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Development and Evaluation of Plant Humidifier for Agriculture Land

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ABSTRACT

Humidity sensor is the one type of transducer which is used to measure the humidity level in the land. According to the humidity level it generates the voltage signals. But these signals are in the range of milli voltage. So there is need to amplify the signal. The signal is fed to amplifier unit in which the incoming signal power level is amplified. Then the signal is given to ADC.

ADC is nothing but analog to digital converter in which the incoming analog signal is converted to into corresponding digital signal. The objective of this project is to control the humidity level in the agricultural land automatically.

The keypad is interfaced with microcontroller which is used to set the desired humidity level. The microcontroller received the digital signal from ADC and compared with set value. If the humidity level is lower than the set value, the microcontroller switch ON the relay which turns ON the pump motor. When the monitor humidity level is equal to set value the pump motor is automatically turned off by tripping the relay to OFF condition.

***Key Words**: IoT, ADC, Relay, Micro Controller*

INTRODUCTION

In agriculture, soil moisture is a primary factor to support plant growth in farm productivity. If the plant area has less moisture can result in yield loss and plant death. High moisture it causes root disease, the continuous monitoring of soil moisture for long duration crops is a challenging task. To maintain the required level of soil moisture, the field needs proper water irrigation. Soil moisture sensing system is used to help irrigators to identify and maintain the required moisture level.

The existing system, the moisture level was identified by Manual work through the dipping of sensors in the Agricultural field. If the farmer needs to identify the entire field moisture level, it is a tedious task for dipping the sensor in various places to acquire the data. The proposed system has the GPS mechanism is used to get the temporal and spatial data regarding a particular location where soil moisture is measured by the proposed system. To overcome the existing system drawback, the proposed system is introduced. The main advantages of the proposed system are continuous monitoring and recording of soil moisture. Based on this result, the farmers can manage the schedule of Irrigation system. The measured value of soil moisture can be access anywhere through the IoT system.

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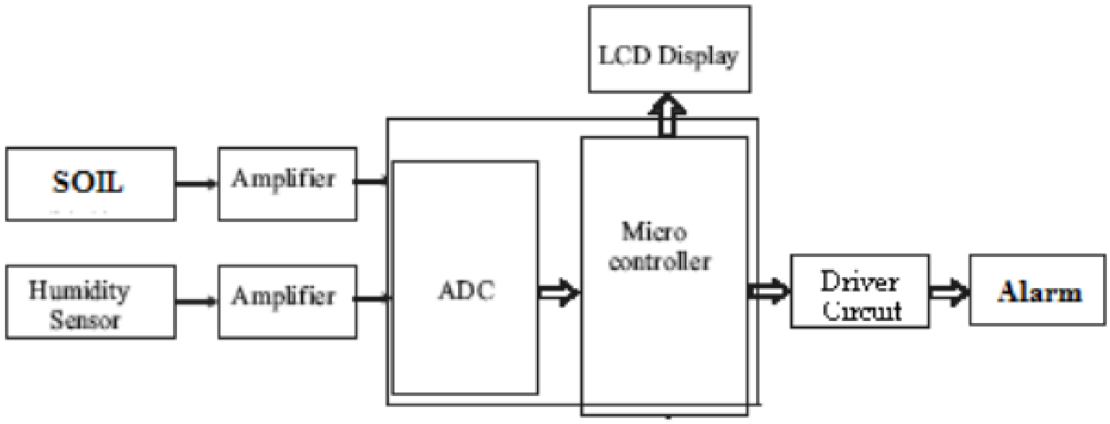
3. Block Diagram:



4. BLOCK DIAGRAM DESCRIPTION

4.1. HUMIDITY SENSOR:

Humidity is the amount of water vapor in the air. Water vapor is the gaseous state of water and is invisible. Humidity indicates the likelihood of precipitation, dew, or fog. Higher humidity reduces the effectiveness of sweating in cooling the body by reducing the rate of evaporation of moisture from the skin. This effect is calculated in a heat index table or humidity index. The amount of water vapor that is needed to achieve saturation decreases as the temperature increases. As the temperature of a parcel of water becomes lower it will eventually will not reach the point of saturation without adding or losing water mass. The differences in the amount of water vapor in a parcel of air can be quite large, for example; A parcel of air that is near saturation may contain 28 grams of water per cubic meter of air at 30 °C, but only 8 grams of water per cubic meter of air at 8 °C.

There are three main measurements of humidity: absolute, relative and specific. Absolute humidity is the water content of air at a given temperature expressed in gram per cubic meter. Relative humidity, expressed as a percent, measures the current absolute humidity relative to the maximum (highest point) for that temperature. Specific humidity is a ratio of the water vapor content of the mix to the total water content on a small basis.

A capacitive humidity sensor measures relative humidity by placing a thin strip of metal oxide between two electrodes. The metal oxide's electrical capacity changes with the atmosphere's relative humidity. These types of sensors are used for weather, commercial and industrial applications.

