Smart Automatic Irrigation System Based on Embedded Technology

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Abstract: Agriculture is currently one of the most essential parts in our lovely planet. In today's world without Agriculture and irrigation, we are like a cactus in a desert. In today's world, the importance of Agriculture is less. Several automations were developed to save agriculture and it's as smart as possible. In this proposed project, a machine that drops seeds in agricultural land automatically with the water is designed. For a human to work continuously on planting seeds is difficult in today's world. Also, the planting may not be uniform when it comes to direct seeding. A proposed model has been developed to make sure it drops seed, and water is fed automatically where the seed drops. This machine runs on dc motors which are controlled by RF- (Radio Frequency) transmitters and receivers. This machine on an average could cover 100 meters in 60 seconds. It will be very efficient in preserving the time that is being wasted and the manpower.

Keywords: Agriculture, irrigation, saving time, Manpower reduced, Motors, transmitter, receiver.

INTRODUCTION

Agriculture uses 85% of freshwater resources worldwide, and the percentage will continue to be dominant in water consumption because of our world's population growth and increased food demand [1]. Today's agricultural method takes a lot of time and effort specifically when a farmer needs to irrigate multiple agriculture fields distributed in different areas [2]. Wastage of water is the major problem in most agriculture. This can be reduced by properly implementing water [3]. There is a need for minimizing the amount of energy and water that is used on the farm. Furthermore, the tools and equipment used in the implementation of this approach make it rather costly which compromises its feasibility [4]. Traditionally farmers will be present in their fields to do irrigation and cultivation processes [5]. But nowadays farmers need to manage their agricultural activity along with other occupations [6]. Machine work in irrigation systems makes farmer work much easier. An approach for integrating precision agriculture and smart grid technologies is presented [7].

This aims at balancing consumption and generation in the farmland, which increases the sustainability of the energy supply [8]. There is an urgent need to implement strategies based on science and technology for sustainable and better use of water and to implement it in a faster way [9]. Direct Seeding is the concept that has been implemented which is a type of seeding where seeds are planted uniformly. When it comes to large areas for example, when seeds are to be planted in one acre of land humans will be difficult in planting those [10]. A lot of time will be consumed it may not be uniform and again water is to be fed from the start which can be done, but in today's world with smart technologies, something must be implemented. Even though there are irrigation projects done that provide water automatically, it lacks to drop seed. To make easy of these works a machine is required that uniformly provides both seeds and provide water simultaneously [11]. In the past, most of the proposed models are operated by electricity, and their products are at a fixed rate. And these models are highly expensive as they were made of expensive devices and products [12]. Thus, due to higher costs, the general farmers cannot buy it for their use.

For instance, in one system plant water status was monitored and irrigation scheduled based on canopy temperature distribution of the plant, which was acquired with thermal imaging [13]. Automatic irrigation is consistently valuable in optimizing cotton yields and water use efficiency based on direct soil water measurements concerning manual irrigation [14]. Here is a simple solution, in attaining both the requirements of direct seeding which is making the seed drop and providing water to it. The remote operating irrigator machine is operated by a person with a remote control where the machine drops both seeds and provides water [15]. Our system includes Hardware components like (Transmitter and receiver) and some minor components like plywood, dc motors, battery, switch, and tray.

METHODS AND MATERIALS

A complete block diagram of the proposed automated irrigation machine is illustrated in Figure 1.A power source for all the motors are the 12V/DC battery [16]. The battery provides the power for the entire machine. This battery could be recharged using a portable USB cable [17]. The main switch is placed on the front of the machine along with LED lights for switching on the machine two LED have been placed green and red, when switching on the machine it shows green and while turning it off it shows red.
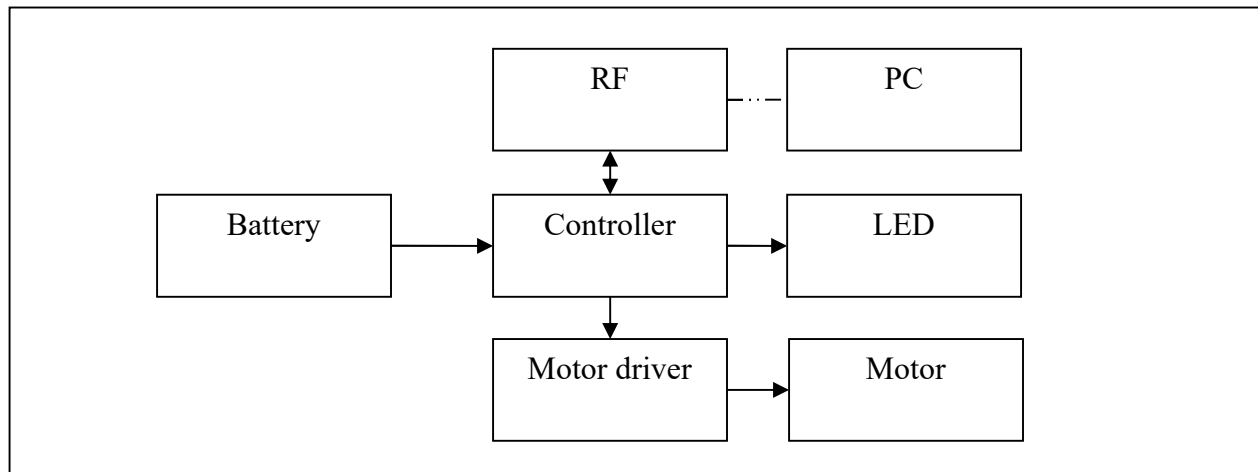

