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BRIDGE STABILITY MONITORING USING RH SENSORS CONTROLLED BY LABVIEW SOFTWARE

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Abstract - *The main aim of our project is to continuously monitor the concrete structures and give alert based on its condition. RH sensors are placed in the concrete structures and the datas from the sensor are continuously received and given to myRIO hardware where the data is compared, split and stored. While comparing the received data with the reference data if any abnormality or change is observed then alarm gives the alert. This alarm control and monitoring is done using LABVIEW software. This type of monitoring requires less space and accuracy will be more. Thus, it would help in preventing loss of many lives and provide control over concrete structure. This monitoring is common for all the concrete structures. The datas are also stored for future use. Data storage is done in the myRIO hardware.*

Key Words: **RH sensors, Concrete Structures, LabVIEW, myRIO, Alarm**

1. INTRODUCTION

Nowadays collapsing of concrete structures is becoming common this results in loss of many lives. On analyzing this problem we came to know that loss in lives would have been prevented if there was an alert regarding the condition of the concrete in the bridge. The stability can be analyzed by placing sensors in the bridge. The sensors used may be fiber optic sensor, RH sensor, acoustic touch sensor, etc., [1]. This analysis is done using the NI lab view software and the sensors output is given to the myRIO hardware that helps us to give analogue output. The analogue output is given to the alarm circuit if any deviations were found else it is stored in the memory.

2. RH SENSOR

RH sensors are relative humidity sensors. These sensors measure both humidity and temperature. There are three different types of humidity they are

- Absolute humidity
- Relative humidity
- Saturation humidity

Absolute Humidity (vapour density) is defined as a ratio of the mass of water vapour in air to the volume of air, with the unit of grams per cubic meter or grains per cubic foot. Relative Humidity (RH) is defined as ratio of the amount of moisture content of air to the maximum (saturated.) moisture level that the air can hold at a same given temperature and pressure of the gas. RH is a temperature dependent magnitude, and hence it is a relative measurement. The RH measurement is stated as a percentage. Saturation Humidity is defined as the ratio of the mass of water vapour at saturation to the volume of air. RH sensor used here is of capacitive in nature and its construction is like two electrodes separated by a dielectric material. The sensor reads the value when there is a change in capacitance of the electrodes. When the moisture level remains normal or does not change then the sensor output remains to be normal [2].

Figure 1.1 represents RH sensor.

2.2 Saturation vapours pressure V_s temperature

Figure1.2 represents the temperature variation with respect to saturation vapour pressure.

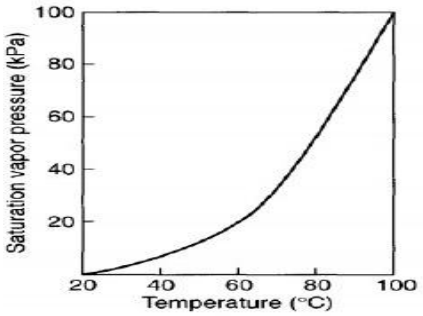
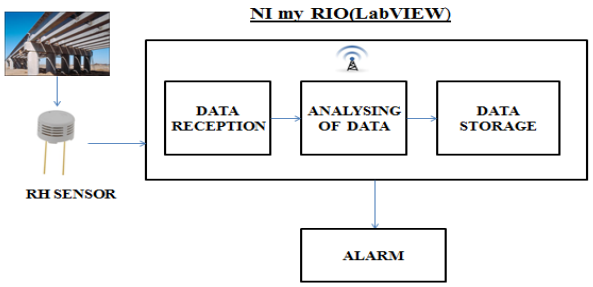


