A REVIEW ON ANALYSIS OF REAL-TIME EMBEDDED DATA ACQUISITION SYSTEMS WITH INTERACTIVITY

Vinod Wamanrao Gangane
Research Scholar
Department of Computer Science
Sunrise University
vinod.gang43@gmail.com

Dr. Jitendra Rai
Research Guide
Department of Computer Science
Sunrise University

Abstract

Data collection is crucial to both online and real-time controls. Real-time data must be able to be collected, saved, processed, and evaluated by the system. Online interactive monitoring is a challenging aspect of many embedded and real-time data collection and control system applications. Different data collection systems employ a communication network to control remote equipment while analyzing different distant signals. This review paper will focus on numerous reported interactive embedded data collection systems.

***Key Words**: Interactive, Data acquisition system, Real time, embedded system, Literature survey.*

Introduction

Data capture systems with remote accessibility are highly sought-after nowadays for a variety of purposes. A remotely linked data acquisition system's primary goal is to gather the right information for the user at the right time and speed so that they may monitor the system's recorded values. A client could also be able to identify the issue and take charge of the circumstance.

The information is simple to get and manage using a PC. An input, output sub-system, a host computer, and the controlling software make up a data acquisition system. A standalone Linux program combines the host CPU, the input and output subsystems in one package. These programs are often known as embedded data collection systems. Three components of an interactive embedded-based data collection system—an embedded system, a server, and a client PC—are interconnected through the internet or Ethernet. Embedded hardware serves as the data collection system's key component.

The embedded device may be accessed via a web server from anywhere in the globe since it can connect with other components of the data collecting system using General Packet Radio Service (GPRS) or Ethernet. Additionally, real-time bidirectional data sharing is enabled enabling interactivity between parties. If the user needs any information from the embedded system, they may speak with the embedded system directly and get the information they need.

It expedites the transport of data. Users may also communicate with servers. Because they employ web servers for data storage and transport, some of these systems don't need server software or maintenance. In this scenario, the user or client accesses the necessary data via a

typical web browser.

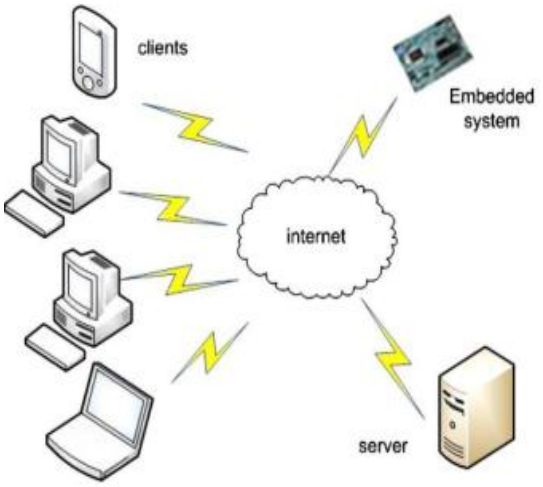

Fig -1: Interactive Data acquisition system

The overarching strategy involves minimizing operational expenses while working with a lot of data. The system's modular design makes it possible to add more components. Additionally, it is adaptable to support a variety of measuring equipment with suitable interfaces. This sort of technology uploads all of the collected images to an internet server for data management. The embedded module is configured such that it only transmits the picture once over GPRS and keeps it on the server if there is a need to transfer large amounts of data or large images. By doing this, we avoid sending the identical data via GPRS to every client. As a result, less data is sent. Thus, the cost of transmission is decreased, particularly when the same data is requested by numerous customers or at the same time.

Literature Survey

Presenting On-line Interactive Data Acquisition and Control System for Embedded Real Time Applications are Priyanka Patil, Dr. Virendra V. Shete, and Pranali Awate [1]. The S3C2440 ARM9 CPU with touch screen and serial port make up the system's hardware. The Mini2440, sometimes referred to as the "friendly ARM," is connected to a touch screen for input and output as well as display. Temperature monitoring is done using the LM-35 temperature sensor. Data communication uses the Universal Asynchronous Receiver Transmitter. Linux is the operating system in use here. Applications are created using QTOPIA.

The TCP/IP protocol was used for PC networking. Ethernet is used for interaction. Ethernet connections utilize RJ-45 connectors. Hypertext Markup Language is used to create web pages (HTML). The mini2440 includes two external SDRAM chips with 32 Mb each as memory, together with flash memory for system storage. This technology does intelligent work for workplaces, schools, and many other locations. This system provides a simple yet upgraded and more sophisticated user interface without the need for extra hardware, however because of poorly planned and configured software architectures, it has a slow reaction time. Prof. V. D. Shinde and Niturkar Priyanka R. [2] present Embedded Web Server for Real Time Applications.

In This system's ARM processor, running a real-time operating system and a web server application, is the focus of this article. Each data acquisition and control device has 24 channels for collection and control, all of which are separate from one another. Each I/O channel has a selection of electrical and non-electrical signals including current, voltage, resistance, etc. Data conversion from analog to digital is done using an ADC. The data that was

measured and transformed is kept in an external memory. In web server mode, this external memory operates as a database. Ethernet is used for inter-party communication. Communication through RS485 is natively supported by the ARM processor. On certain other PCs or networks, data has been managed and saved through RS485 & Ethernet. The Hypertext Markup Language is used to create web pages.

