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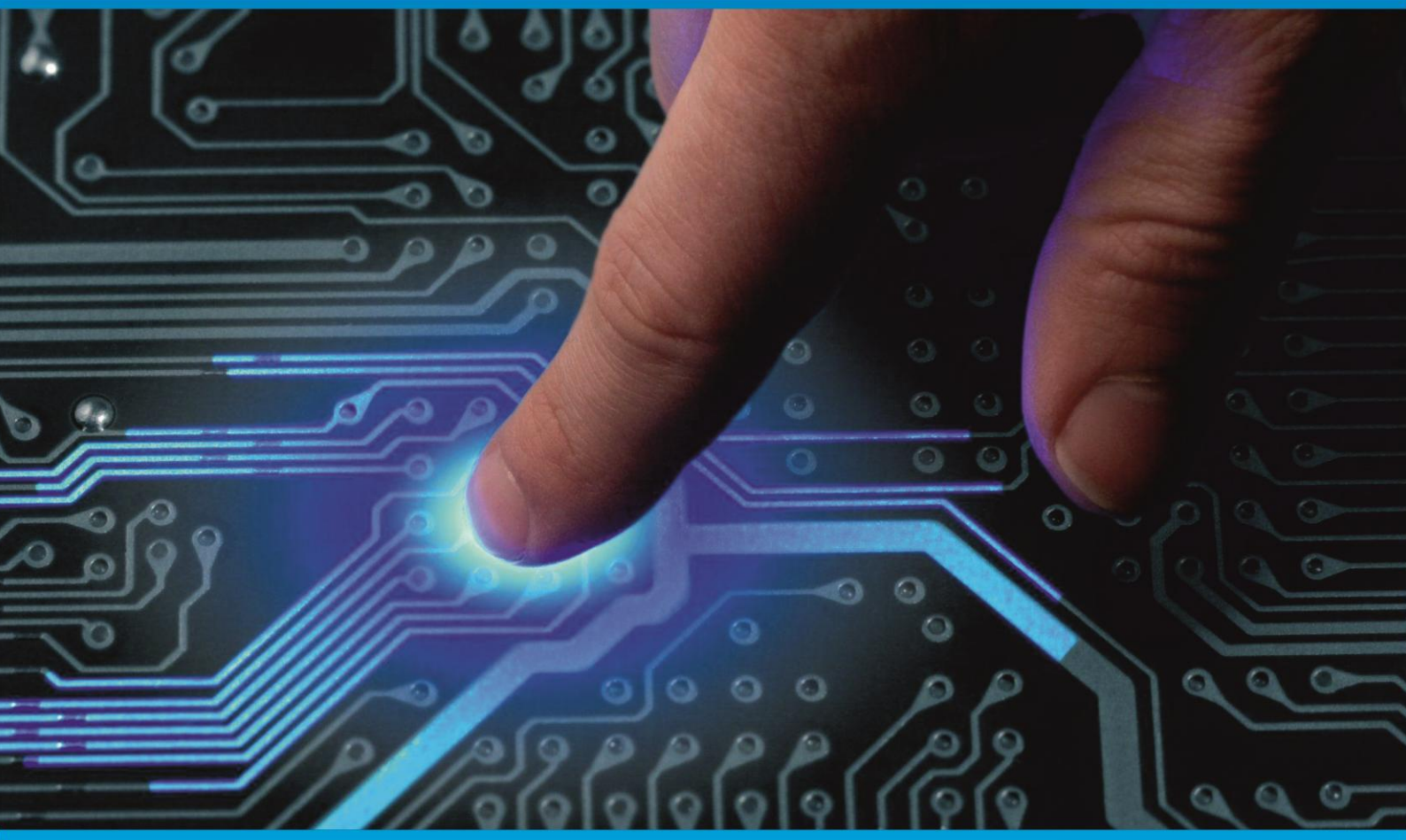

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Enhancement of the Micro-Controller- Based Equipment Using the Data Obtained From IoT Equipment

