

Synthesis of Adaptable Gadget for Shielding the Crops

S. Suresh Kumar, P. Akash, V. Ashish, E. Aswin, R. Gowtham

Abstract: *The major problems faced by the farmers are excess water stagnation in the field during rainy seasons and grazing of agricultural land by animals and birds. Extreme cases of flooding cause crops to submerge in water resulting in devastating losses and over grazing of the agricultural land by the animals and birds destroys the crops and nutrients. All these problems combined together leads to lesser production with great loss. Hence farmers are always afraid of these things and they feel unprotected and unsecure. Our proposed device gets rid of these problems and makes the farmers feel safe with no loss. Our project itself is an innovation because it makes use of multiple components like frequency irritator and colorful lights for protection of agricultural land. Generally, human's audible frequency range is 20 Hz - 20 kHz. But many animals and birds have ability to hear sound either above or below this frequency which irritates them so that they move away from field. The flashing red lights act as a warning for birds. Both these equipments prevents field from them without harming them. The automatic opening of valve concept is also a new innovation. As an additional feature, we have added a mobile charging unit for the comfort ability of farmers.*

Index Terms: *Flashing Red Lights, Frequency, Mobile Charger, Self Sustaining Gadget, Water Level Control.*

I. INTRODUCTION

“Farming is not just a job; it’s a way of life”. In our country, agriculture is basically an important part of our livelihood and it is our primary economic activity. About two- thirds of our population is engaged in practicing agriculture. Hence it is necessary to protect the agriculture from being vanished. This led us to introduce a device which protects the back bone of our nation. The major problems faced by the farmers are excess water stagnation during rainy seasons and grazing of agricultural land by animals. Extreme cases of flooding cause crops to submerge in water resulting in devastating losses and grazing of the agricultural land by the animals and birds destroys the crops. All these problems combined together leads to lesser production with great loss. Hence farmers are

always afraid of these things and they feel unprotected and unsecure. Generally, agricultural land is an open field in which crops are planted and harvested. So, this field does not tend to have a protection of its own and also the farmers are mostly poor to provide protection to their field. These factors lead the farmers to get afraid of protecting their field from these disasters, which gives us a conclusion to have an external device which can prevent these mentioned issues. [1] In our day-to-day life, we hear about many accidents to animals in highways. To avoid this social problem, an intelligent electronics system generates the sound signal which can be inaudible to human and irritating for animals. [2] A smart gadget is used to control the pests with DTMF (Dual Tone Multi Frequency) technology. [3] Different crops, in different conditions require varied quantity of water in the field in order to survive the condition. If not, it leads to death of the crops. Hence our project, when implemented, can protect the fields from danger which in turn makes the farmer feel safe. Moreover, external power supply in such remote regions is very difficult to obtain. [4] Shows the modern welding technology that is invaded for the welding of steel. [5] This work deals on the fabrication of bar bender to reduce cost and efforts by human and they simplified the design suitably for small scale construction based rod bending works. Hence we have made our project independent on any external power supply by placing a solar panel in it. This makes our project a self sustainable one.

II. FABRICATION OF ADAPTABLE GADGET

For producing this gadget, a microcontroller (Arduino Mega 2560) is used which is the brain of our entire electronic system whose function is to control the components like user input display, servomotor, light driver, laser sensor, real time clock and a sound amplifier. Arduino IDE is used for programming the electronic components for controlling the entire system. Arduino mega gives the control input from the input devices and provides adequate output to the peripheral devices for their function. To increase the amplitude of the sound, an amplifier is used. The solar panel makes our device a self sustainable one and so our innovation does not require any external wiring. Since it is a self powered gadget, a battery is used and hence a DC to DC buck convertor is used to step down voltage from its input to its output. To show the current time, a real time clock is used. Relay is used for controlling the flashing red light. Laser sensor is used to detect the accurate positions of the water level having an accuracy of 1mm and it can measure objects upto 12m distance. Each component performs a specific role in our device.

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The entire power supply to the system is controlled by the main switch. The user interface panel is provided for allowing the farmer to know about the condition of the soil and the flow diagram is shown in Figure 1. Figure 2 shows the first version of our device we made use of a box to keep all the electric components in it. We also used a wind mill for power generation. But it had some drawbacks as it was too heavy to

carry, very difficult to set up in the field, more stability issues and also the space occupancy was too large to be used in the agricultural land because of the disturbance to the farmer. The windmill was not able to produce much power and it was very difficult to implement it. For water level sensing, we used ultrasonic sensor which was not too accurate.

