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# Drip Irrigation System Using IOT

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**ABSTRACT**

This paper focuses primarily on reducing the wastage of water and minimizing the manual labor on field for irrigation so that you can save time, cash and power of the farmer.India is a country with agriculture having paramount significance. Hence it is important to irrigate the plants in an astute way to get good production by maximizing the yield per unit space. Irrigation is the supply of an appropriate amount of water to the plants at a precise time. The objective of this endeavor is to irrigate the plants using the smart drip irrigation system within National Institute of Technology Karnataka campus. To achieve this, open-source platform is used as a central controller of the system. Various sensors have been employed which continuously provide the existing parameters of factors governing healthiness of plants. Based on the information obtained from the RTC module water is supplied to the plants at regular interval of time by controlling a solenoid valve. The entire irrigation system can be monitored and managed by the webpage. This web page has a facility for controlling the irrigation of plants, both in manual and automatic fashion. The health of the plants is monitored by a raspberry pi camera which gives live streaming to the webpage. Water flow sensor accords information about water flow to the controller by the means of wireless communication. This information is analyzed by the controller to find out leakages in the pipe. Further, weather prediction is carried out, so as to regulate the quantity of water being administered thus making it more reliable and efficient

## INTRODUCTION

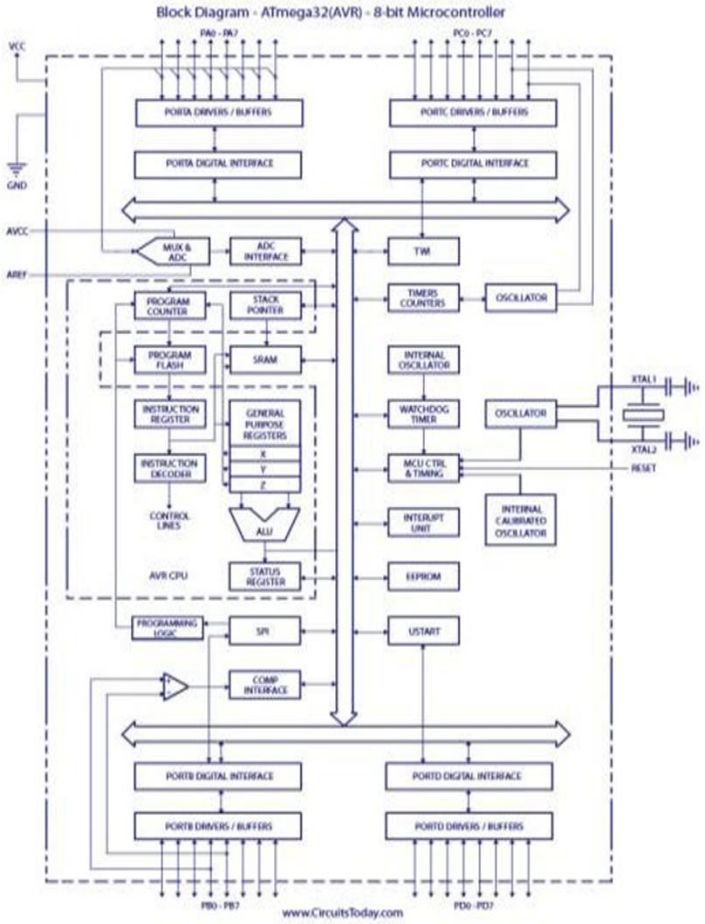
The effect of global warming and increasing drought are creating an unprecedented strain on the continued availability of water resources. There is also a threat to food security and water crisis because of the expected increase in population to 9.8 billion by 2050. Since irrigation is a significant consumer of freshwater, wastage of resources in this sector could have substantial consequences on food security. Consequently, to improve the efficiency of water use through precision irrigation, the integration of cutting-edge technology such as the Internet of Things (IoT), for irrigation management, identification, and control strategies for prediction and optimization is used by taking account of the variabilities in the environment and also to enhance precision irrigation system.Precision irrigation system plays a significant role in providing significant contributions to food production and to reduce the stress experienced by farmers. Therefore, there is need to precisely design an irrigation system that can predict, adapt and deliver the appropriate amount of water to the crops where and when it is needed in response to the changing dynamics of the soil, weather and the plant.The term internet has been associated with things and is now being identified as IoT, which implies the interconnection of electronic devices through internet via Wi-Fi, radio frequency identification device (RFID),Lora Wan, Zigbee, Bluetooth, Long term evolution (LTE), and other wireless communication technologies. In the current decade, IoT has provided an efficient means in the monitoring system as the user can monitor and control the system anywhere and at any time. In agriculture, the application of IoT has the main aim to connect physical objects (things) such as sensors, cameras, flow meters, actuators, and robots to the internet using wireless network connectivity to measure variables such as soil moisture, temperature, humidity, images of plant and other weather conditions. Therefore, it would be advantageous to leverage on IoT system platform towards enhancing the monitoring and control process of irrigation operation and to observe plant response in terms of growth and water stress.

