

Ultra Low Power Real - Time Ground Water Level Data Logging System

V S Narendra Tati¹, G Anusha², K Vijaya Prasad³

¹*P.G. Scholar, Department of VLSI & ES, DJR College of Engineering & Technology, Andhra Pradesh, India*

²*Assistant Professor, Department of VLSI & ES, DJR College of Engineering and Technology, Andhra Pradesh, India*

³*Professor & HOD, Department of VLSI & ES, DJR College of Engineering and Technology, Andhra Pradesh, India*

Abstract- This review paper is focused on groundwater level monitoring, long-term groundwater level data and data visualization. The level logger (or telemetry) provides an inexpensive and convenient method to measure level, temperature and conductivity salinity all in one probe. It can provide real time view as data is being recorded by the connected data logger. Water-level measurements from boreholes are the principal source of information about the groundwater recharge, storage, and discharge. Long-term and systematic measurements of water levels provide essential data needed to evaluate changes in the resource over time to develop groundwater models, forecast trends and monitor the effectiveness of groundwater management. A significant advantage of this method of data collection and reporting is the groundwater level data can be updated real time. By using GIS, the dataset of water level can be visualized to understand the relationship between locations of borehole relative to topographic, geologic, or hydrologic features. GIS and the internet greatly boost the capability to deliver an interactive water level data to potential users. All of these features are presented along with graphical evidence of the deployment of the different devices and of several cellular communication and on-site data acquisition tests.

Index terms- Borehole, groundwater, water monitoring, level logger, data collection, telemetry

I.INTRODUCTION

Water is one of the important natural resource in the world, which is used for different purposes like for irrigation, for drinking, in hydro plant, etc. so it is necessary to save wastage of water in field, in nuclear plant and hydro plant also. Thus this project

introduces a simple wireless monitoring and control of water surveillance system which uses water level sensors. Meteorology is an interdisciplinary science, which studies about atmosphere. To study the behaviour of atmosphere, measurements of different atmospheric parameters are required. Some of the well-known meteorological parameters are air temperature, humidity, rainfall, wind speed, atmospheric pressure and atmospheric gas components. Automated Meteorological Data Acquisition System is used to gather information about the current meteorological information which is used to predict the future trends of weather. This automated system can provide useful information regarding any impending disaster.

In order to develop a low cost application specific data acquisition system, a number of previous works have been reviewed. S. Rosiek et al., presented a microcontroller based data acquisition system for weather station monitoring. The sensor data are transmitted to GSM modem every 24 hour via RS-232 interface. M. Benghanem et al., developed a low cost wireless autonomous remote weather monitoring system. This system collects data and transfers the data to a PC and a remote server using wireless technique. Zigbee based data acquisition system is developed for online monitoring of grid connected photovoltaic (PV) system [4]. M. Funetes et al., designed a low cost autonomous data logger for PV system monitoring using microcontroller. Wireless water quality measurement system is developed in. Greenhouse monitoring using microcontroller based meteorological data acquisition system is developed in. Several factors such as synchronization, data

transmission, sampling time, analog to digital conversion, noise and isolation have to be considered for data acquisition in real time. During multi-channel data acquisition several sensors are connected to the microcontroller or PC. Sensor data should be stored in a memory unit. Now a day's high speed real time multi-channel data acquisition system is available with transmission rate up to 3 GigaSamples/Sec. For this kind of high data rate Field Programmable Gate Array (FPGA) and Advanced RISC Machine (ARM) processor are used. A Real – Time ground water level data logging is designed using MKL27Z128VHL4 microcontroller. The MKL27Z128VHL4 is interfaced with FLASH memory using serial peripheral interface (SPI) communication. This approach stores all the data in FLASH memory which is easily accessible. Data logging and supervisory control of a plant using SMS server is discussed in. The traditional A/D converters can't match the high speed data transmission and multiple A/D converters have timing problem. Therefore, a high speed A/D converter should be used for data acquisition. BMP180 sensor is used for the barometric pressure and for the water level MK21 Sensor is used. Here the GSM/GPRS communication M66 module is used. In this project every one hour reads the data and stored in the flash and data is sent to the servers.

II. EXISITING SYSTEM

Weather is an air condition in a certain place and in the relatively short time that includes conditions of temperature, humidity, and barometric pressure as its main component. Weather changes can be observed by using a device called Automatic Weather Station (AWS). AWS has been widely applied in various fields such as environmental research for geo-statistical[1], analysis of temperature measurement [2], prediction of wind

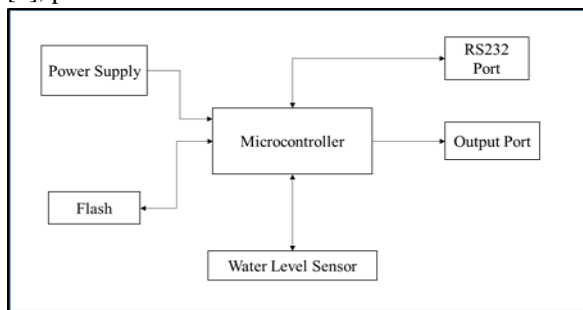


Fig 1: Existing system Block Diagram

energy potential location [3], measurement of the movement of the mass balance [4], and estimation of crop water needs.

