Damage Detection of Railway Track by Sensor Using Advanced RISC Machine

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Abstract - Ultrasonic distance measuring sensors are widely used in many industrial establishments and particularly in the metrology area. These sensors are used in many engineering disciplines because of their high-precision Characteristics of different methods. In addition, Global positioning System (GPS) receivers and total stations are widely used in geodesy. Using the GPS receivers is very popular, particularly for navigational purposes different techniques. In this paper, a new railway track geometry surveying system, which is designed by integrating the ultrasonic sensor, Fire sensor, GPS receiver, and total station, is introduced. This new surveying system is an alternative to classical geodetic measurement methods that are often used for ARM controlling the railway track geometry, To identification the location of damage detection of Track gauge, and track axis coordinates, which are railway geometrical parameters, can be instantly determined while making measurements by using the New surveying system.

Keywords- Geodesy, Global Positioning System, ultrasonic sensor, fire sensor, multisensory system.

I. INTRODUCTION

In all railways system, particularly in the case of railways, safety and reliability are highly considered depending on some developments in railway systems, high speed trains are being extensively used, and rail transportation is being increased. Reasons for this increase are high speed, economical, environment friendly, safety; characteristics can be continued by periodical maintenance and control measurements. Depending on different factors, deformations may occur on the superstructure of railways. Determining these deformations on time and taking precautions is very important for the safety of railway systems. Positioning data along with the train speed helps the administrations to identify the possible safety issues and react to them effectively using the communication method provides by the system

The fast growth in railways caused the necessity to provide speed and

automation in geodetic control measurements. The introduction surveying system in this paper is operational on track geometry and track gauge. Track axis coordinates, which are railway geometrical parameters nn, [1] are obtained with integrated global positioning system (GPS) receivers. The received the signal and send the message to station , In addition by means of motorized total station, the system can be operated in tunnels without interruption where it is not possible to work with GPS receivers. Thus the standards of [2] the International Union of Railways on railway geometrical parameters can be achieved in different type of modules in different techniques like that we using ultrasonic sensors and fire sensors to detect the object in proposed system.

II. Components Of The Surveying System

A. Ultrasonic Sensor:

Ultrasonic sensor provides a very low-cost and easy method of distance measurement. This sensor is perfect for any number of applications that require you to perform measurements between moving or stationary objects. [3] Naturally, robotics applications are very popular but you'll also find this product to be useful in security systems or as an infrared replacement if so desired. You will definitely appreciate the activity status LED and the economic use of just one I/O pin.

The Ping sensor measures distance using sonar; an ultrasonic (well above human hearing) pulse is transmitted from the unit and distance-to-target is determined by measuring the time required for the echo return. Output from the sensor is a variable-width pulse that corresponds to the distance to the target.

Interfacing to the BASIC Stamp and Javelin Stamp microcontrollers is a snap: a single (shared) I/O pin is use to trigger the Ping sensor and "listen" for the echo return pulse. And the intelligent trigger hold-off allows them to work with the onboard three-pin header allows them to be plugged into a solder less breadboard and to be connected to its host through a standard three-pin servo extension cable.

Fig.1. Ultrasonic sensor used to determine the surveying system.

B. GPS Receiver

Global Positioning System is an earth-orbiting-satellite based system that provides signals available anywhere on or above the earth, twenty-four hours a day, which can be used to determine precise time and the position of a GPS receiver [4] in three dimensions. GPS is increasingly used as an input for Geographic Information Systems particularly for precise positioning of geospatial data and the collection of data in the field. Precise positioning is possible using GPS receivers at reference locations providing corrections and relative positioning data for remote receivers. Time and frequency dissemination, based on the precise clocks on board the SVs and controlled by the monitor stations, is another, use for GPS. Astronomical observatories telecommunications facilities and laboratory standards can be set to precise time signals or controlled to accurate frequencies by special purpose GPS receivers.

Dual frequency GPS receivers have been used on the surveying system to determine the track axis coordinates. In these method GPS measurement method, reference and rover receivers are used. The reference receiver has a radio transmitter that transmits the carrier-phase correction data. The rover receiver has a radio receiver that receives the corrections transmitted from the reference receiver.

C. GSM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, [5] just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

The term GSM modem is used as a generic term to refer to any modem that supports one or more of the protocols in the GSM evolutionary family, including the 2.5G technologies GPRS and EDGE, as well as the 3G technologies WCDMA, UMTS, HSDPA and HSUPA.