## Proposing A New Method

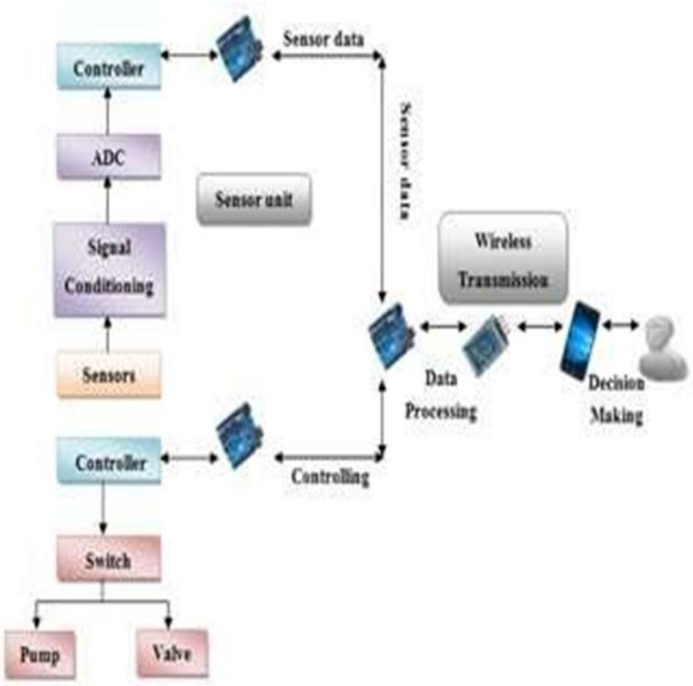
In the proposed system instead of normal irrigation type we use drip irrigation method where the water can be directed to the root in sufficient amount so that water as well crop management can be improved. Using IoT the drip irrigation method is automated with the help of sensors and pipe tubes. Various sensors such as temperature, soil moisture sensors are used in field monitoring and the ground water level can be monitored lively using the float switch where the fall in water level can be notified to the farmer through SMS. If the field is dry, it can also be notified too the latest drip irrigation technology called hydro-pc, guarantee a wide, efficient labyrinth leading the water into a flow control cell, where a special diaphragm compensates the stream, and keeps farmer to his mobile and the motor will be switched ON and if the moisture level attains a certain level the motor is switched OFF automatically without manual instruction. The farmer can monitor the field and water level either through the web page which updates field information lively or through SMS in mobile phone. Thus, through the Web interfaced processor and relay switches the water management is controlled and information is delivered a stable flow rate at changeable inlet pressures. IG hydrops drip line is highly resistant to clogging. The dripper inlet filter, located closer to the tube centre, guarantees an excellent constant flushing treatment. The relatively small diameter drip line makes a better drip

irrigation efficiency. Decrease retained water in the system, causing a shorter refilling time with less redundant drained water, on sloppy terrains, no excessive water wetting in the lower parts of the field. Competitive low cost and big saving on transportation volume and weight. *Applications for hydro-pc:* All kind of crops on sloping terrain. Or where long run drip lines are a must, look at our irrigation systems design section.

## BLOCK DIAGRAM OF ATMEGA 328 P MICRO CONTROLLER




Agriculture plays a vital role in world-wide economy. It is the main source of sustenance for people. It is necessary to make economical utilization of resources as per the environmental conditions, to fulfil the fundamental needs of the crops. With the assistance of contemporary technology, the environmental factors can be gathered and analysed in an exceedingly precise manner. This data will facilitate the farmers to take concerned decisions which might facilitate reduction of nutrient action and conjointly save resources. Technological headways inside the zone of farming will affirm to increment in profitability and decreased manual work. The vital inconvenience faced in numerous horticultural zones is that absence of motorization in agrarian exercises. In agriculture scheme, sharp following of soil parameters like moisture and water system control frameworks can be measured utilizing sensors with exactness. Sensors are utilized for collecting the certainties about the natural qualities while actuators are procured to respond on the input to have controls over the conditions. The context acquisition through sensors provides a precious contribution in modelling conditions of domains which have form of time variation attributes. Drip irrigation system is a type of water system that spares water and compost by enabling water to dribblegradually to the roots ofvarious plants, either onto the soil surface or specifically ontothe root zone, through a system of valves, channels, tubing, and emitters. Slender tubes convey water specifically to the base of the plant which can make productive utilization of water. Soil moisture, temperature and humidity sensors are placed in the field for collecting the environmental parameters. This collected data is send to server where the comparison with threshold values is done. Accordingly, the controlling system will take appropriate actions to water the plants.