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ABSTRACT: IoT 'Internet of Things' has a major role in the field of agriculture, as the time passes by there are less people who wish to work on farm under the sun and most people from the rural areas are moving towards urban cities in search of work leaving behind their ancestral agricultural lands which has caused a reduction in the availability of the labor for agricultural field works and this is also another reason due to which we see agriculture is depleting in our country to overcome the problem of labor we can use IoT devices in agriculture but most of our farmers are not much educated and cannot use complicated technologies and even though they are capable of using it there are lot of other factors which make it hard for our farmers to use IoT technology like our rural areas don't have a good internet facility which is the major requirement by the IoT devices, and another problem is that there is a constant load shedding or partial current supply in the rural areas, and another thing in rural areas is the mobile towers use a larger bandwidth spectrumdue to which there is issue with the mobile network in a lot of places as the signals are not good. So, this paper focuses on overcoming all these issues and provide a convenient technology that does not require the internet neither a stable current nor mobile network for it to function to its 100% potential and can be provided to the farmers at anaffordable cost and even an uneducated farmer would be able to use it with ease.

I. INTRODUCTION

IoT 'Internet of Things' has made the lives of people more comfortable nowadays compared to the old times. As we see the IoT devices have started replacing the laborers' requirements in factories, offices, the army, agriculture, and many more fields not only that it has made the lives of people easy and comfortable in a big way for example: "In earlier times people needed to hire workers for any house hold chores like dishwashing, or washing clothes, or doing household chores, but as time proceeded it was hard to find workers or maids for household work and even they found someone the wages would be unaffordable. At this time the chores of the maid were replaced by the IoT devices like smart automatic dishwasher for washing the dish, and washing machines for washing clothes, and smart automatic vacuum cleaner to clean the floor". In a similar way,even the agricultural field has suffered the same consequences where it faces inadequate labor issue, and excess of payment for the laborers but not only that it has a lot of other issues like global warming and depletion of natural resources like rivers, lakes, and underground water reserve and even the use of chemical fertilizer depletes the land of its fertility. Due to all of the reasons the agricultural sector in our country has taken a huge step backward so to overcome these issues we have to use organic farming methods and avoid the use of chemical fertilizers to maintain the fertility of the agricultural land, and in-terms of overcoming the usage less available natural resources and laborers that is where the IoT technology steps into the picture for example: "The available water source can be utilized without wasting it using drip water irrigation method which is controlled by IoT devices which provides the required amount of water to the land no more and no less which drastically reduces the wastage of water when compared to the same drip water irrigation which is directly connected to a motor pump". And there is a lot of machinery as well which reduces the issue of laborers as well.

There are many research papers published on IoT technologies in agriculturethat have helped our farmers in a lot of ways.But there are few issues in getting the IoT devices installed in the farms as well because most of our farmers are not much educated and cannot use complicated technologies and even though they are capable of using it there are a lot of other factors which make it hard for our farmers to use IoT technology like our rural areas don't have a good internet facility which is the major requirement by the IoT devices, and another problem is that there is a constant load shedding or partial current supply in the rural areas, and another thing in rural areas is the mobile towers use a larger bandwidth spectrum due to which there is an issue with the mobile network in a lot of places as the signals are not good. Due to these factors, a majority of our farmers are not being able to take full advantage of the IoT technology.

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So, this paper focuses on overcoming all these issues and provide a convenient technology that does not require the internet neither a stable current nor mobile network for it to function to its 100% potential and can be provided to the farmers at an affordable cost compared to IoT technologies and even an uneducated farmer would be able to use it with ease and can be used by any farmer irrespective of the availability of internet or network at his/her farm. Basically, the idea is to focus more on automated systems which do not require the internetand can run on a very small amount of electricity such as 5V – 12V. And does not require any sort of involvement of the mobile phones. This can be achieved by enhancing the accuracy of the microcontroller technology using the data which is obtained by soil sample test and the data from the global IoT devices which are available over the internet for example: "Like the international water index of a particular area which is easily available over the internet."

II. PROPOSED METHOD

The data which is obtained from the soil sample test is first taken and based on the results of the test i.e., the different types of soil present in the different region of the farm is first taken into consideration as the water required to keep the land moist varies based on the type of sand present in each area and in addition to this as the seasons vary throughout the country and cannot accurately predict the weather there is a moisture sensor connected to the circuit using which the moisture in the land is measured and considering the data obtained from the sensor and the result data from the soil sample test, based on these information the program is first designed to match the moisture content of respective sand type accordingly and burned onto the microcontroller. Once this is done the remaining circuit connections are connected as shown in the below figure.

