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A LOW COST AUTOMATED IRRIGATION SYSTEM WITH SOIL MOISTURE SENSOR

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Abstract - *Wireless path following system in irrigation process of land is proposed as per the requirement of land. The sensors are used to detect the motion and soil moisture level of land. The robot is a composition of three main parts: electric circuit, mechanical design and algorithm. With the development of technology, automation is channelized with the process to facilitate the irrigation to increase the yield of crops and conservation of water resource and time. Row motion and alignment serve important role for smooth control of irrigation in the field and information is send to the user through coded output on any output device. The main focus of the project is the decision making for the process of irrigation. Regular updates and alerts about field conditions is sent to owner's mobile phone for better understanding of the field environment. Hence, complete automation at low cost is aimed in order to achieve higher goals in agriculture.*

Key Words: Farming System, Soil Moisture Senor, Ultrasonic Sensor, IR Sensor, Arduino Board, Algorithm

1. INTRODUCTION

Here sensors are used and connected to Arduino board to control all the self-calibrating motion of robot using algorithm. This is concerned with farming process as irrigation, designed mechanism and algorithm in Arduino IDE. This is done by using the corresponding units respectively. The inputs are taken from the sensors like ultrasonic sensors, IR sensor, Soil Moisture sensor and output is displayed on LCD. A microcontroller can be compared to a small standalone computer, it is capable of executing a series of pre-programmed algorithm and interfacing with other hardware devices. But before the execution of the irrigation robot, a microcontroller requires some software in terms of program burnt into its memory. In this irrigation robot, the software algorithm guides the hardware devices about to perform the desired operations according to the conditions. In this irrigation robot, the Arduino mega 2560 board is based on the core technology of microcontroller. Arduino IDE software which is compatible with the assembly language used for its microcontroller ATMega 2560. According to data required for agricultural growth per year, it should increase 7-8% but as per the data of last two decades it is 2.7% only.

2. PROPOSED SYSTEM

The first is to design the self-calibrating robot with Arduino Mega 2560, for the purpose of irrigation which it has to be built along with specifying requirements. In this case, a system is to be developed for smoothness of this operation with more accuracy. The resources necessary to produce crops (particularly land) are diminishing rapidly. The amount of land is inversely proportional to population. Change in human mind set and life style with more demand of comfort and to reduce man power needed in farming. The people who are disabled and cannot work properly, found it difficult to cope with production of crops. Even people far from field are unable to monitor their crop on consistent basis. So, in the proposed work an intelligent Arduino based system using all sensors will be developed which is able to:

- To make high precision row farming easy.
- To avoid deliberately overlapping of previous rows.
- To reduce man power and conventional resources needed.
- Ability to do various jobs (i.e. seeding, weeding, fertilization, irrigation) via single machine.

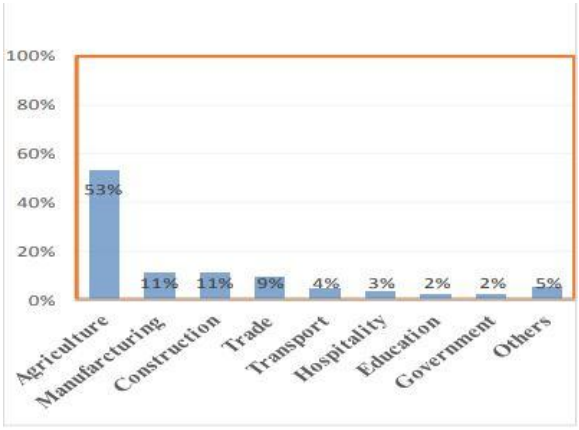

Fig - 1: Occupation Influence of Different Fields

The contribution of agriculture in the employment is about 53% which is more than other employments as shown in figure 1. It can be maintained only by using new technologies and advanced methods of farming. The research is going on to rise quality of performance and increase commercial growth all over the world.

3. HARDWARE DESIGN

The framework for chassis is made up of aluminum alloy square tubes. Aluminum is used to provide light weight and durability to chassis. Thread tread block tyres are used with 4.5" diameter for better gripping and push on farm land applications. The designed block diagram for irrigation robot is shown in the figure 2.

On the robotic vehicle four 12V 100 RPM high torque motors with gear box system are used to drive four wheels of the robot. Motor driver board based on L298 is used to drive the motors for motion.

The real time data is taken through sensors as ultrasonic sensors, infrared sensors, and soil moisture sensor. The system with four ultrasonic sensors (HCSR04) for four direction detection. The soil moisture sensor is used to measure soil moisture.

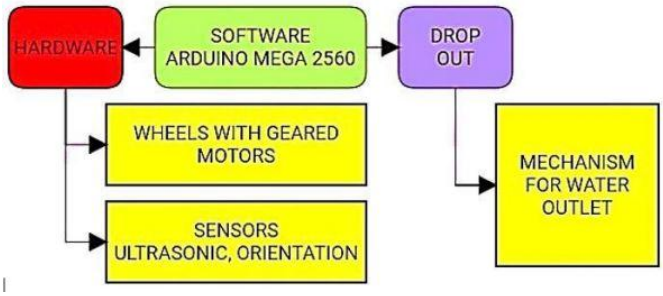

Fig - 2: Block Diagram of Irrigation Robot

4. METHODS AND ALGORITHMS

4.1 Design Method

1) Robot Motion

The robot motion in the field can be done by the help of sensors. The ultrasonic sensors have the property to target any device. In this proposed work it may be boundary. The high frequency and lower wavelength of ultrasonic sensors make the focus of the sensor at a particular distance. The algorithm is applied for movement in the row and the self-calibrating process to detect the boundary and move to another row. Four ultrasonic sensors are connected to the irrigational robot.one on front side to measure the distance from the end point in the row, second ultrasonic sensor is connected with servo motor at back side of the chassis. The third and fourth ultrasonic sensors are connected on the right and left side of the chassis to measure the from nearest boundary. These are connected directly to the Arduino board to take the readings from sensors and to take appropriate actions.

2) Soil Moisture Data

The soil moisture sensor is used to detect the data for requirement of water to the soil. It is used for automatic watering to the land. There are three pins power supply, analog reading, ground connection. It has two pins to dip and check the moisture level.

3) Irrigation Process

In Irrigation, the moisture of soil is checked with soil moisture sensor. The water is used to dispensed until moisture content reaches at the reference value defined by the user through programming. PWM controlled water pump is driven by PWM signals which provides variable control for speed of water dispensed.

4.1 Irrigation Algorithm

The irrigation algorithm is as follows:

1) Place the robot in the field starting point.
2) Let the distance of x meter be the discretized path to be tracked by the robot.
3) Let the distance of x meter be the discretized path to be tracked by the robot.
4) Function for irrigation in the field at required rate.
5) Check the soil moisture at every third step.
6) Calculation for water requirement within the data of soil moisture and given rate value of water.
7) If water content is required, Call function Water dispense for a delay.
8) Water dispensing through motor connected to pump.
9) Complete operation.
10) Return

5. RESULTS AND CONCLUSION

According to the water demand the requirement is fulfilled with the help of soil moisture sensor. The open source Arduino mega 2560 is used in the designing for microcontroller. The system efficiently monitors and controls the automatic self-calculated process for irrigation. By this, the irrigation resource water can be conserved and saved from wastage. It is easy to save it by this effective process.Hence, automation in the field of agriculture results in increased yield, better efficiency and optimal use of natural resources to provide the maximum output. The simple and user friendly application also makes it easy for any person using it tounderstand and interpret the data. Moreover, the online database ensures that one can access the data from anywhere in the world and stay aware of the information.

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