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A Review on -Implementation of Data Acquisition System onto ARM for Intra Underwater System by using Bluetooth

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Abstract— **The Bluetooth is an open wireless technology which revolutionized the connectivity by providing freedom from wired connections. It is a cable replacement technology that has changed the face of connectivity between the communicating systems. The usage of cables in the industrial field especially in the application of autonomous systems becomes more cumbersome and any fault in the connections may lead to a total system failure.**

I INTRODUCTION

An underwater embedded Bluetooth data acquisition system based on ARM and Bluetooth chip called 'BlueLink' was constructed for completing the task without cables in industrial field and to reduce the complexity of cable, the occurrence of accident and so on. Data acquisition system is product or processor used to collect information to document or analyse some phenomenon data acquisition which is based on sensor technology, signal detection and processing. A sensor, which is a type of transducer/is a device that converts a physical property into corresponding electrical signals. Underwater modelling, mapping, and monitoring for marine biology, environmental, and security purposes are currently done manually or using expensive hard to man ever underwater vehicles or individual instruments. We would like to bring a new level of automation and capability to this domain in the form of versatile and easily deployable underwater sensor networks. Just like the Berkeley Mica Mote, the current industry standard for ground sensor networks has fuelled an explosion in the development of ground and aerial sensor network applications; our goal is to develop underwater technology that will enable a similar level of automation. More than 70% of our planet is covered by water. It is widely believed that the underwater world holds ideas and resources that will fuel much of the next generation of science and business. However, any underwater operations are fraught with difficulty due to the absence of an easy way to collect and monitor data [1]. Underwater sensors exist but they are not networked and their use has many issues:

Deploying, retrieving, and using the sensors is labour intensive;
Collecting the data is subject to very long delays;

- The manual aspects of using the sensors lead to error; The spatial scope for data collection with individual sensor is limited;
- Individual sensors are unable to perform operations that require cooperation, such as tracking relative movement and locating events.

As is required is a low-cost, versatile, high quality, easily deployable, self-configurable platform for underwater sensor networks that will

(a) Automate data collection and scale-up in time and space,
(b) Speed-up access to the collected data, and is easy to use.

1.1.1 Why is an Underwater Embedded needed?

A number of problems confront us in achieving this goal. Some such as power efficiency, deployment and repair are common to wireless sensor network deployments on land, though more difficult in the underwater environment. Other issues render the problem radically different. A key issue is communications current terrestrial wireless sensor network applications to date have used radio. At frequencies that are practical with low-cost radio chips and compact antennas, radio waves are attenuated so strongly in salt water that radio communications is impractical [3]. Wireless information transmission through the ocean is one of the enabling technologies for the development of future ocean-observation systems and sensor networks. Applications of underwater sensing range from oil industry to aquaculture, and include instrument monitoring, pollution control, climate recording, and prediction of natural disturbances, search and survey missions, and study of marine life. Underwater wireless sensing systems are envisioned for stand-alone applications and control of autonomous underwater vehicles (AUVs), and as an addition to cabled systems.

1.2 Necessity

Aquatic robotics concerns robotics research using autonomous surface and underwater vehicles (ASVs and AUVs). This research can involve development of (robust)

algorithms for vehicle control, autonomy, sensing and navigation. Often, we try and push the boundaries of computer science research, while applying our algorithms in applications that aid biologists and oceanographers. A good example is the work we have been doing to help study the Southern California coastal ocean, with an emphasis on the assessment and prediction of harmful algal blooms, in collaboration.

1.3 Objectives

ARM based designs have seen an immense growth during the past few years, with free and open software tools becoming an integral part of embedded systems development. These free and open source codes offer a high-quality tool chain for ARM development. These systems have acquisition of signals as the basic part. All this industries need a platform which can do their automation jobs. For this generally readily available DAQ cards from different vendors are available. These cards have different features according to design and cost. The DAQ card that we desiyied has analog inputs, Digital inputs and outputs, Interrupts / timers and at least one PC interface ports like Serial, USB, Ethernet, GPIB etc. The objective was to design the DAQ System to target the recent needs in the industries and make it compatible with the new trends in the technology. The utilization of the facilities, flexibilities and the available recourses to match the requirements is targeted in the design. There are wide ranges of systems available in market which performs data acquisition along with the logging but at very high rates.This project is designed with keeping in mind the recent trends of applications and its requirements along with the cost constraints. There are certain other goals which are targeted through this design which are as included like industrial application, affordable to small scale industries, system can take place of systems based on monitoring temperature, pressure and distance as well.