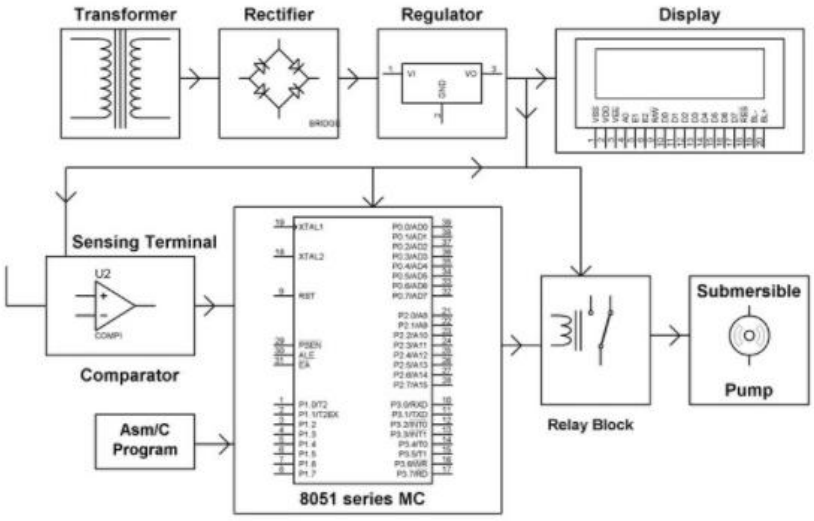

Figure 1.Circuit Diagram for automated irrigation system using Microcontroller 8051

The Microcontroller acts as a brain of the circuit as the program designed will be burned on to it, and a 5v power supply is used to supply power to the entire circuit with the assistance of a transformer, a bridge rectifier circuit and a voltage controller.The microcontroller is programmed by using KEIL software. The 8051 microcontroller is customized so that it gets the information signal from the moisture sensor which comprises of a comparator to sense the shifting states of the dampness in the dirt. The OP-AMP which is utilized as comparator goes about as an interface between the detecting material and the microcontroller for moving the dampness states of the dirt, viz.wetness, dryness, and so forth.

When the microcontroller gets the information from the detecting material – it looks at the information and compares it with the program on the microcontroller, which produces the required signals and transfers the signals for the working of the pump. The sensor course of action is finished with the assistance of two firm metallic poles that are embedded into the horticultural field at some distance. The necessary associations from these metallic bars are interfaced to the control unit for controlling the tasks of the pump as indicated by the dirt dampness content.The signals that are sent from the sensors to the microcontroller through the output of the comparator operate under the control of a software program which is stored in the ROM of the microcontroller. The LCD displays the condition of the pump (on or off) interfaced to the microcontroller.

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The above circuit can still be upgraded as there is constant load shedding in the rural areas and some remote areas might not have electricity at all at such circumstances the above circuit can be connected to a solar panel also known as solar photo voltaic cell for an alternate source of power or an external battery can be connected to the circuit as an alternate source of power and if the farmer is capable of using a mobile phone and want to manually control the circuit a GSM modem can be added which transfers the data to the farmers mobile based on which the farmer can perform the required action i.e., turn the irrigation system on or off. The working of the circuit is the same as explained earlier and there are no changes to the working principle of the circuit apart from adding an alternate power supply just in case of power outage or load shedding. The inclusion of the GSM modem can also be optional to the circuit only if necessary and the farmer is capable of using it as it can be connected to the circuit with some minute changes in the circuit and is easy as well. The upgraded circuit diagram using the solar panel is given below.

