Designing and Dismounting an Intelligent System of Irrigation Management for Greenhouse based on Delphi Software

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Abstract

The drought continuity and also restricting watery sources caused agriculture section forget old flooding methods for optimum water exploitation and proceeding new irrigation systems. New generation of irrigation systems called intelligent systems is a new solution leading to exploiting water increase to higher than 80%. In order to measure sensors and to control processors in designing and dismounting intelligent systems, Delphi programming and computer was administered in this study.. Managing works such as irrigation time and controlling temperature, humidity and even ventilation are managed and controlled automatically through adjusting the style of controlling intelligent systems. Processors are responsible for providing necessary factors about greenhouse such as heat, cold, light and humidity. Designing software in Delphi area caused all measuring parameters' monitoring from greenhouse area in computer area. Central hardware system exports different orders through getting data from sensors for controlling processors. The processors used in this way should be able to establish a faster relationship between processors .We concluded that economizing should be done in using water from 40 up to 50 percent with managing irrigation time and round – the – clock temperature. Thus, the plant has enough amounts of nutritional materials.

Keywords: green house ,controlling irrigation system ,sensors ,Delphi software

1- Introduction

Management methods and controlling irrigation have attended more attention in recent years [1]. Some universal studies have been carried out by famous companies worldwide and finally theories and researches caused irrigation systems become commercial characterized doctrinaire harvest of water in agriculture area [2]. We can decrease using water to less than 50% through flooding method and increase exploiting agriculture water around 60% [3]. Using intelligent solutions can be a desirable solution for water crisis and suitable management with considering modern water status and also wasting water up to 80% in agriculture section. It's better to pay attention to agriculture section, because it has an important role in a progressing country [5]. Different studies have been done in irrigation areas and decreasing using water considering greenhouse cultivation [6]. If irrigation is done in 40% of usable water, we can get the

best mixture of increasing water utility and least time for irrigation and in this distance, only 70% of water will be countable for plants [7]. In greenhouse cultivation, the best time for irrigation is the time that dust humidity is 25%. We can provide on time irrigation with intelligent system of irrigation management for greenhouse [8]. According to studies there isn't any watery stress on plants with intelligent irrigation [9]. Using intelligent system is a new principle in increasing exploiting water in agriculture area and preventing fatalities such as delivering water whose amount is around 70% up to 90% [10]. Using advanced techniques is an affective factor in decreasing losses and fatalities [11]. Therefore, drop irrigation is one of effective ways for providing water and nutritional materials for plants which not only decrease using water and increase irrigation output, but also cause water used with more uniformity and more attention. Also this method decreases water losses, salinity control, and increases quantitative and qualitative practicality of plants [12]. Irrigation councilors' services can have an important role in accepting technologies and increasing water exploitation [13]. In fact, intelligent system is a system that can irrigate plants in any kind of topography (low and high land) previously defined firmly or defined by the user. We can irrigate with even shallow capitation, if setup stations control irrigation intelligently [14]. In intelligent systems to control and manage time and also irrigation amount, the system designed is a cross between mechanical systems and irrigation systems of champ and garden. It means that this system exports irrigation when plants need water and prevent wasting water [15]. In this study, an ideal method based on Delphi has been suggested that prevents from wasting water with designing intelligent systems for greenhouse.

2- Suggested Method

We should pay attention to measurement and control humidity and also temperature for designing intelligent systemsof irrigating greenhouse, because these are important factors in designing intelligent systems of irrigating [16]. Therefore, they are evaluating in every time by electronic systems and inside temperature kept fix with controlling thermal and cold systems. After controlling temperature parameter, and greenhouse humidity and also dust humidity by sensors, the plants are irrigated by dropping method. It was shown that the results of feedback are online on pages. It's better to notice that controlling greenhouse events is possible through contacting relevance cables to computer serials in separate areas. Figure 1 shows the diagram block by using suggested method.