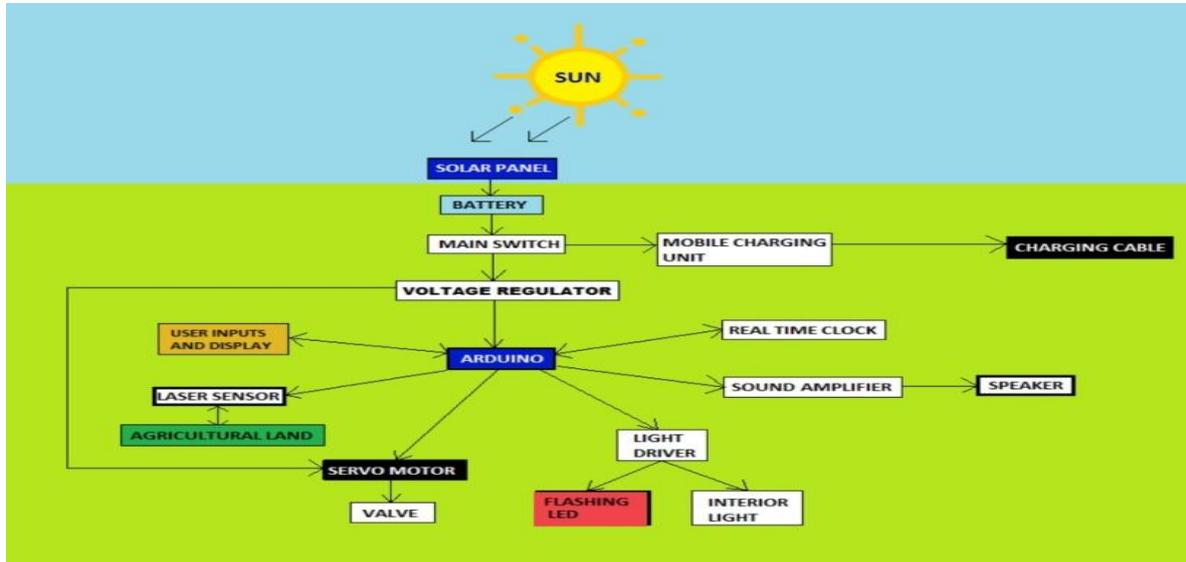


Fig.1. Flow Diagram of Entire Setup.



Fig.2. First Generated Adaptable Gadget.

In order to overcome these problems, we made second version of our gadget as in figure 3. We reduced the total weight by totally changing the design. Instead of metal, we made use of an acrylic. We removed the windmill and made use of solar panel which reduced the weight as well as generated more power than the windmill. In the place of a box, we used a metal pillar with a shelf to carry all the electronic components which reduced the space occupancy, transportation and reduced cost. Instead of ultrasonic sensor, we used laser sensor for improved accuracy as in Figure 3.

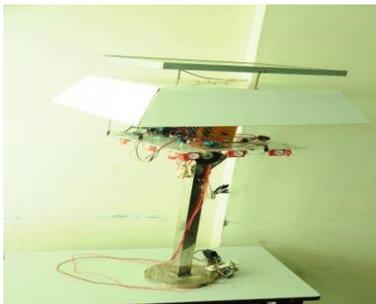


Fig.3. Second Generated Adaptable Gadget.

III. RESULTS AND DISCUSSION

Frequency irritator

Animals are always a threat for agricultural land. Some of them are elephants, wild boar, moles, deer, rabbit, monkey, etc. These animals whenever they enter the agricultural field, they try to damage it, which leads to crop damage. It is really very difficult to prevent the entry of animals manually because this may cause damage to the life of the farmers. So for this purpose, we have provided the frequency irritator. This frequency irritator produces high frequency sound or ultrasonic sound which irritates the animals and prevents it from entering into the field.

Table 1: Frequency Range Table.

Living Organism	Frequency Range(Hz)
Human Beings	20 - 20000
Elephants	16 - 12000

Monkey	60 – 45000
Wild boar	42 - 40200
Birds	700 - 5000

Generally, human beings can hear sound within the frequency range of 20Hz to 20000Hz. If the frequency level increases above 20000Hz, it won't be audible for humans but this sound is audible for some animals which affect the agricultural land. So the frequency irritator produces high frequency sounds which irritate the animals and prevents it from entering into the field without harming them. The frequency level is kept varied so that animals with different frequency ranges will get irritated. From the Table 1, we can find that some animals like elephant and birds have frequency range similar to that of human beings. So, the high frequency sound does not affect these beings. To overcome this, we have provided a button in the user interface panel which when pressed produces sound of frequency range starting from 1500 Hz as in Figure 4. This doesn't affect human being as the high frequencies are not audible to humans. Moreover high frequency sound waves may strengthen plant immune system.



Fig. 4. Birds get Irritated by the Frequencies Produced by our Gadget.

