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AN AUTOMATIC MONITORING AND CONTROL SYSTEM INSIDE THE GREEN HOUSE

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ABSTRACT

Today, a major problem is heavy dependency on neighbouring states for food products. One of the main reasons for the decline in agriculture in our state is the lack of the availability of labour in our state. This problem can be overcome by automation in agriculture. The introduction of "AN AUTOMATED GREENHOUSE MONITORING SYSTEM" could bring a green revolution in agriculture. Appropriate environmental conditions are necessary for optimum plant growth, improved crop yields, and efficient use of water and other resources. Introducing this system can help in increasing cultivation in a controlled environment. A greenhouse environment is used to grow plants under controlled climatic conditions for efficient production. Automating the data acquisition process of the soil conditions and various climatic parameters that govern plant growth allows information to be collected with fewer labour requirements. Existing systems are bulky, very costly, difficult to maintain and less appreciated by the technologically less skilled work force. This project is designed using the world's most powerful microcontroller, the ATMEGAC51 where the temperature, humidity, soil moisture, and illumination conditions are analysed. In a nutshell, we believe our project will bring change to conventional agriculture. It is only a small step toward a huge future success for our agricultural and scientific sectors. The proposed system is an embedded system which will closely monitor and control the microclimatic parameters of a greenhouse on a regular basis, round the clock, for the cultivation of crops or specific plant species, which could maximise their production over the whole crop growth season and eliminate the difficulties involved in the system by reducing human intervention to the best possible extent. The system consists of sensors, an Analog to Digital Converter, a microcontroller, and actuators. When any of the above mentioned climatic parameters crosses a safety threshold that has to be maintained to protect the crops, the sensors

sense the change and the microcontroller reads this from the data at its input ports after being converted to a digital form by the ADC. The microcontroller then performs the needed actions by employing relays until the strayed-out parameter has been brought back to its optimum level. Since a microcontroller is used as the heart of the system, the set-up is low-cost and effective. As the system also employs an LCD display for continuously alerting the user about the condition inside the greenhouse, the entire set-up becomes user-friendly. Thus, this system eliminates the drawbacks of the existing set-ups and is designed as an easy-to-maintain, flexible, and low-cost solution.

INTRODUCTION

The proposed system is an embedded system which will closely monitor and control the microclimatic parameters of a greenhouse on a regular basis round the clock for cultivation of crops or specific plant species which could maximize their production over the whole crop growth season and to eliminate the difficulties involved in the system by reducing human intervention to the best possible extent. The system comprises of sensors, Analog to Digital Converter, microcontroller, and actuators. When any of the above-mentioned climatic parameters cross a safety threshold which has to be maintained to protect the crops, the sensors sense the change and the microcontroller reads this from the data at its input ports after being converted to a digital form by the ADC. The microcontroller then performs the needed actions by employing relays until the strayed-out parameter has been brought back to its optimum level. Since a microcontroller is used as the heart of the system, it makes the set-up, low-cost and effective. As the system also employs an LCD display for continuously alerting the user about the condition inside the greenhouse, the entire set-up becomes user friendly. Thus, this system eliminates the drawbacks of the existing set-ups and is designed as an easy to maintain, flexible and low-cost solution.