III. PROPOSED SYSTEM

A generalized data acquisition system consists of different components such as sensing unit, signal conditioning unit, computing unit and display unit. The data acquisition system (DAQ) acquires particular environmental or physical parameters from the real world, performs signal conditioning on it and computes the actual value for display purpose. The block diagram representation of a generalized data acquisition and control system is shown in below.

The respective sensors which can acquire different meteorological parameters such as ambient temperature, light intensity, barometric pressure, altitude, relative humidity and soil moisture content are connected with input port of KL27 microcontroller and the collected data is sent to a PC using serial communication port of

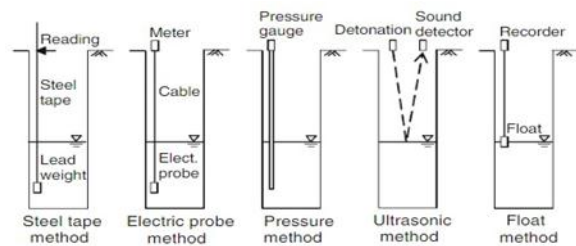


Fig 2: Different types of methods.

Microcontroller. The serial communication port is connected to device using debug port. In there are different types of methods are there out of those methods we selected Electric Probe Method. Those all methods are mentioned below.

IV. SYSTEM ARCHITECTURE

In our project, we are using microcontroller (KL27), GSM modem, power supply, water level sensor, temperature sensor, BMP sensor, ADC. In a very simplistic form, a microcontroller system can be viewed as a system that reads from (monitors) inputs, performs processing and writes to (controls) outputs. The output of the water sensor is digital output. Hence the output of this sensor goes directly to the microcontroller. Whereas the output of the other sensors are in analog form. Therefore we need to convert these analog values into digital values before

connecting to the microcontroller. ADC is used for this purpose.

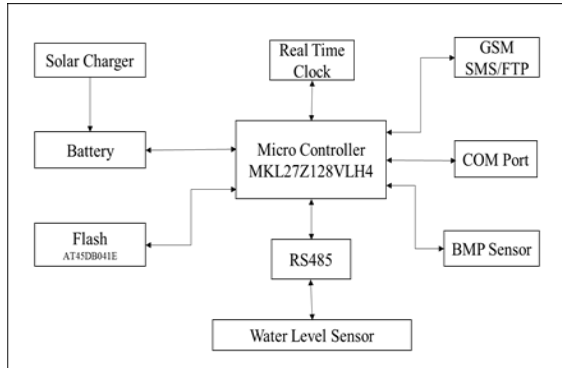


Fig 3: Proposed system Block Diagram

A GUI like Visual Basic is used in our project for displaying the values on the computer. A receiving serial port is connected to the computer to receive values from the site. If the values received are

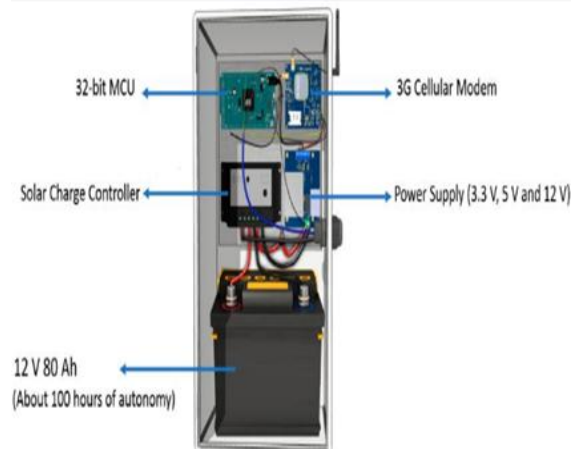


Fig 4: Functional image 1 above a dangerous level then a SMS will be sent through the GSM modem.

Here is the full functional images of the data logger

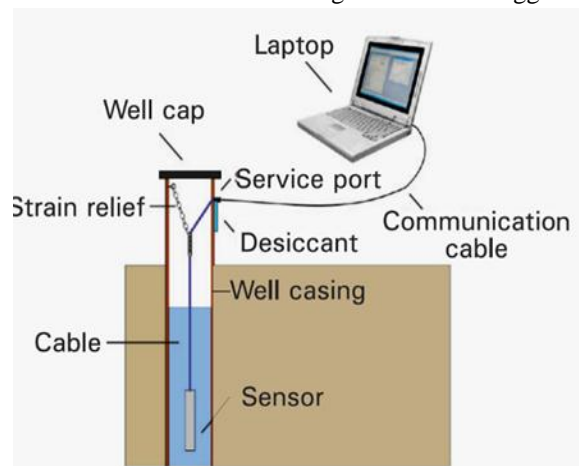


Fig 5: Functional image 2

V. RESULTS

The system successfully provides real time monitoring of the water level, temperature and barometric pressure. Sensors for measuring various parameters like water depth, temperature, bmp were successfully implemented. Transmission and reception of data from the sensors to the GUI using GSM modules is demonstrated. A predefined SMS using GSM modem is sent when any of the monitored parameters goes beyond the range. Hence by using this monitoring system we can have real time monitoring of various parameters and depending on these observations the concerned authorities are alerted to take the precautionary measures.