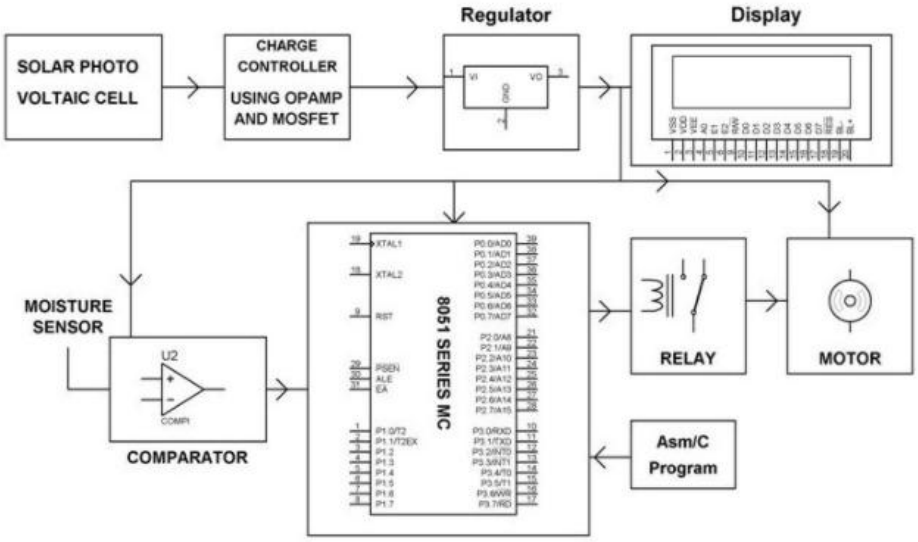

Figure 2. Circuit Diagram for Automated irrigation system using Microcontroller 8051 with solar panel

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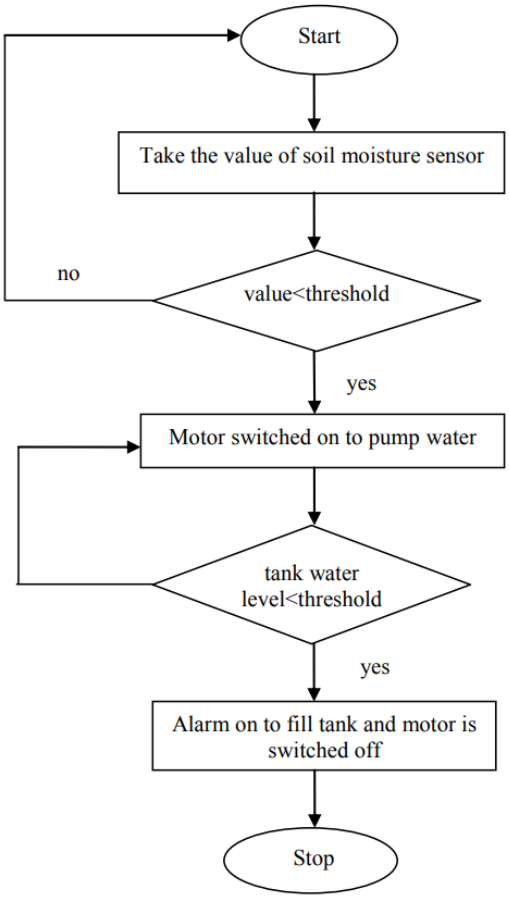
III. FLOW CHART



