

Interface for Industrial WSN in IoT Environment using A Reconfigurable Smart Sensor

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ABSTRACT

A sensor interface contraption is fundamental for sensor data collection of present day remote sensor frameworks (WSN) in IoT conditions. In this paper, to handle these issues, another technique is proposed to diagram a reconfigurable quick sensor interface for mechanical WSN in IoT condition, in which complex programmable reason contraption (CPLD) is held onto as the enter controller. The contraption is merged with the most a la mode CPLD programmable development and the standard of IEEE1451.2 adroit sensor specific. Execution of the proposed framework is confirmed and great impacts are accomplished in practical utilization of IoT to water condition checking.

KEYWORDS:

CPLD, IEEE1415 protocol, Internet of Things (IoT), sensor data acquisition.

I. INTRODUCTION

Remote sensor frameworks (WSNs) have transformed into a hot research point starting late batching is considered as a practical approach to manage diminish orchestrate overhead and improve versatility. Remote sensor structure is one of the unavoidable systems which sense our condition through different parameters like warmth, temperature, weight, and so on. FPGA/CPLD has excellent gear basis control, steady execution, and synchronicity, which enable it to finish parallel securing of multi sensor data and essentially upgrade persistent execution of the structure. FPGA/CPLD has at this moment ends up being more noticeable than MCU in multi sensor data obtainment in IoT condition. Remembering the ultimate objective to organize a broad assortment of clever sensor interfaces in the market and deal with the similitude issue of vigilant sensor, the IEEE Electronic Engineering Association has in like manner pushed IEEE1451 sharp transducer (STIM) interface standard tradition suite for the future headway of sensors. Splendid sensor interface for mechanical WSN in IoT condition. This framework presents numerous ideal conditions as depicted underneath. As an issue of first significance, CPLD is used as the middle controller to release the constraintment on the far reaching data acquisition interface, and recognize truly parallel getting of sensor data. For the sensors not in perspective of IEEE 1415 tradition standard, the data securing interface structure can finish the limit of fitting and play. In this paper, this arrangement take full ideal position of CPLD qualities, for instance, high execution speed, versatile affiliation structure, IP setup could reuse, et cetera.

The paper is organized as follows: Introduction of the paper is in Section I. Section II informs about the related work and detailed hardware and software implementations are described in Section III. The architecture and application in water quality monitoring is discussed in Section IV, V and VI. In Section VII results are been shown. Finally, we conclude our work in Section VIII.

II. LITERATURE SURVEY

Qingping Chi et al. [1], proposed another strategy to plan a reconfigurable savvy sensor interface for mechanical WSN in IoT condition. Shifeng Fang et al. [2], presents a planned approach to manage water resource organization in light of geoinformatics including developments, for instance, Remote Sensing (RS), Geographical Information Systems (GIS), Global Positioning Systems (GPS), Enterprise Information Systems

(EIS), and cloud administrations. Cheong, P. et al. [3], paper shows a ZigBee-based remote sensor organize hub for the bright i.e. UV discovery of fire. R. KarpagaPriya, T. KarpooraEswari, and K. Akilakumari [4], presents an Industrial WSN in IOT Environment Interface with Smart Sensor Using ARM. Bharani M., Elango S., Ramesh S.M., and Preetilatha R. [5], presents an installed framework based checking framework for businesses by interfacing sensors with ATmega Microcontroller.

III. THE RELATION WITH IOT

"IoT" is about physical things talking with each other, where machine-to-machine (M2M) trades and individual to-PC correspondences will be contacted "things". Since IoT is connected with a broad number of remote sensor contraptions, it makes endless. Sensor data securing interface equipment is one of the key parts in IoT applications. Data amassing is the fundamental utilization of WSN and more essentially. IoT is an essential drive to support profit association with various applications. The designing of IoT is spoken to as in Fig. 1.

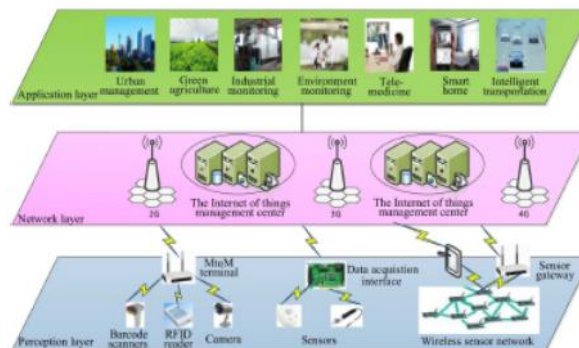


Fig.1. Architecture of IoT.