3- Techniques and Controlling Parameters in Project

The purpose of this study is evaluating humidity, temperature and intelligent irrigation of a greenhouse. So one of huge micro controls found in market is used and it is of AVR with ATMEGA64. There are 3 humidity sensors for controlling humidity: number 1 is used for controlling humidity of outside of greenhouse. Number 2 is used for

humidity of inside greenhouse; and number 3 is used for implant, measuring humidity in 15cm depth of dust. Also when humidity is in maximum, the micro commands to fan and ventilate window and therefore turns on fan and opens window.

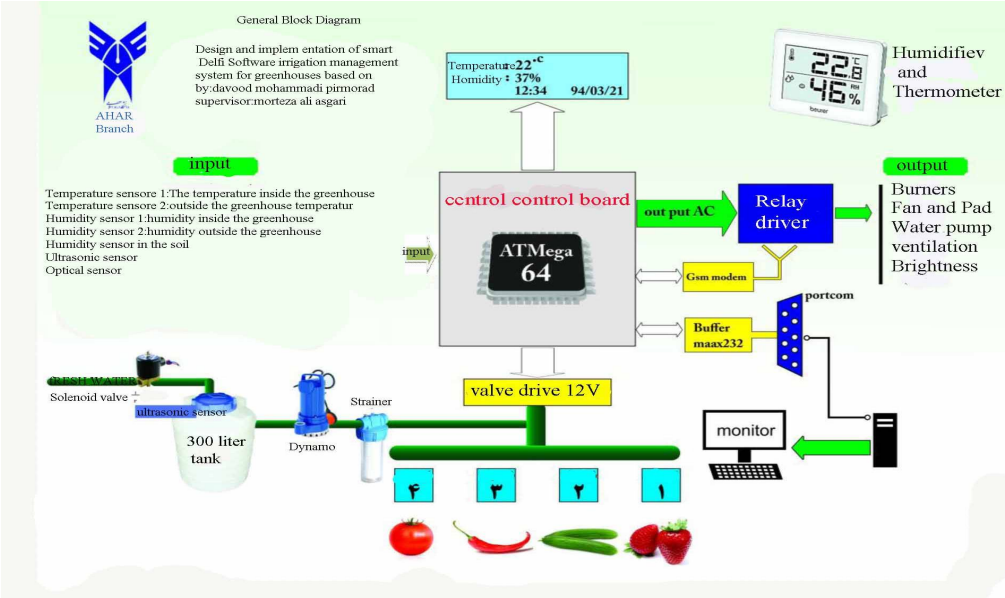

Fig. 1. The diagram by using suggested method

When the humidity decreases and the humidity come to suitable amounts, the micro stops and so the fan turns off and closes window. The maximum and minimum amounts are defined by software in plans. Two temperature sensors are used inside and outside of greenhouse which are of LM35 and measure average temperature in greenhouse. If temperature is less than minimum amount, the micro gives connect command to wheel and if temperature goes to maximum amount, the micro stops wheel. Show screen used in these projects is 2*16 which are assembled on main motherboard and used for solving problems and showing alarms. Also for exact report and greenhouse monitoring based on windows in designing windows in Delphi area, center system can set dates in computer by com port. Also light caused that system become stable and is member of techniques that are used in designing intelligent systems of irrigating greenhouse.

4- Letterpress Zone of Designing Range in Intelligent System of Irrigating Greenhouse

The range of letterpress zone includes of set of electrical zones used in electronic equipment. The practical map of range in designing systems for controlling continental conditions of greenhouse designed in software area is in relation with nucleus of ATMEGA64 used for different entrances. In this project, impart for interchange information by short message from sim900 establish bilateral relations by micro controller doorway which can report defined numbers of errors with respective AT command. In figure 2, you can see the map of operating design and it's relation with used materials.

