FPGA BASED REAL TIME MONITORING SYSTEM FOR AGRICULTURAL FIELD

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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. In past couple of decades, there is immediate growth in field of agricultural technology. Utilization of proper method of irrigation by drip is very reasonable and proficient. A various drip irrigation methods have been proposed, but they have been found to be very luxurious and dense to use. The farmer has to maintain watch on irrigation schedule in the conventional drip irrigation system, which is different for different types of crops. In remotely monitored embedded system for irrigation purposes have become a new essential for farmer to accumulate his energy, time and money and will take place only when there will be requirement of water. In this approach, the soil test for chemical constituents, water content, and salinity and fertilizer requirement data collected by wireless and processed for better drip irrigation plan. This reviews different monitoring systems and proposes an automatic monitoring system model using Wireless Sensor Network (WSN) which helps the farmer to improve the yield

Real-time monitoring provides reliable, timely information of crop and soil status, important in taking decisions for crop production improvement. The contribution of this research is the development of a real-time remote monitoring system that acquires data from any kind of sensor to be transmitted by radiofrequency to a computer with an interface module. This allows the sensing of large area fields with a system capable of monitoring crop local environmental or physiological status; the data transmission and storage in the computer is made in real-time. To design this device, the system on a chip approach was followed. Implementation was done in a field programmable gate array, which ensures a low cost.

Keyword : - *carbon dioxide, greenhouse, agricultural, wireless sensor network*

1. INTRODUCTION

India is an agriculture–oriented country. For the quality and Productivity improvement of greenhouse crops, it is necessary to measure and control several interacting physical variables. These tasks can only be accomplished by 'control systems with built in software'. Erecting greenhouse is expensive. Many farmers cannot adopt the greenhouse technology due to its high cost. Our project highlights about the approach to control the environment in Greenhouse. The greenhouse controller senses the changes in the temperatures (Dry temperature, Wet temperature) through input sensors and processes to take control action. Real time monitoring provides reliable, timely information of crop and soil status, important in taking decisions for crop production improvement. Evaluation of agricultural production systems is a time consuming and difficult process because it means performing visits to selected crop fields to be able to measure and register certain physical, chemical and biological

characteristics of the cultivated areas. 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.

The Irrigation is the artificial application of water to the soil for assisting in growing crops. Drip irrigation also known as micro irrigation & is an irrigation method which minimizes the use of water & fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone due to which a large quantity of water is saved & also the fertilizer which comes to the plant with the water. Indian agriculture is dependent on the monsoons, which is dependent on the nature and not a reliable source of water, so there is a need for an automatic irrigation system in the country which can provide water to the farms according to their moisture, temperature and soil types & fertilizers. For a big farm land with horticulture activity the solution will be an automated system. Water contained in the soil is called soil moisture. And it is very important for plant growth. The advantage of using wireless sensors is to control all related parameters for better irrigation management.

1.1 Objectives

- The prime objective is to select the appropriate wireless network to collect the data from moisture sensors, temperature sensors of various areas of the field, water level sensors in the irrigation system to monitor the proper drip of water along with the fertilizer.

- The objective of this research was to develop a low cost wireless monitoring system to obtain measurements of current field conditions in real-time. To identify the suitable pump with facility for maintaining certain recommended pressure in the water pipe. To indentify proper sensors and monitoring device required for the farming data like soil moisture, soil temperature, soil fertilizer & chemical constituents.

1.2 Needs of Project

- In India, the market is mainly based on agriculture and the climatic environment is isotropic and is not able to make full use of agricultural assets. The main cause is the lack of rains in many parts of India and scarify of land water. The demand for new water saving techniques in irrigation is growing immediately right now.

- The effectiveness of the irrigation is determined by a number of different factors, including the type of irrigation system and the conditions at its instance of application

- Irrigation is the artificial application of water to the soil usually for supporting in harvesting the crops. In crop production, it is mainly used in desiccated area and in periods of rain water shortfalls.