It comprises of three layers:

1. Observation Layer;
2. Arrange Layer and
3. Application Layer.

The layout of data getting interface is principally associated with the acknowledgment layer of IoT. The perception layer of IoT is predominantly made out of sensors, RFID per clients, cameras, M2M terminals, and diverse data gathering terminals. The data acquirement interface is accountable for the compromise and joint exertion of various conditions and assembling of sensor data.

IV. ARCHITECTURE

CPLD is focus controller of the interface contraption. It is used to control data acquisition, taking care of, and transmission intelligently, and make some preprocessing work for the accumulated data. Inside CPLD driver of chips on the interface contraption is in like manner redid. Different versatile interfaces are created on the equipment. It can be connected with 8-channel straightforward banner interface and 24-channel electronic banner interface. Thusly, we can pick assorted transmission technique for the contraption in different current application circumstances. Fig 2. exhibits the essential thought of utilization and working graph of the reconfigurable splendid sensor interface contraption in which we can see the Analog to Digital Converter (ADC) module and banner interface on the interface device are controlled by the CPLD, which makes it possible to accumulate the 8-channel straightforward signs and 24-channel electronic banners circularly, and sets these assembled data into the planned Static Random Access Memory (SRAM) on the interface device. The accumulated data can be transmitted to the host PC side by technique for USB serial wired correspondence or Zigbee remote correspondence, so that the customer can dismember and set up the data.

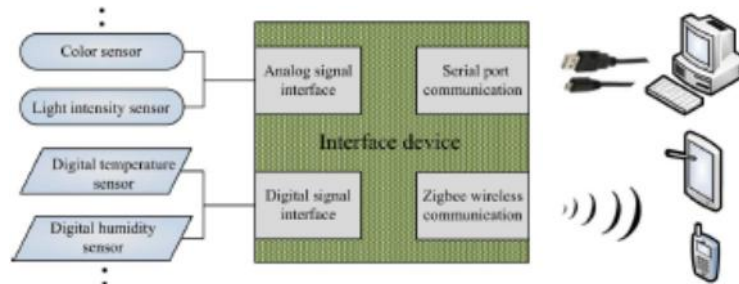


Fig. 2. Application and working diagram of the reconfigurable smart sensor interface device.

V. IMPLEMENTATION

A. The Introduction of the Hardware Architecture

The general structure of reconfigurable wise sensor interface involves CPLD chip (XC2C256 chip), valuable stones and periphery circuit, correspondence circuit for swinging USB to serial port (PL2303HXC chips and periphery circuits), control supply of 1.8 and 3.3 V (LM1117 chip, voltage controller and channel circuit), a SRAM memory (TC55V400 chip), fast 8-channel ADC (ADS7870 chip and periphery circuit), LED pointer light, a straightforward extended interface, and three progressed expanded interfaces. Fig. 3 shows the CPLD gear square chart. The hardware structure can moreover send and get data other than the basic sensor data acquiring. It can send data to the control center through USB serial port or Zigbee remote module. Zigbee remote correspondence module can be related with the board through the littler than anticipated USB interface or the extensible GPIO interface on the contraption.

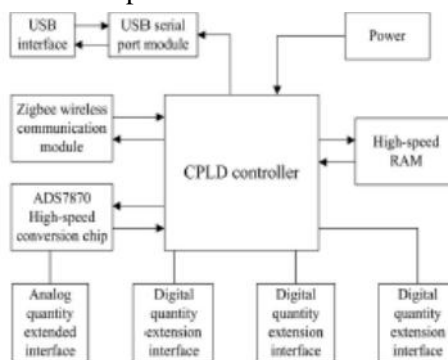


Fig. 3. CPLD hardware block diagram.

B. VHDL Design

Rapid Integrated Circuit Hardware Description Language (VHDL) plan of the system joins two areas. One segment to uses the VHDL lingo as the basic gadget and make related components out of the reconfigurable splendid sensor interface device by suggesting the standard of IEEE1451.2 statement. It reflects the complexity between reconfigurable clever sensor interface device and general data obtainment card, which has a magnificent effect in adroitly assembling sensor data. The other part is changing the interface driver in light of VHDL hardware depiction lingo. It principally covers programming of each gear chip driver and sensor driver on the contraption. Fig. 4 shows the general structure layout of VHDL some bit of system.

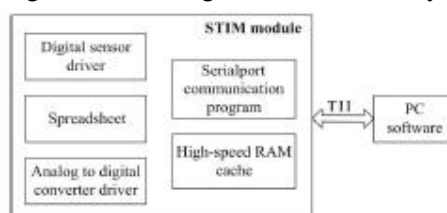


Fig. 4.Overall structure diagram of VHDL part of the system.