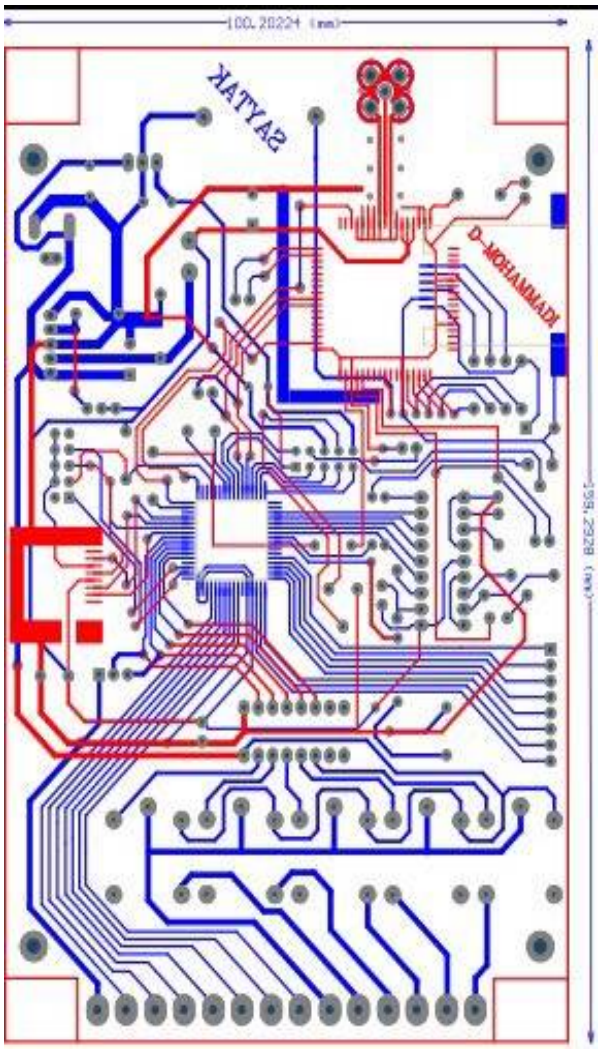

Fig.2. The map of operating design

5- Programming with DELPHI Language

We designed software based on Delphi in this project. This software as an operative system copulative between operator and hardware, receives all information from processor by rs232 protocol (serial doorway). In other words, all parameters of greenhouse area are monitored in windows area. Also it enables all information disposal operators by message.

6- Experiment Area and Test

Our experiment area was a greenhouse with dimension of 3*4 and height of 2m used for 3 rows and 2 classes. The least equipment was used to check temperature problems. We used 40*40 windows and ventilation for vacating maximum humidity and greenhouse gases. We used a human made hitter by gaseous torch and locality pot for thermal system of this greenhouse heated with blowing heat flame in metal pot. Figure 3 shows the hitter used in this project.

Fig.3. The torch and pot used in project.

Fig.4. The picture of greenhouse

The method of irrigating in this project is a plastic storage of 300 liters put inside a surface of 1inch and used with conduction lines (polo etalon tubes) of 1inch after passing a filter to main points put in first of them an electric faucet of 12volts. These can be opened and closed by processors simultaneously or independently.
four types of edible plants as a test are used in greenhouse tests:

- Cucumber
- Strawberry
- Tomato
- Pepper

Figure 4 shows the picture of a greenhouse in test area of an intelligent irrigation system.

7- Results

We begin to implant in implant dishes and the area of pitmas. The irrigation done by sensors based on the type of plant and measuring dust humidity and the time of irrigating was proportionate with weather condition, so as avoiding from irrigating to check wasting water by evaporation.

Because there isn't any compost in that area, for providing nutritional materials we used different vitamins based on plant's need during the week. Table 1 shows the types of vitamins used. Because experiment greenhouse was in city and used city water, the strawberry decreased its' blossom during the time measured by ph vehicle in different tests and as a result we found that water is alkaline for neutralizing alkaline quality added some acid sulphuric to it and tested again and then it was shown that its blossom increased during a week.