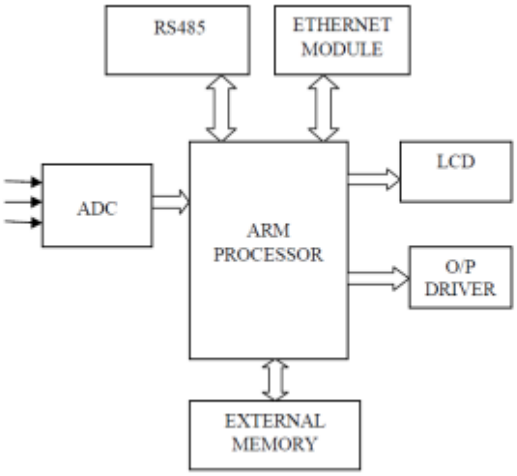

Fig -2: Embedded web server for real time application

This method is particularly helpful for distributed control systems, networked lighting control systems, smart home applications, and other industrial fields. This system has several applications in the fields of transportation, chemical metallurgy, steel, electric power, and petroleum. Internet-based data collecting system employing an integrated Raspberry Pi CPU for single chip technique and a GSM module for remote access is presented by Priti. G. Pachpande and S. P. Dhanure [3]. In this study, a camera and GPS are integrated into an embedded system that is linked to a Raspberry Pi for data collection. The user of this embedded device is linked to it through the internet. There is a GSM module for connection on the user side. Images are captured with a CMOS camera. They are employing a micro strip patch antenna, a low noise amplifier, and the NMEA 0183 receiver protocol to receive GPS data. This system runs on the Linux operating system, which is a suitable option for an embedded device. This solution employs a programmer called flash magic tool to download the hex file into the microcontroller board. Keil ARM (Vision) is used to efficiently and rapidly write programs for embedded applications. The Hyper Text Transfer Protocol, sometimes known as HTTP, is the standard protocol for transferring data between a web server and a web browser. This system is excellent for improving efficiency and is well suited for industrial monitoring and controlling needs. Additionally, it offers an industry automation system that can be remotely monitored and operated in real time. This system uses an internet connection to both measure various distant signals and operate various remote devices. This system may be customized to fit a variety of industrial data collecting, monitoring, and control applications.

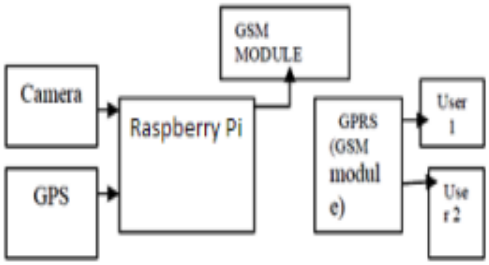

Fig-3: Internet based data acquisition system using Raspberry Pi

By using an embedded web server, this system offers the benefit of cost reduction and allows users to access data using any common web browser. Data Collection System Based on ARM Embedded Web

Server is presented by Ms. Vaishali Dhawale, Prof. S.M. Turkane [4], and it deals with the monitoring and acquisition of physical parameters in real time required for industrial automation. The system's embedded hardware, which utilizes a C/OS-II, is its brains. The free RTOS C/OS-II is used with the LPC2917-1 ARM-9 CPU for real-time data acquisition. Through a signal conditioning circuit, the ARM9 CPU is linked to the LM-35 Precision Centigrade temperature sensor, Module SYHS-22 humidity sensor, and MQ-6 gas sensor. Process monitoring and control employ sensors. They like the SIM300 GPRS module for connection. This system prefers Keil software for IDE development, Orcad 9.0 for PCB design, ASP.net for online front ends, SQL Server 2008 for backends and databases, and VB 6.0 for offline front ends when it comes to the software. A web server is used to host databases, and depending on the needs of the user, there are two different operating modes: online and offline. In online mode, analog data from sensors is gathered, converted to digital data, then transformed into a message format before being sent online to a web server. When operating in offline mode, analog data from sensors is read, converted to digital form, and sent to an external memory. When handling huge amounts of data, this method lowers operating costs and eliminates the need for a central server for data administration and transmission.

CONCLUSION

An overview of several data collecting and control systems used in a variety of applications is provided in this article. A literature review gives comprehensive details on current systems. In several locations, there are numerous data monitoring and acquisition systems. It is evident from the literature review in this research that each data gathering and monitoring method has advantages and disadvantages of its own. The raspberry pi is the most recent one, and many of them have utilized ARM 9 and ARM 11. Different networking methods are used, however the internet is the most effective method for interconnection.

REFERENCES

[1] Priyanka Patil, Dr. Virendra V. Shete, Pranali Awate, "Online Interactive Data Acquisition and Control System for Embedded Real Time Applications," IJAREEIE,Vol.4, Issue5, May 2015, doi:10.15662/ ijareeie.2015.0405004.

[2] Niturkar Priyanka R. and Prof. V. D. Shinde, "Embedded Web Server for Real Time Applications," IJECCE Vol. 5, Issue (4) July. 2014.

[3] Priti. G. Pachpande and S. P. Dhaniure, "Internet Based Data Acquisition Sytem," IJEECS, Volume -2, Issue-1, January, 2014.

[4] Ms.vaishali Dhawale, prof. S.M. Turkane, "Data Acquisition System (DAS) Based On ARM Embedded Web Server,"ijera 2248-9622, Vol. 4, Issue 1(Version 3), January 2014, pp.212-215, ijera. 2248-9622.

[5] Ali Ziya Alkar, Member IEEE, and Mehmet Atif Karaca, "AnInternet-Based Interactive Embedded DataAcquisition System for Real-Time Applications" IEEE Trans. Instrumentation and measurement, Vol. 58, NO.3, March 2009.