VI. APPLICATION IN WATER QUALITY MONITORING

Quick Integrated Circuit Hardware Description Language (VHDL) plan of the framework joins two regions. One section to utilizes the VHDL dialect as the fundamental contraption and make related segments out of the reconfigurable stunning sensor interface gadget by recommending the standard of IEEE1451.2 articulation. It mirrors the multifaceted nature between reconfigurable smart sensor interface gadget and general information acquisition card, which has a grand impact in dexterously collecting sensor information. The other part is changing the interface driver in light of VHDL equipment portrayal dialect. It chiefly covers programming of each apparatus chip driver and sensor driver on the contraption. Fig. 4 demonstrates the general structure format of VHDL some piece of framework.

VII. RESULT ANALYSIS

Proteus VSM uses ISIS schematic find programming to give the earth to arrange section and headway. The ISIS programming solidifies ease of use with powerful adjusting mechanical assemblies. It is fit for supporting schematic catch for both diversion and PCB arrange. Plans gone into Proteus VSM for testing can be net-recorded for PCB arrange either with Proteus PCB Design things or with outcast PCB organize mechanical assemblies. ISIS furthermore gives a high level of control over the drawing appearance, to the extent line widths, fill styles, printed styles, et cetera. These limits are used to give the outline imperative to circuit movement. High-Speed Integrated Circuit Hardware Description Language (VHDL) plan of the system joins two areas. One area to uses the VHDL tongue as the basic instrument and make related parts out of the reconfigurable sharp sensor interface device by suggesting the standard of IEEE1451.2 assention. It reflects the qualification between reconfigurable splendid sensor interface device and general data obtainment card, which has a wonderful effect in cleverly assembling sensor data. The other part is tweaking the interface driver in light of VHDL hardware delineation tongue. It basically covers programming of each hardware chip driver and sensor driver on the contraption. Fig. 5 shows the general structure diagram of VHDL some bit of system.

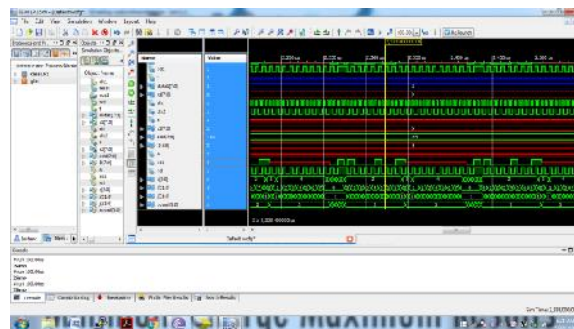


Fig 5 I2C simulations

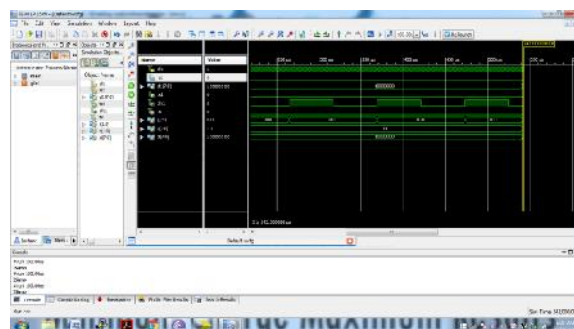


Fig 6 Serial Simulations

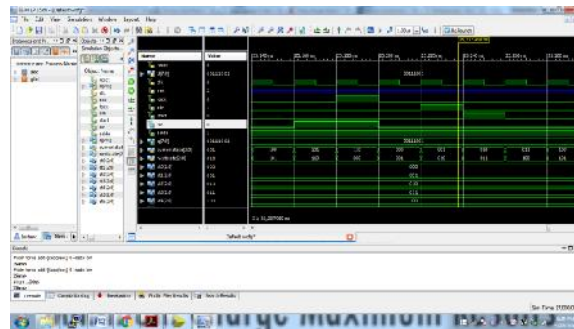


Fig 7 ADC simulation

VIII. CONCLUSION

This paper depicts a reconfigurable astute sensor interface for mechanical WSN in IoT condition. Sensor data astutely can be easily accumulated by this system. It was made in light of IEEE1451 tradition by joining with CPLD and the usage of remote correspondence. It was composed in view of IEEE1451 convention by consolidating with CPLD and the use of remote correspondence. Utilization of IEEE1451 convention empowers the framework to gather sensor information shrewdly. As they are associated with the Different sorts of sensors can be utilized. framework. Primary plan technique for the reconfigurable keen sensor interface gadget is portrayed in this paper. For example, the IEEE1451 tradition can be culminated and the limit of spreadsheet should be amplified. It will have a wide space for progression in the region of WSN in IoT condition.

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