2. LITERATURE SURVEY

After the research in the agricultural field, researchers found that the yield of agriculture goes on decreasing day by day. Use of technology in the field of agriculture plays important role in increasing the production as well as in reducing the extra man power efforts, water requirement and fertilizer requirement. Some of the researchers tried for betterment of farmers and provides the systems that use technologies which are helpful for increasing the agricultural yield. Some of such researches carried out in the field of agriculture are summarized below

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Sr.	Year	Author	Abstract
1	April 2014	Aniket.H.Hade, Dr. M.K. Sengupta	In remotely monitored embedded system for irrigation purposes have become a new essential for farmer to accumulate his energy, time and money and will take place only when there will be requirement of water.
2	December 2014	K.Sindhu, Y.Srichakrapani, M.Kamaraju	The sensors will monitor the field conditions, and the sensors information will be stored in memory.
3	June 2016	Priyanka.J.Ranade, Prof. S. B. Takale	To get rid of this problem proper distribution of water in field is required.

2.1 System Development

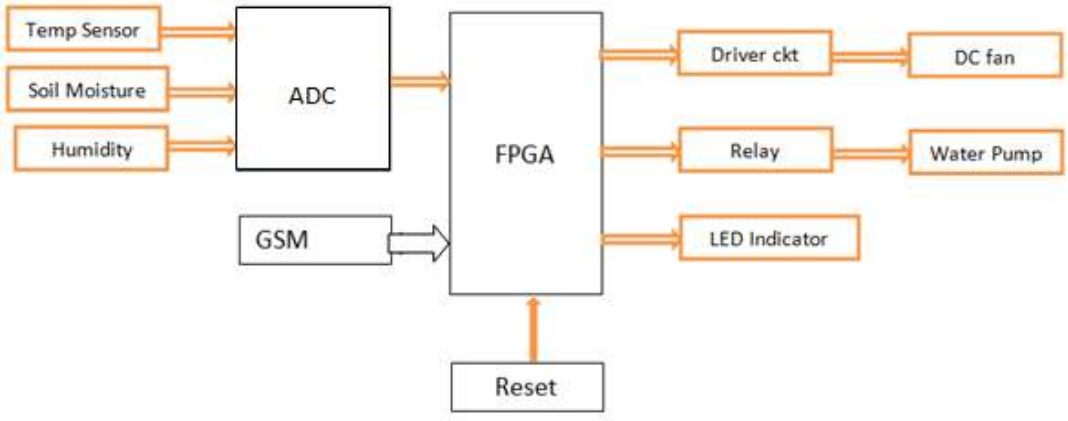

FIG 1. BLOCK DIAGRAM

Irrigation is the main concern for agriculture. Long gone are the days of manual watering or relying on servant to water when you are on vacation or away on business. The Project presented here waters our plants regularly when you are out for vacation.

The circuit comprises sensor parts. Sensors like Temperature, humidity and soil moisture are interface to the Microcontroller. Sensors output is analog so we have to use ADC 0809 to convert it into digital.

The microcontroller monitors the soil moisture sensor and when sensor sense the dry condition then it will automatically starts water pump using relay. Also continuously temp will be monitor and fan will switch ON or OFF according to temp condition. LED indicators are used to indicate humidity condition.