Table.1.The type of vitamins which are used

The characteristics of vitamins that are used	Consumption amount based on m1/g on liter
Nitrogen	150
phosphor	150
calcium	200
potassium	150
Magnesium	50
sulfur	60

We decrease greenhouse temperature to 3 degrees during night and day to plants have best flower and fruits. Also when greenhouse humidity was less than permissible amount, the system which was in greenhouse top, transfer flouring water to plant's root without contact with plant's leaf. Also when the humidity was higher than permissible amount, ventilation start to decrease humidity for 5 minutes and set greenhouse humidity. While temperature and humidity increase and/or decrease, it reports by message to operator. In designing greenhouse the situation of outside temperature which measured by number 2 sensor are shown in figure 5. The temperature of inside greenhouse measured by number 1 sensor and the average of month temperature in six months are shown in figure 6.The temperature of greenhouse kept fix to 30 degrees because of premature sprout in cucumber, tomato and pepper. The temperature of inside greenhouse decreased 5 degrees until plants have increased their flowers by intelligent system.

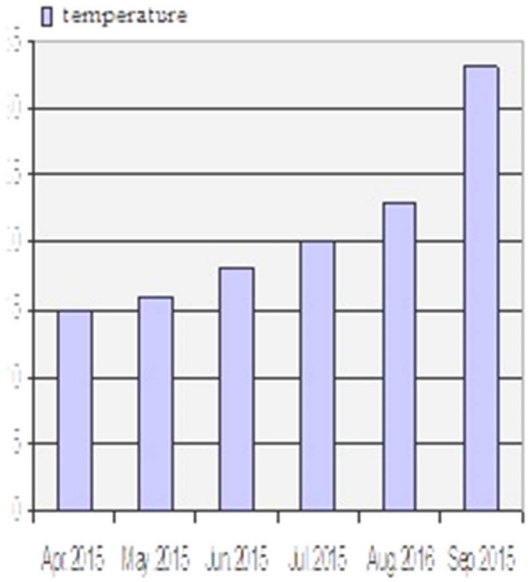

Fig.5. The situation of outside greenhouse temperature

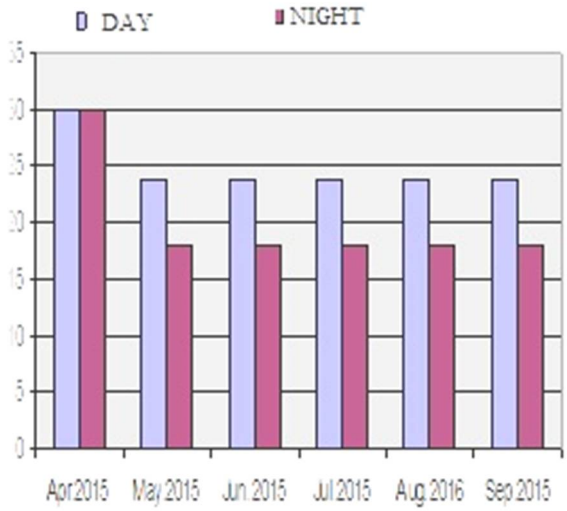

Fig.6. The report of inside greenhouse temperature

The number 1 sensor measures the humidity of inside greenhouse, when the humidity increase, the processor decreases humidity with activating ventilation system and when humidity decreases, it increases humidity.

The humidity amount was based on percentage and figure 7 shows the average of humidity by number 1 sensor in every month.