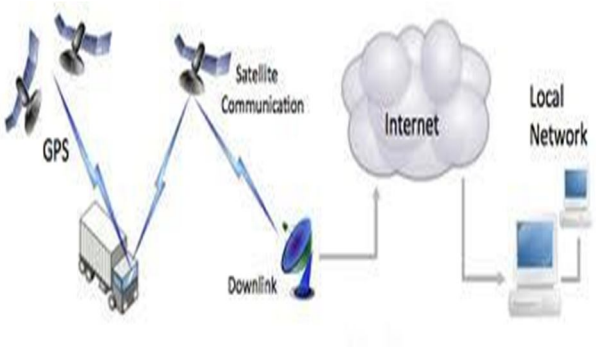

Fig. 2: GPS System

D. Remote Station

The parameters to be measured for Detection of Railway Track by Sensor are ultra sonic sensors and fire. [8] These ultra sonic sensors are placed at sides of railway track.

Once the tracked length has reached desired failure level the sensors send a signal to the micro controller to send message to sever about failure detection in term of location information.

Fig.3: Alignment of Ultra sonic sensors

The signal send by the sensor is boosted up to the required level by corresponding amplifier stages. Then the amplified signal is fed to converters of desired resolution to obtain digital form of sensed input for microcontroller use.

A 16X2 line LCD module can be used in the system to monitor current readings of all the sensors and the current status of respective tracks. [6] The required readings can be transferred to the Centralized Computer for further analytical studies, through the serial port present on microcontroller unit. While applying the automation on large networks more than one such microcontroller units can be interfaced to the Centralized Computer. This client module will send information (Sensor) to master through GSM communication.

At Master side, we used ARM7 controller for receiving information from sensors. After receiving information from Client modules Controller will update to server through GPS service.

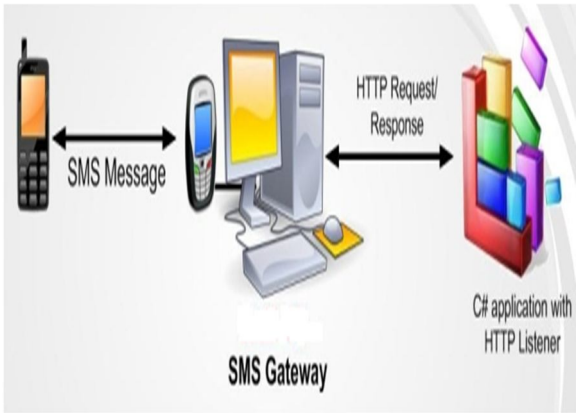

Fig.4: SMS Gateway

The microcontroller unit has in-built timer in it, which operates parallel to sensor system. In case of sensor failure the timer turns off the system after a threshold level of time, which may prevent the further disaster.

E. Fire sensor

The fire sensor circuit is too sensitive and can detect a rise in temperature of 10 degree or more in its vicinity**.[7]** Ordinary signal diodes like IN 34 and OA 71 exhibits this property and the internal resistance of these devices will decrease when temperature rises. In the reverse biased mode, this effect will be more significant. This indicates normal temperature.

Fig. 5: The fire sensor used to determine the surveying system

CONCLUSION

GPS receivers are very popular, particularly for positioning system. In this paper, a new railway track geometry surveying system, which is designed by integrating the, Ultrasonic sensor, Fire Sensor GPS receiver, and total station, is introduced. This new surveying system is an alternative to classical geodetic measurement methods that are often used for monitoring the railway track geometry. The surveying system can be further improved by integrating different sensors. It can be concluded that this technique achieved the best overall results compare to this module.

REFERENCES

[1] R. T. Lemmon, "The Influence Of The Number Of Satellites On The Accuracy
Of RTK GPS Positions," *Australian Surv.*, Vol. 44, No. 1, Pp. 64–70, 1999.

[2] B. Hofmann-Wellenhof, H. Lichtenegger, And J. Collins, *GPS-Theory And Practice*, 5th Ed. Wien, NY: Springer-Verlag, 2001.

[3] L. Beales, "Track System Requirements," Railway Group Standards,
GC/RT5021, Railway Safety, London, Oct. 2003.

[4] E. Gülal And B. Akpinar, "Applications Of GPS Based Machine Guidance Systems In Open Pit Mining Operations," In *Proc. Int. Conf. Modern Manage. Mine Producing, Geology Environ. Protect.*, Varna, Bulgaria, Jun. 9–13, 2003.

[5] R. Glaus, G. Peels, U. Müler, And A. Geiger, "Precise Rail Track Surveying,"
GPS World, Pp. 12–18 2004, May 1.

[6] I. Milev And L. Gruendig, "Rail Track Data Base Of German Rail—The
Future Automated Maintenance," In *Proc. INGEO FIG Regional Central Eastern Eur. Conf. Eng. Surv.*, Bratislava, Slovakia, Nov. 11–13, 2008.

[7] B. Li, C. Rizos, H. K. Lee, And K. H. Lee, "A GPS-Slaved Time Synchronization
System For Hybrid Navigation," *GPS Solutions*, Vol. 10, No. 3, Pp. 207–217, Jul. 2010.