Resistive humidity sensors utilize ions in salts to measure the electrical impedance of atoms. As humidity changes, so does the resistance of the electrodes on either side of the salt medium. State-of-the-art resistive humidity sensors use ceramics to overcome areas where condensation occurs.

Thermal conductivity sensors measure changes in heat to detect humidity. Two thermal sensors conduct electricity based upon the humidity of the surrounding air. One sensor is encased in dry nitrogen as a comparison to the other sensor which measures the ambient air. The difference between the two measures the humidity.

4.2. SOIL SENSOR:

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Soil moisture sensors measure the water content in the soil and can be used to estimate the amount of stored water in the soil horizon. Soil moisture sensors do not measure water in the soil directly. Instead, they measure changes in some other soil property that is related to water content in a predictable way.

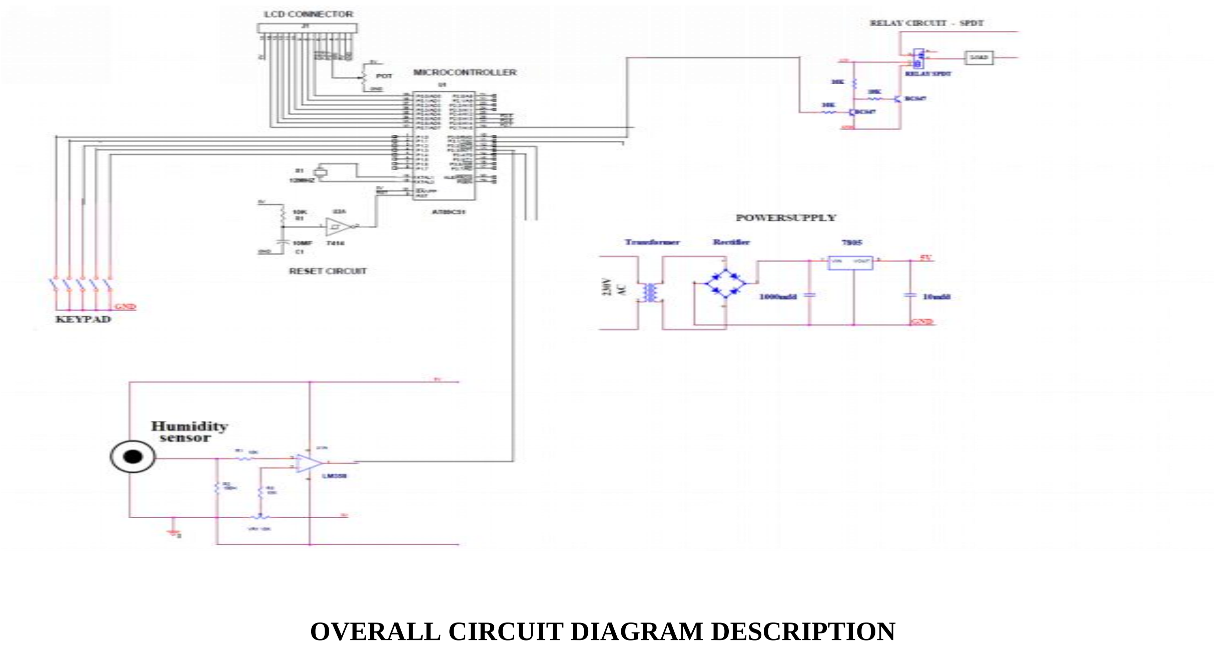
The Soil Moisture Sensor uses capacitance to measure dielectric permittivity of the surrounding medium. In soil, dielectric permittivity is a function of the water content. The sensor creates a voltage proportional to the dielectric permittivity, and therefore the water content of the soil. A soil moisture sensor is a device that measures current soil moisture. Sensors integrated into the irrigation system aid in scheduling water supply and distribution much more efficiently. Such gauges help to reduce or enhance irrigation for optimum plant growth.

It's calculated by weighing the wet soil sampled from the field, drying it in an oven, and then weighing the dry soil. Thus gravimetric water content equals the wet soil mass minus the dry soil mass divided by the dry soil mass. In other words, the mass of the water divided by the mass of the soil.

4.3. MICROCONTORLLER

Microcontrollers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life more strongly than one can imagine. Since its emergence in the early 1980's the microcontroller has been recognized as a general purpose building block for intelligent digital systems. It is finding using diverse area, starting from simple children's toys to highly complex spacecraft. Because of its versatility and many advantages, the application domain has spread in all conceivable directions, making it ubiquitous. As a consequence, it has generate a great deal of interest and enthusiasm among students, teachers and practicing engineers, creating an acute education need for imparting the knowledge of microcontroller based system design and development. It identifies the vital features responsible for their tremendous impact, the acute educational need created by them and provides a glimpse of the major application area.