FIGURE 1: Block diagram

The power supply for the transmitter is provided by the 9V battery as shown in figure 2. The switch is connected to the receiver which is placed at the bottom of the machine and made every connection at the bottom of the machine. From the receiver five DC motors are connected, where four motors are for the movement of the motors placed at four corners. Each DC motor has 65 RPM (Revolutions per Minute) for movement and one 45 RPM motor for seed dropping cardboard cart. Figure 2 shows the power supply to remote
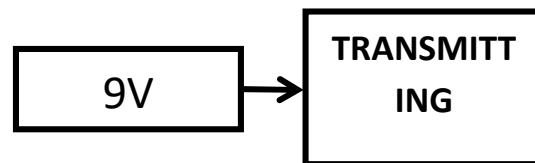

FIGURE 2: Power supply

Water is stored in a compatible box that has a 9VDC water pump inside for a continuous supply of water. At the end of the machine, there is an aluminium coil sheet for the flow of water backward since the seed should be dropped first followed by the water. At the front a small compatible box with seeds is placed, a small rotating cardboard wheels present inside the seed box for the continuous drop of seed in a rotating manner.

HARDWARE IMPLEMENTATION

Our hardware includes motors, RF (Radio Frequency) receiver and transmitter. Both transmitter and receiver are RF type which has a frequency of 433MHz and low power consumption and also receiver supply current are compatibly less around 3.3mA as shown in Figure 3.
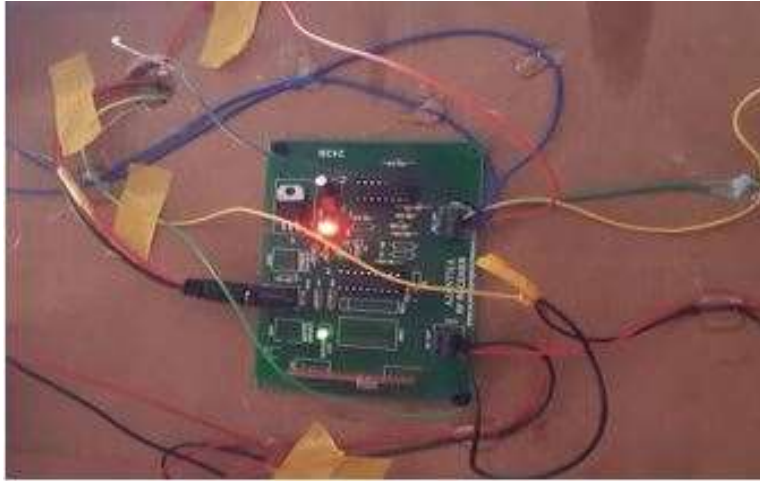

FIGURE 3: The hardware model of Receiver

The transmitter is connected with a battery which supplies the transmitter. RF transmitters, as well as receivers are used to make sure the cost gets reduced. The transmitter consists of four buttons to make the machine move forward backward left and right as shown in Figure 4.
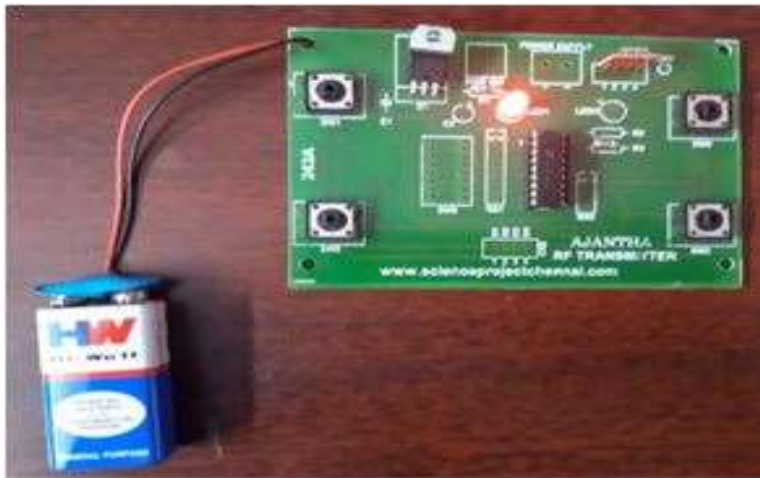

FIGURE 4: Transmitter

FIGURE 5: Cardboard wheel

Figure 5 shows cardboard wheel is made for continuous rotation and drop of seeds without breakage where in turn it is rotated through motor fitted.

FIGURE 6: Aluminium coil arrangements

An aluminium coil is placed at the end of the machine for water flow backward it has been kept making sure the components below the machine do not get affected. Since all the connections and wires flowing below the machine, water could affect it to make sure that it is placed in such away as shown in Figure 6.

FIGURE 7: Model of proposed system

CONCLUSIONS

The machine runs on an average of 95-100 meters in 60 seconds which is way faster than few existing models and seed dropping will be effective, and it there won't be any breakage in seed dropping along with water. On concluding our machine is faster, compatible, innovative, and useful in today's world. One can operate this machine from 3 meters to 100 meters or even more since Radio frequency transmitters and receivers are used. Our future work in this project is to use solar energy to recharge the battery so that the machine battery gets recharged; even when the battery gets low the machine continues to run. Our major disadvantage is the battery which will drain soon since every part in the machine runs entirely on one battery to overcome this solar energy will be very useful since adopting solar panels to our machine makes sure that the battery will not drain.

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