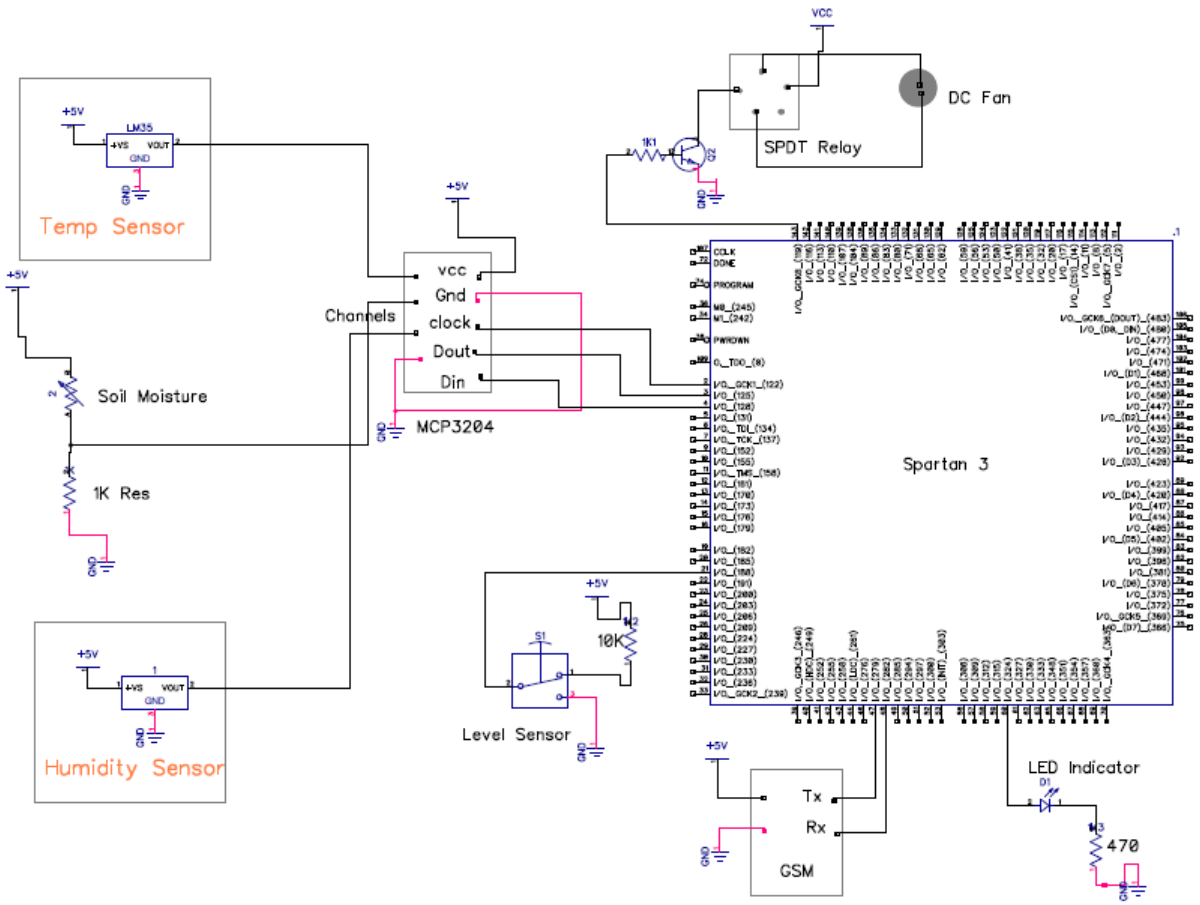

FIG 2. CIRCUIT DIAGRAM

3. SELECTION OF COMPONENTS

1. Temperature Sensor (LM 35):

A temperature sensor is used to measure the temperature of the fields. This is most effective field parameter which has greater influence on other parameters. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an

advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

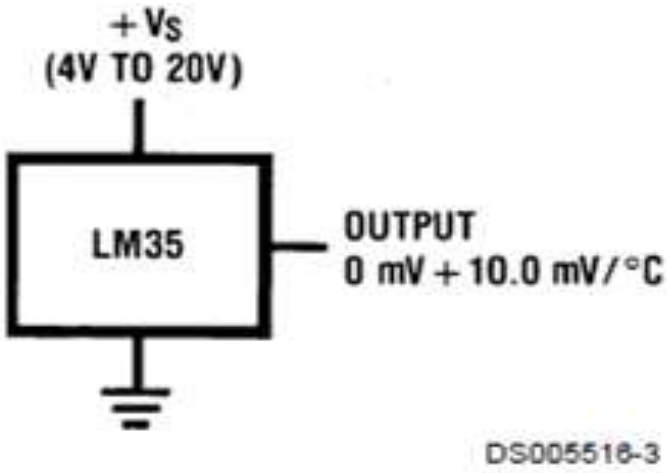

FIG 3. TEMPERATURE SENSOR

2. Humidity Sensor (SY-HS 220):

Humidity is the presence of water in air. In agriculture, measurement of humidity is important for plantation protection and soil moisture monitoring. The humidity sensor is also called a hygrometer. It continuously measures and re-ports the relative humidity in the air.