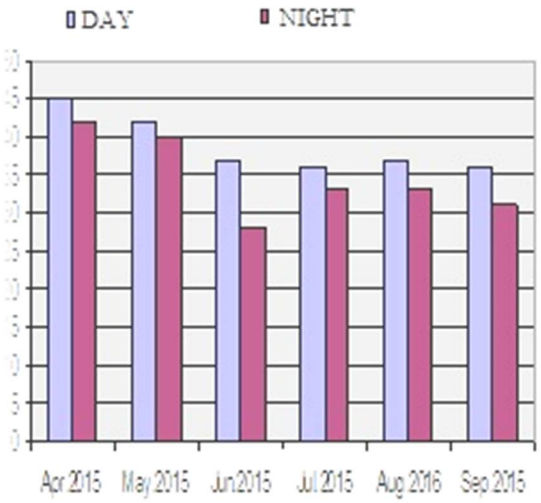

Fig.7. The average of humidity by number 1 sensor

The water and electricity are measured in intelligent greenhouse and are compared with last greenhouse and are shown in figure 8. The consumption of water is saved 40 to 50 percent, because of managing the time of irrigation and the night and day temperature and also for avoiding irregular evaporation in water. As a result, plants get enough nutritional material and so it can have resistance growth.

Table 2 shows the fruits of greenhouse designed in comparison with traditional method. According to above table, the growth and fruit of selective tests is better than usual greenhouse in comparison with intelligent greenhouse.

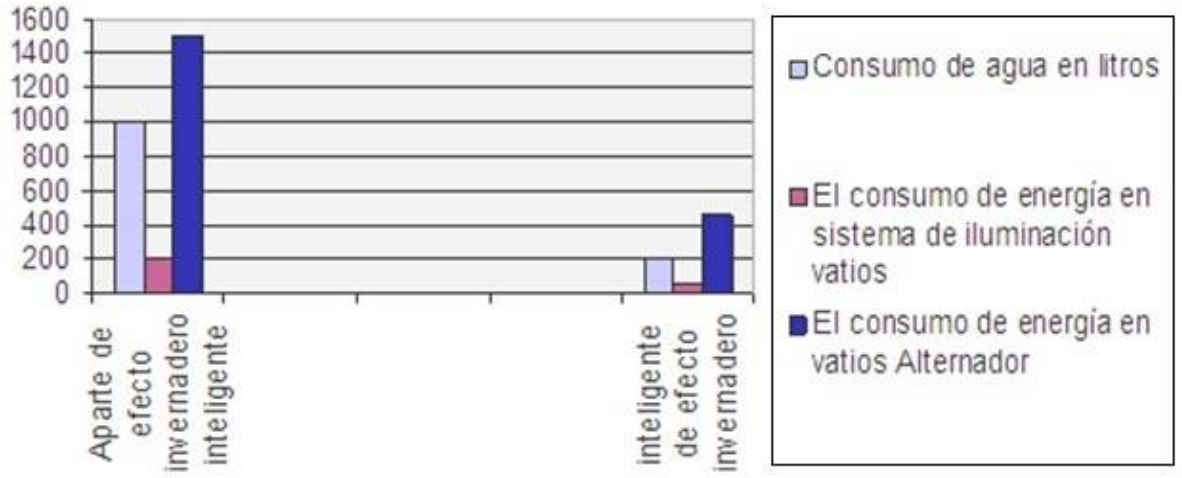

Fig.8. The comparison of water and electricity in intelligent greenhouse with usual greenhouse in 3*4 dimensions.

Table. 2. The amount of greenhouse fruits designed in comparison with usual method

types	The amount of harvest by traditional method in every time	The amount of harvest by intelligent greenhouse in every time	The time of planting
		kg	yearly
strawberry	1.3	2	4 seasons
cucumber	3.5	2	2 time
tomato	1.5 - 2	2.5 - 3	2 time
pepper	1.5	3	2 time

8- Conclusion

According to tests, economizing in water and electricity is optimum in the suggested method. With considering country water, 92 percent of consumption water is related to agriculture section. According to this statistics, Iran has 22% more than average amount. The large evolutions will occur in agriculture section with using optimum and using intelligent systems in agriculture section and so avoiding from premature water. According to suggested method, we can decrease water to one – fifth. We can save our time with using intelligent systems and so the costs of traffic become very low. So we can control important factors with our knowledge in greenhouse.

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