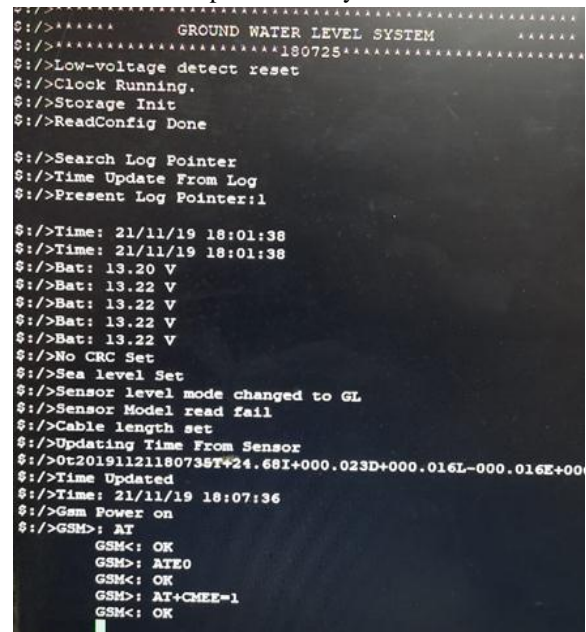


Fig 6: Output of Power on state of Datalogger

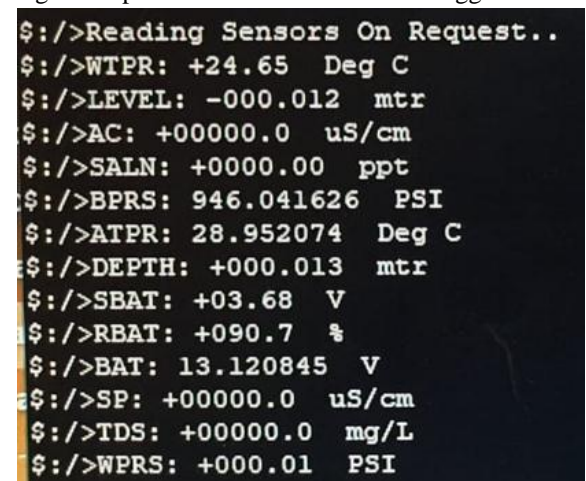


Fig 7: Output of Sensor readings

VI. CONCLUSION

Long-term data are fundamental to the resolution of many of the most complex problems dealing with groundwater availability and sustainability [10]. The availability of long-term groundwater level records greatly enhances the ability to forecast future water levels and remediation can be done as soon as encounter the chip of hydrologic stresses. The modelling will improve understanding of wide range issues including movement of contaminants through groundwater systems, development of new public groundwater supplies, quantification of national water resources and impacts of groundwater abstraction on rivers. The output of the GIS model are made available to be used in the public interest and the advancement of science.

REFERENCES

- [1] Wen bin Huang, Guanglong Wang, Jianglei Lu, Fengqi Gao, Lianhui Chen "Research of wireless sensor networks for an intelligent measurement system based on ARM", International conference on Mechatronics and Automation, pp. 1074 - 1079, 20
- [2] Ruiz-Garcia, L.; Lunadei, L.; Barreiro, P.; Robla, I. A Review of Wireless Sensor Technologies and Applications in Agriculture and Food Industry: State of the Art and Current Trends. *Sensors* 2009, 9, 4728–4750.
- [3] Department of Water Resources. 2010. Groundwater Elevation Monitoring Guidelines.
- [4] Alley, W.M., Reilly, T.E., and Franke, O.L., 1999, Sustainability of ground-water resources: U.S. Geological Survey Circular 1186, 79 p.
- [5] Bernama. 2016. Largest underground water source in Malaysia found in Kedah. <http://english.astroawani.com/malaysia-news/largest-underground-water-source-malaysia-found-kedah-114970>
- [6] G.K. Banerjee, Rahul Singhal, Bhubaneswar, Orissa India "Microcontroller Based Polyhouse Automation Controller", International Symposium on Electronic System Design, pp.158- 162, Dec 2010. [
- [7] Guangming Song, Fei Ding, Weijuan Zhang and Aiguo Song, "A Wireless Power Outlet System for Smart Homes, "IEEE Transactions on Consumer Electronics, Vol. 54, No.4, November, 2008.
- [8] Burrell, T. Bro, A. Camilli, C.E. Cugnasca, A.M. Saraiva, A.R. Hirakawa, and P. L. P.CorrAea. From wireless sensors to field mapping: Anatomy of an application forrecision agriculture. *Comput. Electron.Agric.* 58(I):25-36,2007.