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IoT Control Solar Based Electric Fencing For Agriculture

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Abstract **- This paper presents the design of a solar powered energizer and on-line fence voltage monitoring system for electric fences. The fence voltage is continuously monitored and transmitted to the Central Monitoring System. If the fence voltage is reduced below the rated value, that fence is considered as faulty fence. Fault Identification System Transmits the voltage value to Central monitoring system. The faulty fence lines can be observed on Central Monitoring System display by the On-duty operator and the fault can be rectified easily. [3,5]**

Keywords- farmer;microcontroller;fencing;safety;IoT; solar panel

I. INTRODUCTION

Now some days there is a huge scope for the usage of Renewable source of energy because Nonrenewable energies come from resource that are not replaced or are replaced only very slow by natural process .Former for the security purpose compound walls, bamboo sticks were used for the protection , with the development of the technology now we are using an solar electric fence system for the agriculture purpose which is most efficient and modern technique, the solar perimeter security electric fence system is a modern day alternative to conventional methods of fencing to protect the crops and property , electric fence is an effective way to reduce loss caused by animals . The solar power fence system provides controlling for all types of animals. Its application suits remote areas provides an economical and practical solution to reach maximum protection of field , the solar power fencing system works on the principle of solar energy the daily observation like solar radiation average input and output energy from solar panel were found 172 and 23 watt respectively voltage in the fence live wire ranges from 2 to 11KV .The advanced power electronic circuit is used for the conversion process, each pulse in the fence wire is for 0.0003 of a second pulses are spaced about 1sec apart . One panel of 35KW and 12V battery was found effective for 3.5 kilometer fence line. It is observed that on a typical land area of earth approximately 1000 watt per meter square of energy from photon is available for conversion into electrical power at solar noon. The solar photovoltaic system converts sunlight directly into DC current used for electric fencing purpose. [1,3]

II. LITERATURE SURVEY

It was pointed out that loss of life, crops and livestock to: predation had a significant impact on people's livelihoods, and both security of food and the lives of the people is a big question. The study indicates that the poor are more vulnerable to human wildlife conflict as they are more dependent on the natural ecosystem. Therefore, conserving the natural ecosystem is gaining equal recognition as poverty alleviation in the recent times. Research shows hidden implications of human wildlife conflict in current conservation of climate which are ignored and poorly researched.

Solar panels and solar energy has been prevailing from a decade along with their short comings, keeping these in mind there's an innovation of portable model for connecting the solar energy to the fencing and for the development of this project. IOT technology is used for this model. The performance of the solar power fence for agriculture is listed it states that there will be minimum wattage of solar energy available in India in any region, it also states that India amount 95% clear sunny days with average daily incidence of solar region at 5000 kcal /m2/day for 8 to 10 hours a day. [1, 8]

Fig. 1: Solar fencing for Agriculture land

III. BLOCK DIAGRAM

The Microcontroller is the central part of the system, a microcontroller is a small computer on a single integral circuit, in modern terminology it is a system on chip or SOC. The microcontroller (AT mega 328P) used here is connected to IR obstacle sensor for the obstacle detection process and it is connected to Memory card module and speaker for the storage of audio information which is used when there is an obstacle found by an IR obstacle sensor.

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The microcontroller is further connected to optocoupler which is used for the isolation of the two circuits, which helps in opposing the reverse or kickback current. The optocoupler is further connected to ULN2003IC and battery. The battery of range 3.7V is used to store the charge and this battery is powered by the solar panel(3.3V). The ULN2003 IC is used for the triggering of high current passing through the circuit.

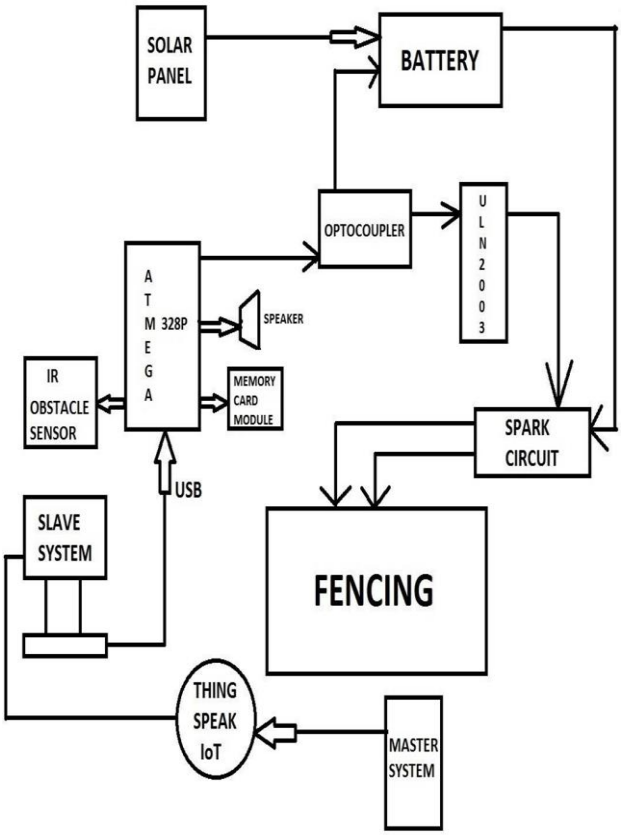

Fig. 2: Block diagram of Solar fencing system

The connections from the battery and ULN2003 IC is connected to spark circuit which is used for the boosting of the voltage and helps in production of spark. The connections of spark circuit are connected to the fencing system. A copper wire and the wooden poles are used as the fencing materials. [2,4]

