks. The module will be planted all over the crucial points across the hilly regions. It divides the regions into four zones i.e Landslide zone, Bridge Break Zone, Sharp Turn Zone and Accidental Zone. The paper discusses how the combination of WSN and IoT can be used in monitoring environmental and physical parameters in real time and helps reduce the mishaps in the hilly areas.

IoT platforms like NodeMCU and Ubidots are used in the process.

3.1 Detection of Landslide or Bridge Overflow

For landslide detection, two lattices at a suitable distance apart are forged down a hill. If there is a landslide, then the stones fall on the upper mesh and as the stones continue to fall, after a point, the upper mesh will be connected to the lower mesh. This connection will generate an output signal which will be sent to DMO office via cloud for further action to be taken.

Detection of bridge overflow will be detected by the aid of moisture sensors placed at the bridge. Whenever the water level touches or rises above the safe or permissible level, then an output message will be produced which will again be sent to DMO Office for taking precautionary measures.

The basic depiction of the flow is shown in Fig -1.

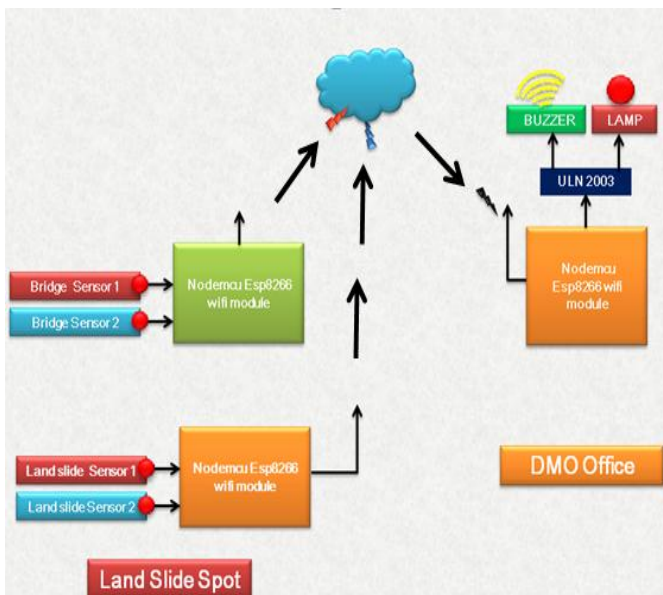


Fig -1: Flow depiction during landslide or bridge overflow

3.2 Prevention of Accidents

As the vehicle approaches a sharp turn or any accidental curve, the sensor tracks its path and indicates the upcoming danger and warns just before moving further. For example, if the vehicle is about to approach a sharp turn, a message will

be pinged on the user's receiver which will warn him of the dangerous road ahead. The messages will also be forwarded to DMO Office. The working as illustrated in Fig -1 for landslide points can be extended to sharp turns and accidental curves.

The Ubidots Cloud Graphical User Interface is shown in Fig -2.



Fig -2: Ubidots cloud GUI

4. CONCLUSION

The project aims to enhance the security in the mountainous regions by employing wireless sensor networks. The different sensors, deployed on various locations or the locations which are more prone to accidents or natural calamities, detect the unnatural or the undesired activity and send a signal to the server and inform it about the possibility or an occurrence of any natural calamity or a mishap. This signal plays an important role in providing

timely help and thereby reduces the consequences of the undesired activity.

This module also has very good future scope, since even though due to rigorous efforts of our government the unfortunate accidents don't seem to be successfully reducing. The module can also be extended to be used as a route detector. We aim to help more and more vehicle users who are frequent travelers in hilly regions. In future, it can also be placed in-built in the vehicle itself.

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