The humidity sensor senses relative humidity. That means it measures both air temperature and moisture. Relative humidity is expressed as a percentage. It is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold.

FIG 4. HUMIDITY SENSOR

3. Soil Moisture Sensor:

Soil moisture sensor measures the water content in soil. Measuring soil moisture is very important in agriculture to help farmers manage their irrigation systems more efficiently. Farmers able to generally use less water to grow a crop, they are able to increase yields and the quality of the crop by better management of soil moisture during critical plant growth stages.

FIG 5. SOIL MOISTURE SENSOR

4. Level Sensor (FSH-24):

The FS series of sensors are economical electromechanical float switches for liquid level sensing. Selectable normally open or normally closed outputs, along with various mounting configurations and housing materials, allow the FS sensors to fit a wide variety of level applications.

FIG 6. LEVEL SENSOR

4. GSM

Global System for Mobile Communications (GSM) is the most popular mobile phone system in the world. The name GSM first comes from a group called Group Special Mobile (GSM), which was formed in 1982 by the European Conference of Post and Telecommunications Administrations (CEPT) to develop a pan-European cellular system that would replace the many existing incompatible cellular systems already in place in Europe. But when

GSM service started in 1991, the abbreviation "GSM" was renamed to Global System for Mobile Communications from Group Special Mobile.

GSM uses Frequency Division Multiplexing AND Time Division Multiplexing. FDMA divides the frequency ranges for GSM, which are 890-915, 935-960 and some others that the book didn't have. Each is divided into 200 kHz wide channels. As far as TDMA goes, each time slot is 577 micro seconds long, 8 time slices is a frame, lasting for a grand total of 4.615ms. A multi frame consists of 51 frames, 51 multi frames make up a Super frame, and 2048 Super frames make a Hyper frame which is 2715648 frames.

