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SOIL AREA NETWORK FORLANDSLIDE PREDICTION AND PREVENTION SYSTEM BASED ON ARM CORTEX M3

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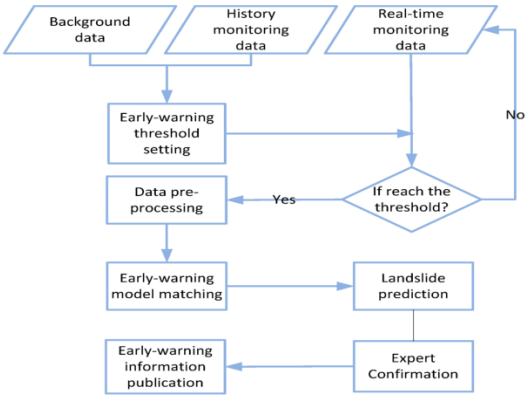
ABSTRACT

To detect an approaching landslide scenario using sensor columns deployed on hills to find the early signals preceding a mudslide or landslide and alerting using GSM. Around the world, landslides and mudslides are critical geological risks affecting humans, and purpose sizeable damages every year. The stability of a slope changed from a solid to an unstable condition that spawns a landslide or mudslide.The ARM Cortex M3 can be used .This microcontroller hardware is can cost effective and low energy consumption.

I. INTRODUCTION

Around the globe, landslides and mudslides are serious geological hazards affecting people, and causing significant damages every year.Approximately 15% of total area of India is susceptible to landslides. These areas are marked as Landslide Hazard Zones. Landslides occur mainly due to heavy rainfall experienced by these zones during the monsoon season and sometimes as an aftermath of an earthquake. The existing methods uses satellite image sensing technology or a camera based image sensing. But these methods are not the cheapest one also.

FLOW DIAGRAM



I. LITERATURE SURVEY

A.SULTAN: An Application for Landslide Susceptibility Assessment and Site Mapping

The grouped developed anapplication for landslide susceptibility assessment and site

mapping using the model. It includes material strength of soil, slope angle, vegetation cover, amount of rainfall, frequency of failure (land movement) and land use. Data organization and analysis comes next for the usability study. Final revisions in the application depend on the results of the evaluation before public release. Countrydue to its geographical setting has a need to develop new techniques and models to measure landslide susceptibility to help in the mitigation of landslides.

B.Landslide prevention using a buried sensor network

This technique can be used for this particular phenomenon (photogrammetry, LIDAR ...), but some significant imperfections and flaws lay within their usage.

There enabling radio communication using very low power levels. Then further the landslides prevention by industrializing an up and running product with the most suitable techniques.

C. Landslide Displacement Prediction With Uncertainty Based on Neural Networks With Random Hidden Weights

A new approach to establish a landslide displacement forecasting model based on artificial neural networks (ANNs) with random hidden weights.Forecasting a lower–upper bound estimation (LUBE) method is adopted to construct ANN-based PIs, while a new single hidden layer feed forward ANN with random hidden weights for LUBE is proposed. A new ANN objective function, which combines a modified combinational coverage width-based criterion with one-norm regularization, is proposed.

D. landslide detection and monitoring with insar technique over upper reaches of jinsha river, china

The SBAS technique has been applied to multi-temporal SAR images to achieve time-series deformation.In future SAR sensors with higher spatial and temporal resolutions will significantly improve landslide detection and monitoring.

E. Proposal of a Distributed Cooperative M2M System for Flood Disaster Prevention

The distributed cooperative M2M system to solve such problems and make an attempt to apply the proposed system

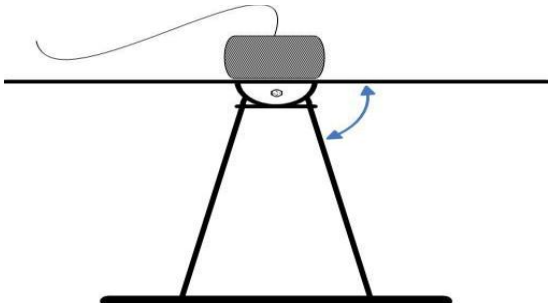
toapplications for flood disaster prevention network. In addition, a rule-based autonomous control mechanism for a real-time flood alert in the M2M gateway is offered. We are planning to apply the results of this study to a flood disaster prevention system as part of a project of the Asia-Pacific Ocean telecommunicationscommunity.

II. MEMS ACCELEROMETER SENSOR

Developmentofawirelesssoilmonitoring nodeincludedtheselectionandmodific

ationofsensorsandwirelessdatatransmissionsystemstomeetpoweranddurabilityrequirementsforfieldimplementation. Forthisresearchtiltandsoilmoisturecontentweremeasured.