Irrigation can be automated by using sensors, microcontroller, Bluetooth, android application as shown in Figure. The low-cost soil moisture sensor and temperature and humidity sensor are used. They continuously monitor the field. The sensors are connected to Arduino board. The sensor data obtained are transmitted through wireless transmission and are reached to the user so that he can control irrigation. The mobile application can be designed in such a way to analyse the data received and to check with the threshold values of moisture, humidity and temperature. The decision can be made either by the application automatically without user interruption or manually through application with user interruption. If soil moisture is less than the threshold value the motor is switched ON and if the soil moisture exceeds the threshold value the motor is switched OFF. The sensors are connected to the Arduino board. This hardware communicates through wireless Bluetooth transmission so that user can access the data through his mobile that has an android application which can get the sensor data from the Arduino via Bluetooth. As far as cost of device is considered Bluetooth technology is used which can be replaced by wi-fi. motor is switched OFF.

## EXPERIMENTAL METHOD

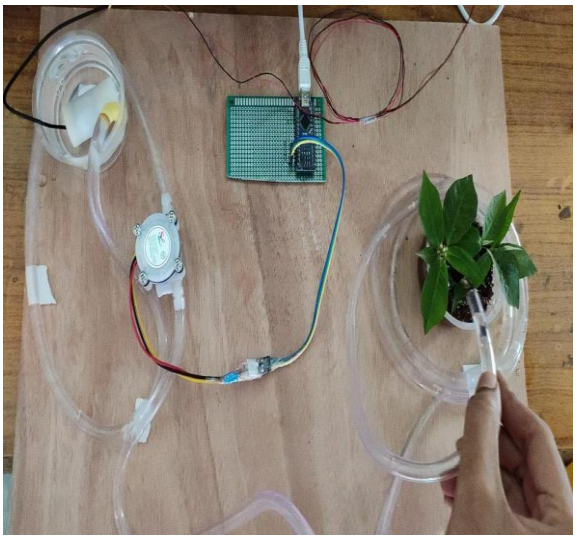
The cultivation experiment on mustard leaf vegetable plant was conducted in a greenhouse environment located at University Technology Malaysia, Johor Bahru, Malaysia (1° 33.554′N, 103° 37.507′E). A transparent plastic nylon and tick net material is used as the roof top while treated net is used to surround and cover up the greenhouse, this is to provide natural ventilation and prevent attack from pests .An IoT based drip irrigation system with emitters placed closed to the roots zone of the plants was installed to supply water to the coco peat inside the poly bags, which is the growing medium to minimise soil erosion, runoff, and save water. The coco peat is a good plant growing medium with high water holding capacity as well as moderate electrical conductivity and PH which is suitable for greenhouse cultivation. The cultivation process of the Mustard vegetable leaf started with planting of the seedling as nursery on the 18th of July 2019, after which it germinated after 4 days and ready for transplanting on the 30th of July 2019. About 65 units were transplanted on the 1st of August 2019 into the poly bag within that greenhouse that is naturally ventilated. Immediately after transplant an, electrical conductivity (EC) value of 1 ds/m, was maintain with A and B fertigation used to aid the growth for two weeks after transplant.

## DEVELOPED IOT BASED DRIP IRRIGATION SYSTEM

Effective monitoring which is crucial for the management of mustard leaf plant is needed to capture the changing dynamics of the soil, weather and plant parameters in the cultivation environment. In order to realise this, an IoT-based monitoring framework comprising of Davis Vantage Pro 2 weather station and a Raspberry's controller was interfaced with the various Express Lite2 with a sensor (flowmeter, VH400 soil moisture sensors) to setup an IoT-based automatic irrigation monitoring system as shown. The weather station was integrated with an IoT-based Arduino prototyping board where the ETO was computed to estimate the amount of water loss from the plant. Evapotranspiration is a process that relates to the loss of water from the plant as well as soil surface into the environment, which is being affected by weather parameters, plant management, and environmental characteristics.

**RESULTandDISCUSSION**

Drip irrigation applies water directly to the ground or soil very slowly, which results in very little water loss due to evaporation or runoff. The soil soaks up water, which is then directly taken into the root system of the plant.
Drip Irrigation System is a type of micro-irrigation method, which allows slow application of water to the soil consistently over a longer period. Using this technique there iseven application of water under low pressure to all the plants in the field.



## CONCLUSION

The primary applications for this project are for farmers and gardeners who do not have enough time to water their crops/plants. It also covers those farmers who are wasteful of water during irrigation. As water supplies become scarce and polluted, there is a need to irrigate more efficiently in order to minimize water use and chemical leaching. Recent advances in soil water sensing make the commercial use of this technology possible to automate irrigation management for vegetable production. However, research indicates that different sensors types perform under all conditions with no negative impact on crop yields with reductions in water use range as high as 70% compared to traditional practices.

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