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FPGA Based Green House Monitoring

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ABSTRACT

The most important factors for the quality and productivity of plant growth are temperature, humidity, light and the level of the carbon dioxide. Continuous monitoring of these environmental variables gives information to the grower to better understand, how each factor affects growth and how to manage maximal crop productiveness .The optimal greenhouse climate adjustment can enable us to improve productivity and to achieve remarkable energy savings - especially during the winter in northern countries. The system itself was usually simple without opportunities to control locally heating, lights, ventilation or some other activity, which was affecting the greenhouse interior climate. This all has changed in the modern greenhouses. The typical size of the greenhouse itself is much bigger what it was before, and the greenhouse facilities provide several options to make local adjustments to the lights, ventilation, heating and other greenhouse support systems. However, more measurement data is also needed to make this kind of automation system work properly. Increased number of measurement points should not dramatically increase the automation system cost. It should also be possible to easily change the location of the measurement points according to the particular needs, which depend on the specific plant, on the possible changes in the external weather or greenhouse structure and on the plant placement in the greenhouse. For the implementation of agricultural technologies, low cost and real time remote monitoring are needed, in this sense, programmable Logic Devices (PLDs) present as a good option for the technology development and implementation, because PLDs allow fast development of prototypes and the design of complex hardware systems using FPGAs (Field Programmable Gate Arrays) and Complex Programmable Logic Devices.

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I. INTRODUCTION

VHDL is a language for describing digital electronic systems. VHDL is an acronym for VHSIC (Very High Speed Integrated Circuit) Hardware Description Language. VHDL rose out of the United States Governments Very High Speed Integrated Circuits Project when it became clear that there was a need for a standard language for describing the structure and function of digital systems including integrated circuits and multi circuit configurations.Field Programmable Gate Arrays (FPGA) are highly integrated IC¨s which consist of combinational logic blocks which are further made up of a multitude of gates. FPGA blocks are very easy to program with presently available VHDL software like Xilinx Foundation Series, V system, Modalism etc. A brief introduction of their working along with few details is as given below. FPGA¨s combine architectural versatility, increased speed, abundant routing resources, and new, sophisticated software to achieve fully automated implementation of complex, high density, high performance designs. Xilinx PLD¨s provides the benefits of high integration levels without the risks or expenses of semi-custom and custom IC development.

With FPGA devices, there are no test vectors to generate and no delay while waiting for prototypes to be manufactured. Because the devices are software configured and user programmed, modifications are much less risky and can be made any time in a matter of minutes.

II. LITERATURE SURVEY

Wael M El-Medany(University Of Bahrain)
In this paper described Wireless sensor networks are one of the most rapidly evolving research and development fields

for microelectronics. Their applications are countless, and the market potentials are huge. However, many technical hurdles have to be overcome to achieve a widespread diffusion of wireless sensor network technology.

This work presents the design and FPGA hardware implementation of a Multiple- Input/Multiple-Output (MIMO) system for Wireless Sensors Networks (WSN). This system will offer more parallel channels between the sensor nodes and the base station at the same frequency band, thereby increasing spectral efficiency. The hardware design of the MIMO wireless sensor network system has been described using VHDL (VHSIC Hardware Description Language). The design has been simulated and synthesized using Xilinx ISE 10.1i software tools, then tested in hardware level using Xilinx FPGA. The design offers remote monitoring system with MIMO wireless sensor network.

O.Korner, HChallaw, ”Temperature integration and process-based humidity control in chrysanthemum”

Simulations in the authors’ previous studies have shown that a modified temperature integration regime with a 6-day averaging period and increased set-point flexibility was able to reduce annual energy consumption by up to 9% as compared to a regular temperature integration regime. The commonly applied fixed set-point for relative humidity (RH) of 80–85% strongly reduced the potential for energy saving with this regime. Therefore, a more flexible humidity control regime was developed. Simulations indicated that yearly energy consumption could be reduced by 18% as compared to a fixed set-point of 80% RH. By combining the two regimes (temperature integration and humidity control), it was predicted that the energy saving would be even greater. To test this prediction, the combined regimes were applied in two experiments with cut-flower chrysanthemum crops investigating the effect on plant development and growth. Different temperature bandwidths for temperature integration (±2, ±4, ±6 and ±8 ◦C) were also compared within the joint regime.

III. PROPOSED SYSTEM

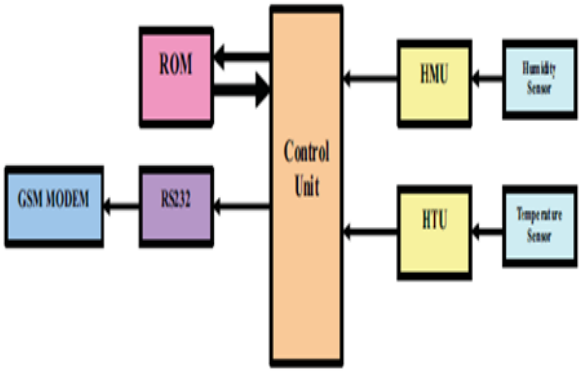

Fig 1. Block Diagram

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Hardware Description Language (VHDL 87) is adopted as a standard by the Institute of Electrical and Electronic Engineers. VHDL is designed to fill a number of need in the design process such as:

1. The description of the structure of a design that is how it is decomposed into sub designs, and how this sub designs are interconnected.
2. The specification of the function of the designs using familiar programming language forms.
3. The simulation before being manufactured, so that designers can quickly compare alternatives andtest for correctness without the delay and expense of hardware prototyping.
4. The synthesis, the VHDL is used as a high level entry for several FPGA and ASIC synthesis tools.
5. The reuse of existing models for new designs.

IV. ADVANTAGES AND APPLICATION

Advantages

1. Monitoring & controlling of temperature, humidity is easy.
2. Low Cost.
3. More easy to use for operator.
4. Use of Arduino processor will make the circuit less complex.

Application

1. Use to monitor and control the green house aspects i.e. temperature, humidity etc.
2. The required changes can be carried out in the weather.

V. CONCLUSION

The greenhouse automation at commercial level is experiencing attention. Also, to achieve competitiveness in the market, the production costs must be kept as low as possible. Low cost automation can be achieved by using VLSI systems so that all category farmers can afford it. The objective of this project was to develop a system to provide autonomous control for temperature and humidity in a closed environment of Greenhouse, which is fulfilled

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