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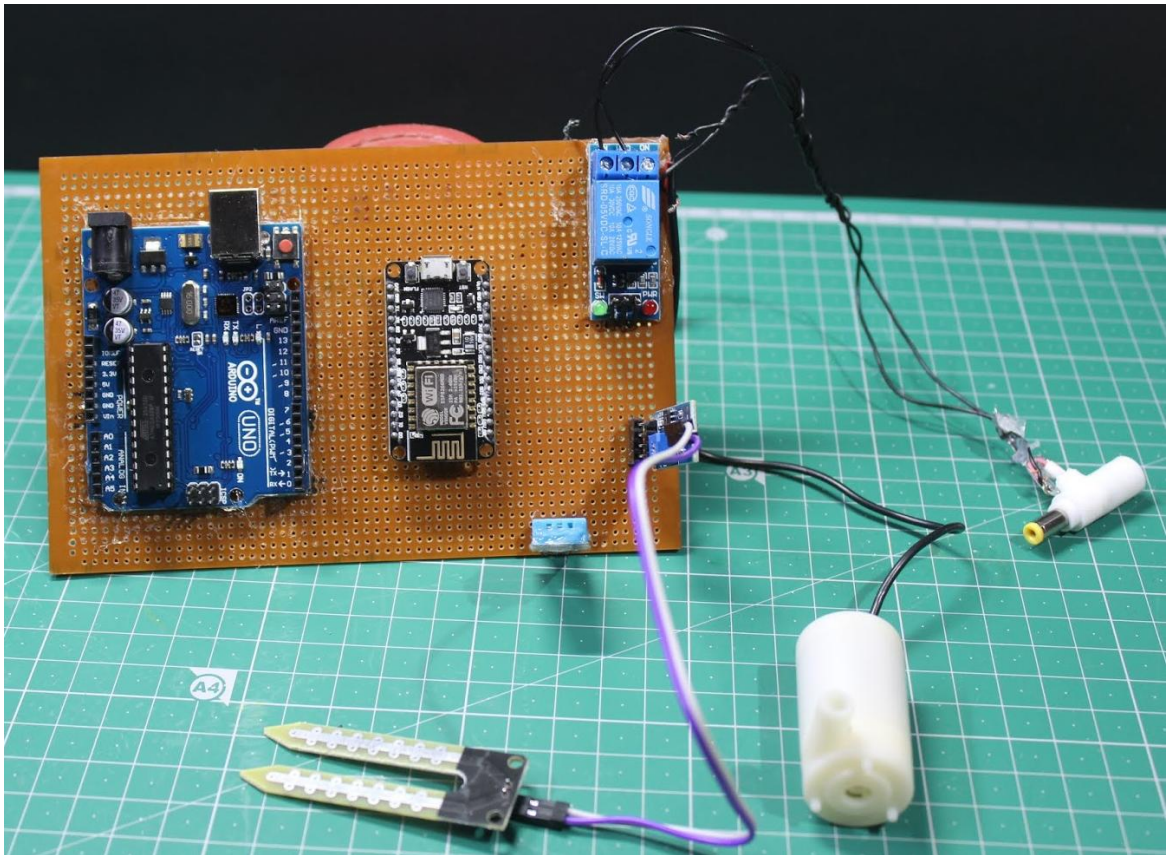

Figure 3. Working circuit of Irrigation system using Arduino

IV. CONCLUSION

The proposed method uses the data available from the IoT devices over the internet and the soil sample test from the respective farm and the data gathered from the moisture sensor on the field using all of these information the parameters required is converted into code which can be burned onto the microcontroller which improves the accuracy of the automated devices rather than just coding it to just turn on and off based on the information gathered from the moisture sensor which just checks for a particular moisture content and does not worry about the soil type. This technology is better in many ways as it does not require the circuit to be connected to internet nor needs a mobile network nor requires a huge amount of electricity and can be run on alternate sources of energy as well like solar panel and battery when compared to normal pump and as it uses the microcontroller the cost of building it is less so this technology can be provided to farmers at a convenient price and as it works automatically just like a normal pump even an uneducated farmer would be capable of using it and not only that this technology can be implement in house gardens as well as automated sprinklers for the plants in the garden. This can be achieved by using a microcontroller and building a circuit around it or the better way is to use a Arduino circuit as the Arduino is cheap and it is easy to burn a program onto it and can be reused by changing the program for the required farm as well on the other hand with microcontroller it is not possible to change the program on it once it is burned i.e., once a program is put onto it that's final there is no way of rechanging it after it is burnt but Arduino has a option where one can delete the old program and update the new program onto it at any point of time and the memory capacity of the Arduino is better than microcontroller and it doesn't require additional parallel IC to increase the memory just in case the size of the program is more than the memory of the microcontroller and it only support HDL [Hardware Definition Language] to write the program onto it whereas with the Arduino the program can be written in c language which is more easy compared to HDL and the irrigation system using Arduino can work with or without the internet and mobile networks and the cost of the entire circuit using Arduino board would cost 6 to 7 times lesser than that using a Raspberry Pi and when compared to irrigation system using built using microcontroller the Arduino circuit would cost 10% to 15% more but it is quite a bargain as the Arduino can be reused and can be upgraded if the owners want to connect it to an internet.

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