Data acquisition and transmission module for flowmeters

Tasks that require data acquisition, processing and sending are becoming more and more common, where commercial cards and interfaces have very high prices [1]. All automation starts from a data acquisition system. This consists of converting physical variables of interest (temperature, flow rate, voltage, current, etc.) into an electrical signal, which are captured with sensors [2]. Subsequently, these data are read by an acquisition card, and communicated to a PC or server, where they are processed, operated and presented.

The progress of hardware tools and free software that has been seen in recent times has also had an impact on the industrial sector. Thus, it is possible to find systems based on these technologies, with features analogous to Data Acquisition Cards or Programmable Logic Controllers (PLC) at a much lower cost. These technologies stand out for the ease in making wireless connections for remote data transmission and for their superior flexibility [3].

Among the main free hardware instruments, the Arduino and the ESP32 stand out. These are boards that incorporate a microcontroller and a series of pins that allow different components to be easily connected. The powerful microcontrollers of these devices allow them to be able to replace PLCs in simple tasks, which makes the implementation of supervision systems cheaper.

It is possible to use hardware (Arduino or ESP32) to acquire and process the variables from the sensors, and then send them wirelessly to the central station from where the process is controlled [4]. Worldwide, its use is reported in various applications such as monitoring the energy consumption of a home, home automation systems, growing houses, naval systems, monitoring of environmental variables, etc [5].

In the Department of Automatic Control of the UCLV several investigations have been carried out in this direction during the last years. The CERCAS Project, System for monitoring the consumption of electrical energy of the UCLV [6] and the Supervision System with an IoT platform for Cultivation Houses [7] stand out. These systems use open source tools that allow web monitoring and supervision of the process in real time, providing timely information for decision making.

As can be seen, there are significant antecedents that demonstrate the applicability and feasibility of implementing a data acquisition system using this type of technology. This project aims to have a similar impact to those mentioned above but focused mainly on the hydraulic sector.

Water is the most important element for life. It is of vital importance for the human being, as well as for the rest of the animals and living beings that accompany us on planet Earth. In order to be safely consumed by man, it must be subjected to different processes in plants or treatment stations, until it becomes drinking water.

Different processes are carried out in the treatment stations. It begins with the extraction of water, both from rivers and from wastewater wells or spring water. Upon arrival at the treatment station, the water is subjected to different filters and chemical treatments to make it drinkable. The final product obtained: drinking water, is sent by pumping to work centers, homes, hotels, etc. that are geographically distributed in different areas.

These plants have a central station that supervises and controls the different facilities such as: wells, pumping stations and treatment plants. Each of these installations requires the use of sensors such as flowmeters that measure the variables considered to be of interest. An important group of sensors are installed and working regularly. In many cases, they only provide information through local indication, which means that in order to know the behavior of these variables, it is necessary for an operator to travel to each of the locations. This situation leads to incurring unnecessary expenses and losing immediacy in receiving the data and making decisions regarding them.

Therefore, the problem arises: There is no data acquisition and transmission system that allows variables to be obtained remotely at the central station.

With the purpose of solving the previous problem, the idea of ​​this project arises. It offers a low-cost solution based on free hardware and software to obtain the measurements of the flow meters found in the different water treatment facilities. The collected data is sent to the central station where it is processed and used to make the relevant decisions.

The prototype intends to adopt an architecture that not only allows it to be integrated into hydraulic systems, but also its operation can be extended to other areas of data collection and transmission

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