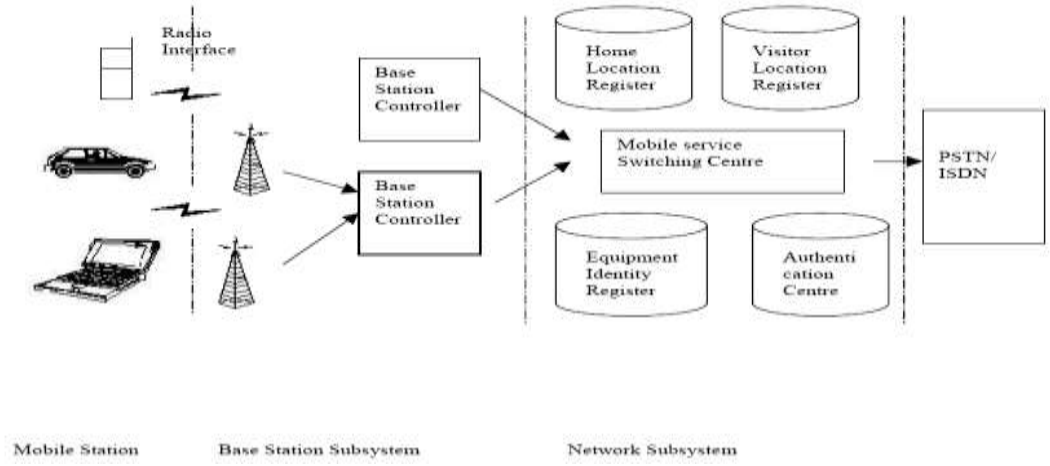

FIG 7. GSM ARCHITECTURE

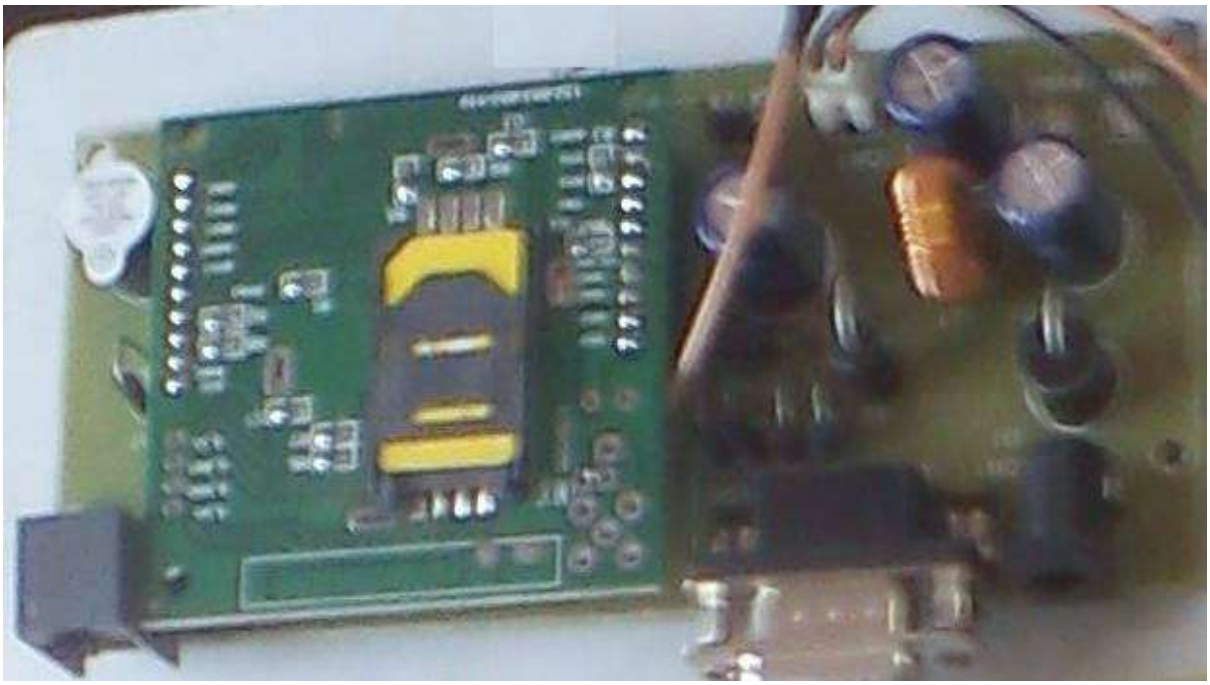

FIG 8. GSM MODEM

5. RESULT

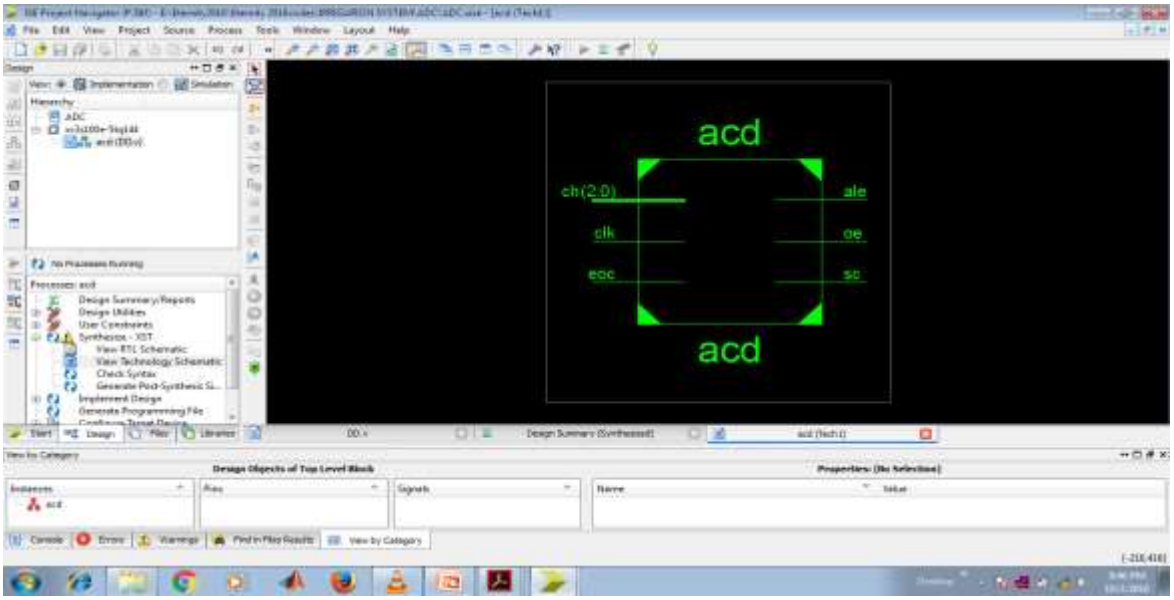

FIG 9. IMPLEMENTATION OF ADC CIRCUIT

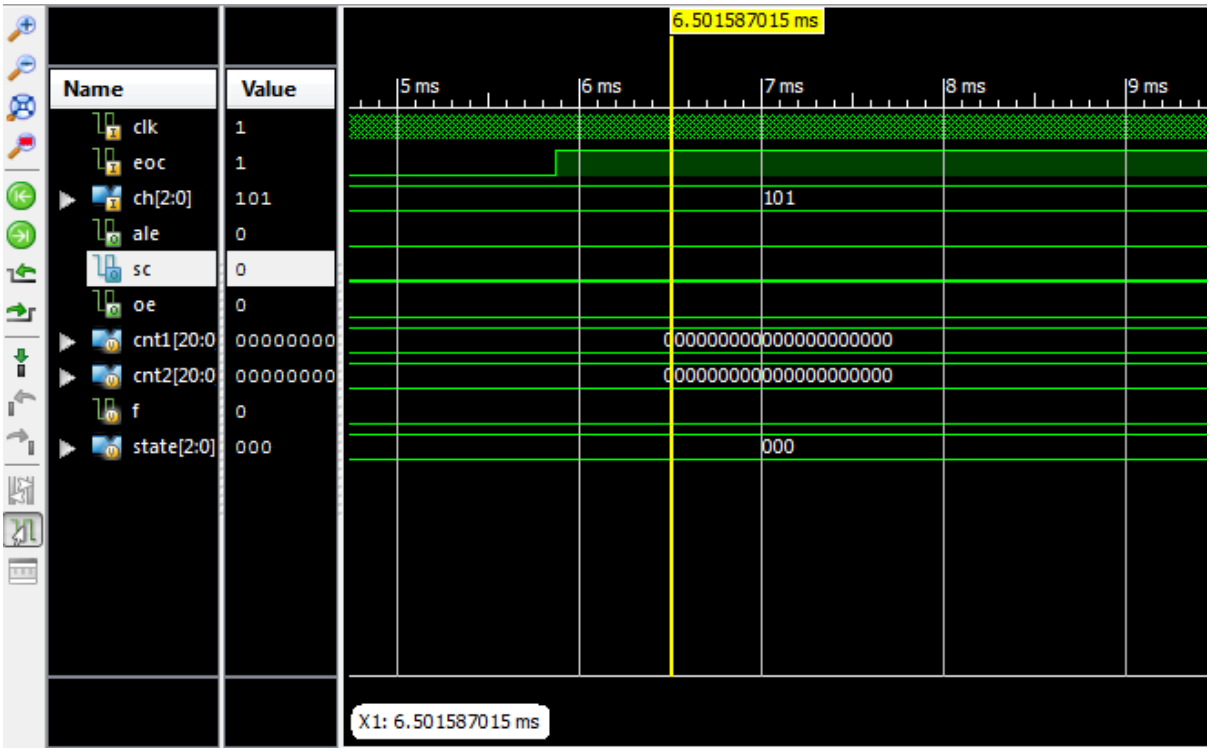

FIG 10. SIMULATION OF ADC CIRCUIT

6. CONCLUSION

The objctive of this project was to develop a system to provide autonomus control for temperatue and humidity in closed environment, which is fulfilled. Also, to achieve competitiveness in the market, the production cost 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.

7. REFERENCES

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