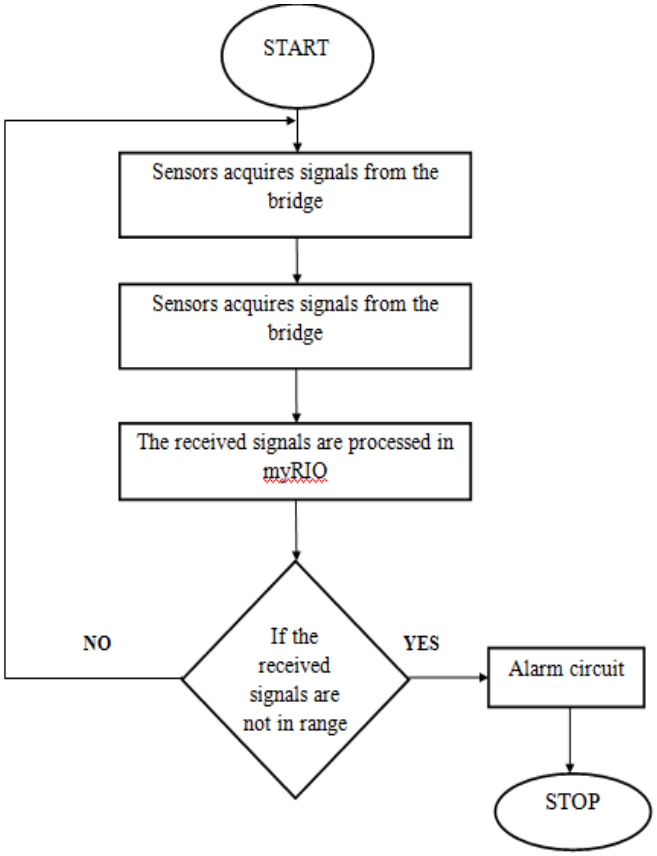
Figure 1.2

3. BLOCK DIAGRAM



The humidity sensor is placed in the bridge. The sensor used here is relative humidity sensor (HS1100) measures both the temperature and humidity. The sensor continuously senses and gives signal regarding. The signal from sensor is given to the myRIO hardware where a set of functions takes place. The signal from the sensor is received by the receiver in the myRIO then it is given to the signal splitter where the received signal is split based on the frequency range when required it also reassembles two signals. Then the signal is converted or processed to the required form using the signal processor. The processed signals are then stored in the memory using data storage. If there were any deviations in the humidity and temperature sensed then the signal is given to the alarm circuit and the buzzer rings [3]. Therefore the monitoring of bridge continues and deviations in the condition of the concrete are given the alert. Thus this monitoring system would help us in continuous checking and protection of the bridge.

4. FLOW CHARTFOR THE PROCESS



5. SOFTWARE USED

The software used here is NI LabVIEW. It is an integrated development environment designed specifically for engineers and scientists. Native to LabVIEW is a graphical programming language (G) that uses a dataflow model instead of sequential lines of text code, empowering you to write functional code using a visual layout that resembles your thought process. This means you spend less time worrying about semicolons and syntax and more time solving the problems that matter. LabVIEW is designed specifically for engineers and scientists building measurement and control systems. With a native graphical programming language, built-in IP for data analysis and signal processing, and an open architecture that enables integration of any hardware device and any software approach, LabVIEW is the software you need to build the optimal solution that can meet your custom requirements and solve the challenges at hand.

6. HARDWARE INTERFACE

Hardware interface is done by NI myRIO. MyRIO is a real time embedded evaluation board made by National Instruments. It is used to develop applications that utilize its on board FPGA and microprocessor. The National Instruments myRIO is a portable reconfigurable I/O (RIO) device that students can use to design control, robotics, and mechatronics system [3]. Figure 1.4 represents myRIO hardware.

Figure1.4

6.1 Connecting Ports of myRIO

National Instruments myRIO has many types of ports. They are

- myRIO Expansion Port (MXP),
- Mini System Port (MSP),
- USB Port,
- Power Supply Port,
- Device Port (Connection To PC),
- Audio Input and Output Port.

NI myRIO has a power requirement of 14 W with an input voltage range of 6 V to 16 V. The NI myRIO Power Supply provides wall power to NI myRIO with the appropriate specifications. An NI myRIO Power Supply must be ordered separately when purchasing the board only version of NI myRIO. Range: 12VDC, 1.5A maximum, 18W maximum.

7. WORKING

The RH sensors are placed in a concrete structure. This RH sensor is connected to the myRIO hardware and then to the PC containing lab view software for controlling purpose. The sensor senses the changes in humidity value and gives output accordingly. The sensed output is given to the myRIO hardware where the data reception and conditioning takes place. The acquired data will be compared with the reference values of the bridge. If the acquired data is in the range of reference data then the bridge is in normal condition. If the data is not in that range then the alert is given. So the alert is given based on the results obtained.

8. CONCLUSION

Thus in this project the sensors are placed in concrete structures and its stability is monitored continuously using labview software and alert is given based on the changes that takes place in the concrete.

9. REFERENCES

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