LITERATURE REVIEW

Petrol-Retailing As A BusinessPetroleum (derived from Latin "petr"-rock and "oleum"-oil) has always been an inseparable part of life in our times. Anything about petroleum (be it its exports, imports, production via exploration, refining, or selling, or its price fluctuation) shakes the global economy, and in the recent past, the world has witnessed some wars and national conflicts caused by it (petrol). So, there is no need to say why it has become "liquid gold" in the true sense of the word (Dugar, 2009). (Ramanathan, 2007), confirms that the word "retailing" has its origin in the French verb "retailer," which means "to cut up" and refers to one of the fundamentals of retailing, which is to buy things in larger quantities and sell them in smaller quantities. The oil industry is divided into three streams: upstream, midstream, and downstream. The upstream basically covers exploration and production of crude oil and gas. The midstream covers the movement of materials through pipelines and the downstream covers the marketing of petroleum products through retail outlets (ROs). In general terms, selling petroleum products through outlets is known as the "petro-retailing business." Petroretailing is the face of oil marketing companies and sells products or services directly to the customers (Kishore & Patel, 2012). The retail fuel industry is capital intensive and overall demand has been static for many years. In general, margins of 15% are very low in comparison to other sectors (HSRC, 2002). For about a hundred and forty-odd years, "petrol" existed as an "undifferentiated commodity" in India. No serious efforts were made to augment and differentiate this "commodity". More importantly, only three government-regulated petrol-selling companies, enjoying a near monopoly status, were running the business, driven by the social objectives set by the government along with the price of petrol (Dugar,2009). In most categories, retailers now know far more about customer behaviour than manufacturers because retailers have ready access to purchasing pattern information via store scanners (Barnes, 2001).Retail fuel stations can be categorised as Company Owned, Company Operated (COCO), Company Owned Dealer Operated (CODO), and Dealer Owned, Dealer Operated (DODO), etc. Fuel stations receive petroleum products from oil marketing companies. From the storage terminals owned by OMCs, fuel grades are transported to stations, usually through tank-trucks. OMCs receive petroleum products from refining companies (Samdani & Kulshreshtha, 2011). For purposes of the fuel industry, three important participants must be highlighted. These are the fuel suppliers (franchisors), the fuel retailers (the franchisees and fuel retailers) and the general public (consumers). Understanding the relationships between these various industry participants is vital for assessing the impact the Consumer Protection Act and its regulations will have in each case. The relationship between the franchisors and franchisees is that of a supplier-consumer relationship, meaning that the franchisor has certain obligations towards the franchisee in terms of the Act and the franchisee has rights which are granted to it by the Act. Similarly, the franchisee (the fuel retailer) as the supplier of the fuel to the general public has obligations towards the general public in terms of the act, and the general public (as consumers) is afforded certain statutory rights to protect their interests in this relationship. Interestingly and very importantly, the fuel retailers find themselves in a unique position where the Consumer Protection Act impacts them on multiple fronts. Firstly, they are afforded the rights as a consumer in so far as one is dealing with their relationship with the franchisors. Secondly, the fuel retailers are saddled with the obligations of a supplier to the general public by virtue of their position in the supply chain. This means that fuel retailers will have to be aware of both the rights and obligations created by the Consumer Protection Act and the accompanying regulations (Forecourt Times, 2012).

BLOCK DIAGRAM

This is a multifaceted set up which is very much prepared to respond to the vast majority of the climatic changes happening inside the greenhouse. It chips away at an input framework which helps it to react to the outside blows proficiently. In spite of the fact, this set-up overcomes the issues created because of human errors it is not totally mechanized and wasteful.

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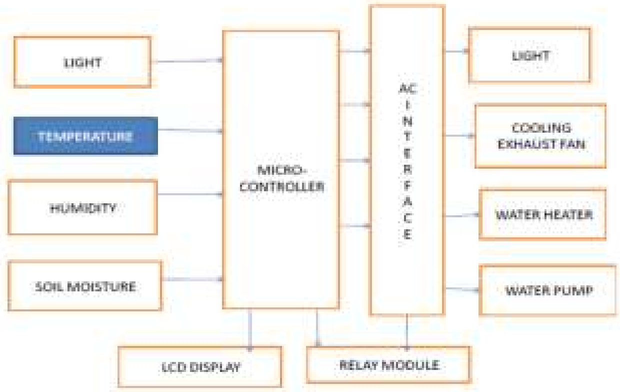

Fig 1. Block Diagram

The proposed framework is an implanted framework which will nearly screen and control the small scale climatic parameters of a greenhouse on a usual premise. For the development of products or particular plant species which could enhance their creation over the entire yield development season and to kill the challenges included in the framework by falling human negotiation to the best feasible degree. The framework contains sensors, Arduino which is helping us theuse of micro controller easily and actuators (Relay module).

HARDWARE DESIGN

A cluster of actuators can be utilized as a part of the framework. For example,transfers, contactors, and change over switches and so forth. They are utilized to turn on AC devices. For example, engines, coolers, pumps, haze machines, sprayers. With the end goal of exhibit transfers have been utilized to drive AC globules to reproduce actuators and AC gadgets. A complete working framework can be acknowledged by essentially replacing these simulation devices by the actual devices.