Automated Valve Mechanism

Sometimes due to heavy rain fall as well as human errors, the water level in the agricultural land gets increased above the required level. This excess water will loosen the roots of the crop and can lead to damage of crops. Controlling the level of water as in Table 2 the agricultural field is never an easy task because different crops require different level of water. This task of maintaining the water level is obtained with the help of automated valve mechanism. The farmer can control the level of water required for his field with the help of the buttons provided on the user interface panel. Each button is specified with separate water level. For example, the first button is specified with 3cm water level and the second one is specified with 5cm water level. By pressing the required button, the required level of water will be maintained in the field. The level of water in the field is measured by a laser sensor. The laser sensor measures the level of water with the help of laser beam. This laser beam strikes the surface of the water continuously and sends the reading the brain of the entire system. Arduino Mega is referred to as the Brain of the entire system. The micro controller checks this value with the pre-set value. If the level of water in the field is less than the pre-set level, then there is no change in the operation of the device. But if it crosses above the preset level, then the Arduino mega sends

signal to the servo motor and the valve is opened to discharge the excess water as in Figure 5.

Table 2 Approximate Water Level.

Seasonal crops	Water required (in mm)
Rice	500 – 950
Cotton	550 – 950
Coffee	800 – 1200
Grains	300 – 450
Sugarcane	1000 - 1500

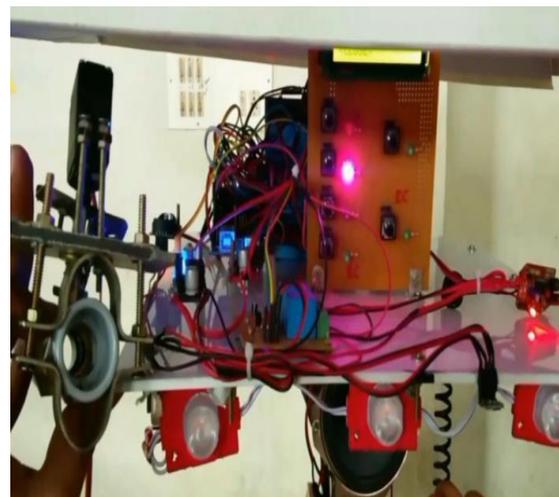


Fig.5. shows Automatic valve operation.

The supply flows from the battery to the servo motor. The servo motor rotates and the valve seat attached with it will also rotate. Due to the opening of the valve, the excess water flows from the field to the drain provided near the agricultural land. When the water level falls below the preset level, then the valve gets closed automatically. The entire operation is performed without the help of human beings. This automated valve mechanism can be placed along the ridge provided in the field.

Charging unit

As an additional feature, we have provided the phone charging unit. The farmer can charge his phone in emergency cases with the help of the charging unit. We have also provided a phone stand for holding the phone while charging. All types of charging pins are provided for different types of charging ports. This charging unit gets power supply from the rechargeable battery which is recharged by solar panel. The phone charging segment is set up in the stem of our device.

Flashing red light

At night the agricultural land will be dark because of the absence of external light devices.

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This allows animals to enter into the field. This darkness can be vanished with the help of the flashing red lights. This light gets switched on automatically from dusk till dawn. During this period it acts as a warning and prevents animals from entering the field as in Figure 6. We made use of red light because of larger wave length (700 – 635 nm) and hence, can travel a long distance. The flashing red lights flashes at a regular interval of 5 seconds. Any light more than 650 nm repels pests and hence insects are not attracted towards it and can also be easily identified by animals. Moreover Flashing red light has no effect on the crops, as they are meant only for alerting the animals and birds. Red light doesn't attract pests. Therefore it also acts as a pest control.



Fig.6.Flashing Red Lights.



Fig.7.Shows Scare Tactic in villages [5] (THE HINDU).

Prospective impact

With the help of this device, we can strengthen the backbone of our country. This device can have impacts like better yield with lesser damage in crops. Fear of farmers about agricultural disasters can be vanished. The impact of our project may seem positive as it protects the animals from getting killed by human activities. The practical implementation of this project to the farmers may have a warm welcome.

IV. CONCLUSION

Our proposed device mainly maintains the welfare of the farmers by protecting their field and prevent from losses by animals, birds and excess water. It also acts as a hand for the

farmers in preventing their field. The effective range of the frequency irritator is 20 meters and it covers 360°. The flashing red light scares the animals, birds and insects. The water level controller controls the excess water from damage of crops. Government can take initiative in providing this multi-purpose device at subsidized rate for increasing the standard of living of farmers. Our main goal is to boost the agricultural standards of our nation

V. FUTURE SCOPE

By increasing the capacity of the solar panel, we can also make the irrigation pump system as self sustainable. In Delta regions, many devices can be integrated as a grid to protect whole farming region. The entire device can also be controlled with the help of an application in mobile phones

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