Component	Current(at3.002V)
Mote, while transmitting	25mA
Mote, whilesleeping	10A
EC-5Moisture Probe	9mA-13.6mA
MEMStiltsensor	0.5mA
Voltage Regulator	29mA



MEMSaccelerometer calibrationapparatus

ALGORITHM

For this process, decision making algorithm can be used.This decision making algorithm can be used because for comparing with Artificial Intelligence which is based on this algorithm.This algorithm can be initiate to the three(x,y,z) axis values.

These three values can be given to the microcontroller unit.Then this microcontroller unit can predict the results based on the threshold values.

POWERDEMAND

Thecurrentdrawsofeachsensortype,thevoltageregulatorandtheDustNetworksmote.Thetwovalueslistedforthemotecorrespondtotheoperationalcurrentdraw,whenthemoteistransmittingdata,andthe‘sleep’currentdraw,whenthemoteisinactive. Thelowcurrentdrawofthesoilmonitoringnodeallowstherechargeablebatteriestoprovideenoughpowerduringperiodsoflimitedsun(cloudydays,nights).

Features of power supply

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

SYSTEM DESIGN

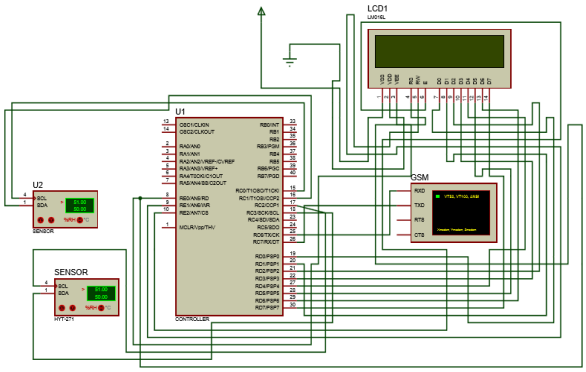
EXISTING SYSTEM

In existing system there is no automatic service for land slide prevention.Usual land slide warning system contains the human involved operationAlso there is a separate operation team for monitoring the operation of team members.

DRAWBACKS

- The main drawback of the existing system was it will consume too much cost produce.
- The existing system needs large number of man power unit.Also we can't provide immediate warning.

PROPOSED SYSTEM



The project gives a cheaper method of landslide prediction and prevention based on WSN with the help of low cost sensors. WSN can be extended to alert the people in their home through nodes with sirens. By connecting it with warning traffic lights on the road the vehicles in the region can be alerted before a landslide. The microcontroller chosen is based on ARM Cortex M3 architecture. ARM Cortex M3 is the next generation high performance 32-bit ARM coredeveloped specifically for microcontroller applications with thumb-2 technology based on ARMv7-M architecture.

ADVANTAGES

- Low power consumption
- High energy efficient
- Low cost sensors can be used

CIRCUIT DIAGRAM

TYPES OF LANDSLIDES

Fall

A fall is the movement of material from a stiff headwall or cliff. It generally involves limited volumes of material, most usually rock. The material falls onmasse, moving freely in the gravity field. The contact with the terrain occurs especially in the last part of the trajectory, where the material becomes frequently shattered.

Topple

A topple is the rotation of a vertical slab about a pivoting point located at the base.Topple is typical of compact vertical slabs (usually but not exclusively rock) lying on soft, unconsolidated terrain. The movement may be extremely slow for long periods, culminating with a catastrophic fall of the slab.

Translational Slide

A slide is defined as the movement of material along a shear surface. For a translational slide, this surface is planar.The identity of the shear surface is somehow preserved and distinguishes a slide from a flow.

Rotational Slide

In a rotational slide, the detachment surface is roughly circular, spoon-like. In contrast with translational slides, where the planar surface often originates from a weakness zone, the circular shape of a rotational slide is created by the failure itself and derives from the geometrical distribution.

Flow

According to Dikau et al. (1996, p. 149), a flow is "a landslide in which the individual particles travel separately within a moving mass. They involve whatever material is available to them and may therefore be highly fractured rock, clastic debris in a fine matrix or a simple, usually fine, grain size. Flow in its physical sense is defined as the continuous, irreversible deformation of a material that occurs in response to applied stress." A flow is thus characterized by a fluid-like movement, in which the information on the detachment surface has been lost. In this work, the word "rock avalanche" will be preferred to "rock flow" to denote a catastrophic landslide mostly composed of rock.