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Fig2:Hardware Design

SYSTEM DESIGN AND IMPLEMENTATION

The implementation of this work was done on the breadboard. The power supply was first derived from a bench powersupply in the laboratory. (To confirm the workability of the circuits before the power supply stage was soldered). Stage by stage testing was done according to the block representation on the breadboard, before soldering of circuit commences on Vero board. The various circuits and stages were soldered in tandem to meet desired workability of the hardware. Three general steps followed in the designing the system.

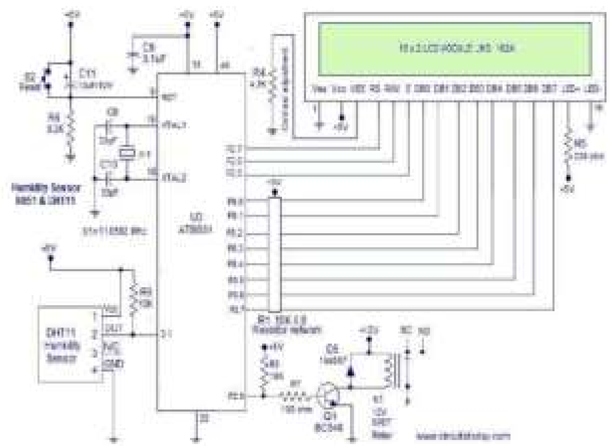

Fig3:SystemImplementation

Step # 1 : Identify measurable variables important to production. It is very important to correctly identify the parameters that are going to be measured by the controller's data acquisition interface, and how they are to be measured.
Step # 2 : Investigate the control strategies. An important element in considering a control system is the control strategy that is to be followed. The simplest strategy is to use threshold sensors that directly affect actuation of devices.
Step # 3 : Identify the software and the hardware to be used. Hardware must always follow the selection of software, with the hardware required being supported by the software selected. In addition to functional capabilities, the selection of the control hardware should include factors such as reliability, support, previous experiences with the equipment (successes and failures), and cost.

SOFTWARE IMPLEMENTATION

Keil Software

Keil Micro Vision is an integrated development environment used to create software to be run on embedded systems (like a microcontroller). It allows for such software to be written either in assembly or C programming languages and for that software to be simulated on a computer before being loaded onto the microcontroller.

RESULT

Low cost system, providing maximum automation. Low maintenance and low power consumption.The system is more compact compared to the existing ones, hence is easilyportable.Laboursaving.Provides a user-friendly interface hence will have a greater acceptance by the technologically unskilled workers.Closed loop design prevents any chances of disturbing the greenhouse environment.Sensors used have high sensitivity and are easy to handle. In response to the sensors, the system will adjust theheating,fans,lighting,irrigation,immediately, hence protect greenhouse from damage.Malfunctioning of single sensor will not affect the whole system.User is indicated for changes in actuator state thereby giving an option for manual override.

FUTURE SCOPE

Sending emails or speaking voice could be used when an alarm happens.The system performance can be modified by providing the power supply with the help of battery source which can be rechargeable or non-rechargeable, toreduce the requirement of main AC power. In addition to measure the conditions that have been mentioned , other conditions may be included like shade and fire detection .Non conventional energy sources such as solar panels, wind mills are used to supply power to the automatic greenhouse equipments.

CONCLUSION

A step-by-step approach in designing the microcontroller based system for measurement and control of the four essential parameters for plant growth, i.e. temperature, humidity, soil moisture, and light intensity, has been followed. The results obtained from the measurement have shown that the system performance is quite reliable and accurate. The system has successfully overcome quite a few shortcomings of the existing systems by reducing the power consumption, maintenance and complexity, at the same time providing a flexible and precise form of maintaining the environment. The continuously decreasing costs of hardware and software, the wider acceptance of electronic systems in agriculture, and an emerging agricultural control system industry in several areas of agricultural production, will result in reliable control systems that will address several aspects of quality and quantity of production. Further improvements will be made as less expensive and more reliable sensors are developed for use in agricultural production. Although the enhancements mentioned in the previous chapter may seem far in the future, the required technology and components are available, many such systems have been independently developed, or are at least tested at a prototype level. Also, integration of all these technologies is not a daunting task and can be successfully carried out.

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