II LITERATURE REVIEW

2.1 History

The total functionality of Data Acquisition System is such that it has to collect the information from the pressure and temperature sensor of the unmanned under water vehicle into central data acquisition system for further processing and storage. The CD AS send the control command to pressure and temperature sensor to send the measured pressure and temperature by them to CD AS. CD AS receives the data and process the data for transmitting it to PC for display. An Embedded system using the ARM processor is programmed to control the pressure and temperature sensor. The total module can be powered up by a simple battery and power supply unit. The ARM processor module sends the commands to the pressure and temperature sensor. The respective sensors transfer the signals to the ARM processor module. This data is then sending to the PC where it is displayed. The data acquisition is based on three steps sensing, signal detection and processing.

1. Sensor that converts physical parameter to electrical signals.
2. Signal conditioning circuitry to convert sensor signal into a form that can be
   converted to digital value.
3. Analog-to-Digital converter, which convert condition sensor signal to digital value.

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2.2 Introduction to Data Acquisition

Data acquisition systems, as the name implies, are products and/or processes used to collect information to document or analyze some phenomenon. In the simplest form, a technician logging the temperature of an oven on a piece of paper is performing data acquisition. As technology has progressed, this type of process has been simplified and made more accurate, versatile, and reliable through electronic equipment. Equipment ranges from simple recorders to sophisticated computer systems. Data acquisition products serve as a focal point in a system, tying together a wide variety of products, such as sensors that indicate temperature, flow, level, or pressure. Some common data acquisition terms are shown below:

- Analog-to-digital converter (ADC)

An electronic device that converts analog signals to an equivalent digital form the analog-to-digital converter is the heart of most data acquisition systems.

- Digital-to-Analog Converter (D/A)

An electronic component found in many data acquisition devices that produce an analog output signal.

- Digital Input / Output (DIO)

Refers to a type of data acquisition signal; Digital I/O are discrete signals which are either one of two states. These states may be on/off, high/low, 1/0, etc. Digital I/O are also referred to as binary I/O.

- Differential Input

Refers to the way a signal is wired to a data acquisition device. Differential inputs have a unique high and unique low connection for each channel. Data acquisition devices have either single-ended or differential inputs, many devicessupport both configurations.

- General Purpose Interface Bus (GPIB)

Synonymous with HPIB (for Hewlett-Packard), the standard bus used for controlling electronic instruments with a computer. Also called IEEE 488 in reference to defining ANSI / IEEE standards.

- Resolution

The smallest signal increment that can be detected by a data acquisition system. Resolution can be expressed in bits, in proportions, or in percent of full scale. For example, a system has 12-bit resolution, one part in 4,096 resolutions, and 0.0244 percent of full scale.

- RS232

A standard for serial communications found in many data acquisition systems. RS232 is the most common serial communication, however, it is somewhat limited in that it only supports communication to one device connected to the bus at a time and it only supports transmission distances up to 50 feet.

- RS485

A standard for serial communications found in many data acquisition systems. RS485 is not as popular as RS232, however, it is more flexible in that it supports communication to more than one device on the bus at a time and supports transmission distances of approximately 5,000 feet.

- Sample Rate

The speed at which a data acquisition system collects data. The speed is normally expressed in samples per second. For multi-channel data acquisition devices the sample rate is typically given as the speed of the analog-to-digital converter (A/D). To obtain individual channel sample rate, you need to divide the speed of the A/D by the number of channels being sampled.

- Single-ended Input (SE):

Refers to the way a signal is wired to a data acquisition device, hi single-ended wiring, each analog input has a unique high connection but all channels share a common ground connection. Data acquisition devices have either single-ended or differential inputs. Many support both configurations

III SYSTEM DEVELOPMENT

We know that pressure and temperature under water is different from pressure and temperature above the water, so it is necessary to measure pressure and temperature under water. Also there are certain objects present under water, which is also necessary to display on computer. Is an open wireless technology that provides connections without wires. It is a cable replacement technology. The usage of cable in the industry field becomes more costly and any fault in the connection may leads to the total system failures. In our implementation, under water robot can move using DC motors i.e. we can start it, stop it and make it go on either in clockwise and anticlockwise direction. The ARM processor can act as central data acquisition system that acquired data from subsystem of underwater robot and transfer the data through Bluetooth module to PC for display.

IV COCLUSION

Here we can implement data acquisition system using Bluetooth module which achieves 2Mbps data rate. This implementation can measure underwater temperature, pressure, & distance from the top level of water how much deep our system is implemented. When we calculate this temperature, pressure & distance theoretically it's very difficult & time consuming. But when we calculate these values experimentally it is easily calculated and displayed on PC so we can use it for future use. When we deployed the DAQ system underwater then it's observed that as distance increases underwater temperature decreases and pressure increases. Those values can be transmitted using Bluetooth module which achieves data rate of 2 Mbps. This data is received in hyper terminal through the Bluetooth device.

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