OVERALL CIRCUIT DIAGRAM



OVERALL CIRCUIT DIAGRAM DESCRIPTION

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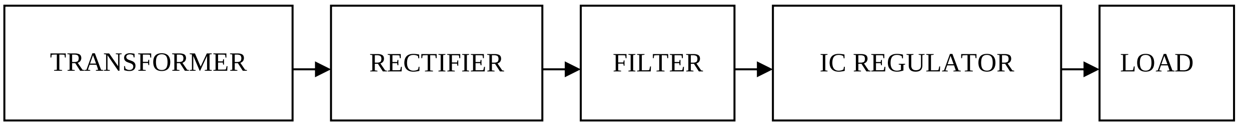
5.1 POWER SUPPLY CIRCUIT

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.



Transformer

The transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC; rest of the circuits will give only RMS output.

Bridge rectifier

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners.

Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4.

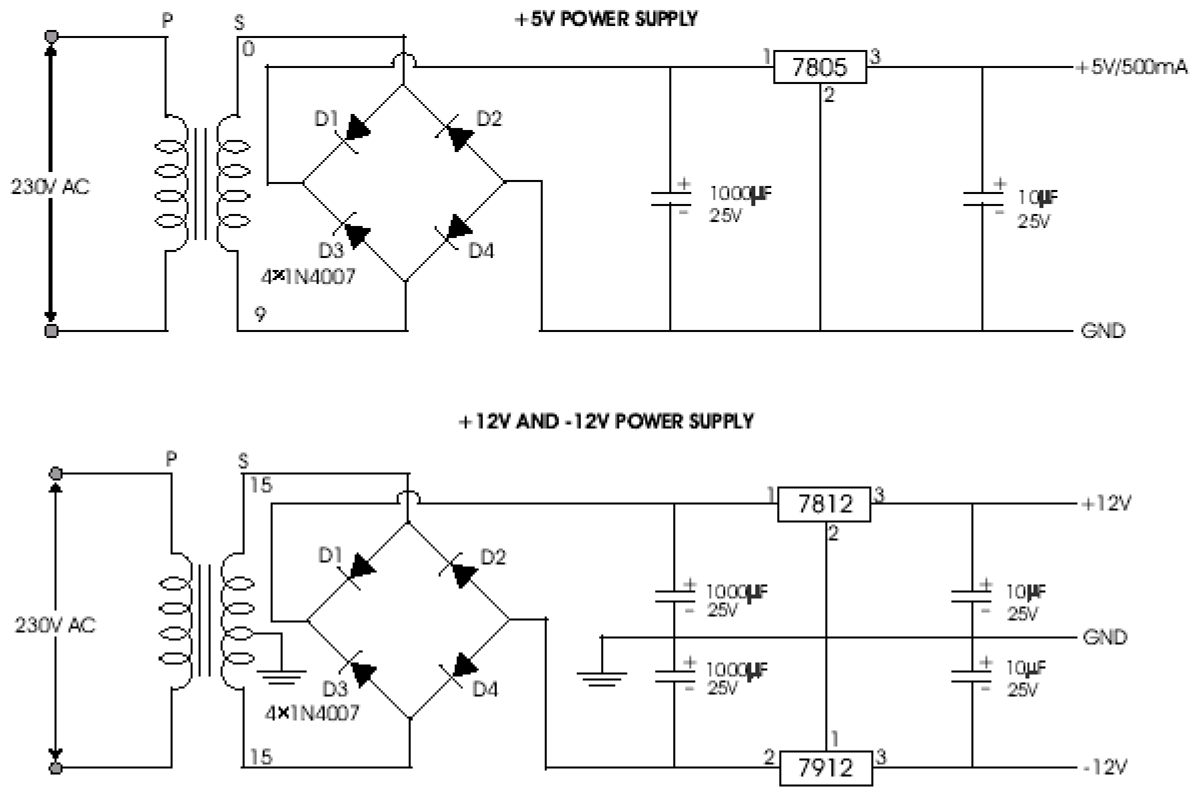
The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow.

The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. this path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3.

One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. Waveforms (3) and (4) can be observed across D2 and D4. The current flow through RL is always in the same direction. In flowing through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier.

IC voltage regulators

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.



Circuit diagram (Power supply)

CONCLUSION AND SCOPE FOR FUTURE

The current work illustrated the importance of smart agriculture on improving and increasing agricultural production in order to contribute to reducing the food demand gap. IoT is considered the backbone of smart agricultural technology, as it connects all components of smart systems, not only in the agricultural field but also the other applications. Concerning the use of IoT in agriculture, it can be used in many practices such as farm monitoring, irrigation, pest control, harvesting, etc. IoT connects several sensors with processing units, then analyzes data, then makes appropriate decisions in real-time. This work reviewed the application of integration IoT with UAV and Robots systems controlled by AI techniques and the limitations of their use in developing countries. Recently, the success of SF performance is related to the speed of data transfer. Hence, the 5G network brought about the smart agriculture field and provided flexible and efficient solutions, as a very high speed characterizes it compared to the fourth-generation networks. The application of smart agricultural technology helps developing countries, such as some Egyptian approaches that represent the beginning toward the spread of such technology and can help develop the agriculture sector and achieve farm sustainability in those countries.

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Finally, these smart technologies should be supported by governments in third world countries at the level of small farms, as they aim to increase production and improve the efficient use of land and water resource.

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