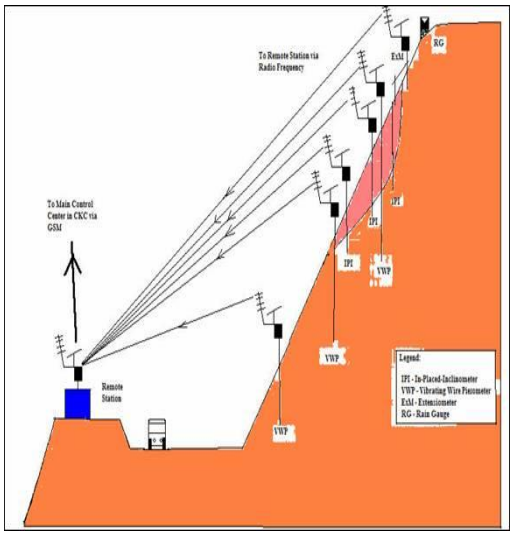


Fig: Flow architecture

MODULES DESCRIPTION

1. NETWORK INITIALIZATION

- The memes sensor can be placed for analysing the soil moisture level with the help of an three axis(x,y,z).We are finding the distance of an sensor to be placed.
- This sensor is equipped with the land are going to monitor the soil level by detecting whether it crossing the limits of the axis by quaking the sensor.
- This sensors is powered with the 5V power supply

2. PREDICTING THE LEVEL OF AXIS AND TRACKING

- In this phase, the level of the axis can be predicted and tracked when it crossed the limits of an axis.
- The tracked values are sent to the microcontroller and microcontroller will process this data's and data's are given to the decision making procedure.

3.DECISION PROCESS

- This process includes the threshold values and based on the threshold values if the threshold value cross the actual value means the trigger process will initiate.
- GPS can be used to find the position of the mems sensor by using the threshold values.The threshold value is calculated if it goes beyond the boundary by the range of values.It distinguishes the range of values.

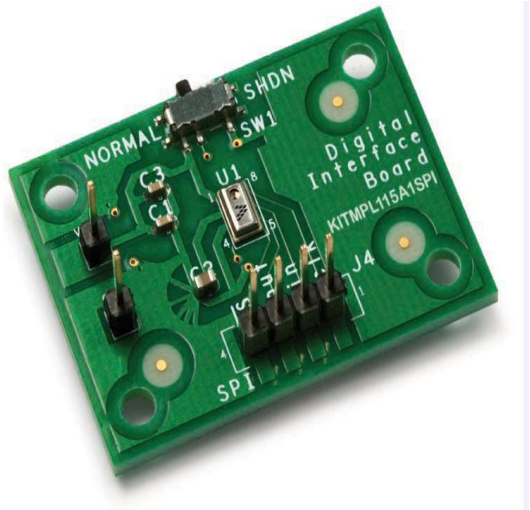
4.ALERTING

- The GSM is the main hardware module which is used for the communication purpose for alerting the people.
- GSM consists of transmitter and receiver.
- The transmitter side can be used at one end as database and at the receiver side used for people or flood authority.

PROJECT ADVANTAGE

The existing methods uses satellite image sensing technology or a camera based image sensing. But these methods are not the cheapest one also. The project gives a cheaper method of landslide prediction and prevention based on WSN with the help of low cost sensors. WSN can be extended to alert the people in their home through nodes with sirens.By connecting it with warning traffic lights on the road the vehicles in the region can be alerted before a landslide. Number of sensor Motes can be increased to monitor a large area. All motes are battery powered and designed to be power efficient.

MEMS SENSOR



III. LIQUID CRYSTAL DISPLAY (LCD)

A liquid crystal display (LCD) is an electro-optical amplitude modulator realized as a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. It is often utilized in battery-powered electronic devices because it uses very small amounts of electric power. With no liquid crystal between the polarizing filters, light passing.

Steps to Interface LCD with PIC Microcontroller

STEP 1: Identify

Determine what you want LCD are available in many flavors which are specified as follows 16x1 , 16x2 , 20x2 in the format AxB where A is the number of columns (chatters) and B is the number of Rows (lines) An LCD might also be Back lit .

STEP 2:Connect

Most of the LCD's follow the standard Hitachi Pin out

STEP 3: Interface

Now connect pins RS ,RW ,E ,D0 - D7 to pins on the micro controller Lets suppose I connect Data bus on port A and the RS , RW , E on port B .

CONCLUSION

Wireless sensor network for landslide detection is one of the challengingresearchareas available today in the field of geophysical research.Thispaper described about an actual field deployment of a wireless sensornetwork for landslidedetection. This system uses wireless sensor nodes,for efficient delivery of real time data to the data management center. Thedata management center isequipped with software's and hardware's neededfor sophisticated analysis of the data.The results of the analysis in the formof landslide warnings and risk assessments will be provided to theinhabitant.

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