IV. COMPONENTS USED IN THE FENCING SYSTEM

- ATMEGA 328P
- MICROCONTROLLER
- ARDUINO UNO BOARD
- IR Obstacle
- sensor Memory card interface module
- Speaker
- Opt coupler
- Battery Solar panel
- ULN2003 IC Spark circuit
- Support and Fencing wires

V. VOLTAGE GENERATION CIRCUIT

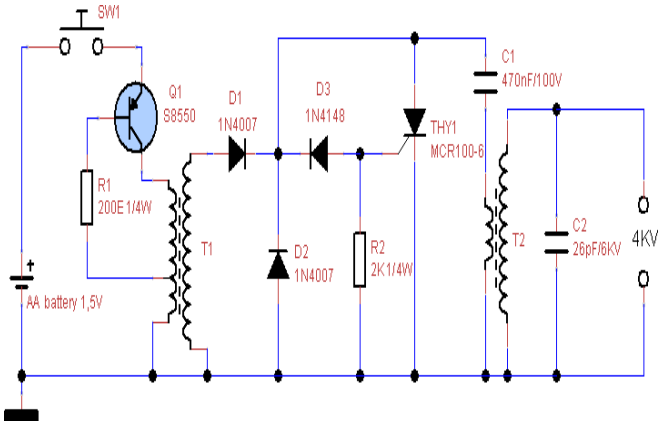

Fig. 3: Voltage generation circuit

Q1, R1 and the primary of T1 are self-oscillating blocking oscillator running at a frequency of about 6KHz. The positive pulses at the base of Q1 have a width of about 10us and a peak voltage of about 12V. T1 has a secondary winding with about 100x the amount of turns of the primary and acts as fly back transformer, generating high voltage pulses of 10us with a frequency of 6KHz at the secondary winding. This means that we have a duty cycle of about 16%. D1 rectifies the voltage at the secondary winding, so only the positive pulses pass. C1 is grounded via the primary winding of T2 and is slowly charged with the 16% duty pulsed current. The interesting part of the circuit is D3, which is a reverse-biased regular 1N4148 diode, that will break down at minimum 100V reverse voltage. So when C1 reaches about 100V, D3 will break down and will provide the gate of thyristor THY1 (SCR - Thyristor) of enough current to start conducting. The SCR used here is a sensitive gate type, meaning it will trigger (start conducting) at gate currents of 40 to 200uA. When THY1 conducts, it will connect C1, that is charged to 100V, across the primary of T2. This means that C1 will discharge into the low resistance primary of T2, causing a huge but very short current spike in the primary of T2. The turns-ratio of T2 is about 50x. At the secondary winding of T2, we find a voltage peak of 4 to 5KV. C2 is added to form a LC-resonance circuit with the inductance of the secondary winding of T2. So the output voltage is not a sharp peak, but rather stretched out due to the self-resonance of the LC circuit. Due to C2, the energy at the output is available for a longer time-span, generating brighter sparks.

To finish the story: when C1 is completely discharged and the current is lower than the hold current of THY1, THY1 will stop conducting, so C1 is not 'paralleled' with the primary winding of T2 anymore and can start charging again. It takes about 50ms to charge C1 to 140V (in my lighter, the break down voltage of D3 was 140V), so we have a repetition rate of about 20Hz between the high voltage pulses at the secondary of T2.

The flash of a camera works in a similar way, by generating a high voltage with a flyback transformer from a single 1,5V battery. A capacitor is charged to this high voltage and its energy released into the trigger-coil of the xenon flash tube when the flash is activated. This generates a short high voltage pulse that ignites the xenon flash tube. Tasers also work in a similar way to generate high voltage pulses.

Fascinating how you can generate any voltage from a 1,5V battery using rather simple electronics. The energy that can be delivered in these short high voltage pulses is limited and not

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life-threatening. The energy at the output is the energy stored in C1, which is released into T2 and is equal to 1/2 * C

= 0.5 * 100nF * 140V = about 0.001 Joule.

10 Joules is considered hazardous.

50 Joules is considered lethal, independent of the time in which this energy is released [6]

VI. WORKING

When the animal touches the fence line the circuit will be closed. Hence electrical impulse current flows through the animals body. Due to this Panic Sensation will be created and the animal will not return to the fence line. In fence line the inductive and capacitive effect will be more predominant than resistance. Faults in the fence line may reduce the peak voltage. The shock administrated in the fence line depends on the soil resistivity which acts like a return path. The resistivity of the human body is estimated as 500Ω from hand to feet path. The safety limits for single impulse waveform based on experiments is presented in the following table:

TABLE I- Electric shock safety requirements

Parameter	Value
Impulse repetition period	T≥1s or f≤1Hz
Impulse duration with a 500 ohm load	T≤10ms
Energy of the discharged impulse in a 500 ohm load for energy limited energizer	W≤ 5J
RMS current of the discharged impulse in a 500 ohm load current limited energizer	For t (i) < 0.1 ms, I rms=15.7 A

The discharged energy in the load must be lower than the energy stored in the capacitor of the energizer. Hence the energy stored in the capacitor must be less an 5J. So that the person or animal who comes into contact will not receive severe damage. [8]

VII. FEATURES

a. Electric Fence can be built alongside existing fences except in case of barbed wire fences.
b. Existing posts can be made use of provided the comer/ end poles are strong
c. The shock does not physically harm animals or human beings
d. It is not dependent on regular electricity supply as it operates on battery
e. A long life as the fence is not subjected to physical pressures of wear and tear.
f. Selective barriers possible. For example, cattle barriers can be designed to allow smaller. [2,6]

VIII. ADVANTAGES

a. Human and Animal safety
The electric shock is completely safe and non-lethal for human and animals. The animal / human touching the fence will keep himself away from the fence. As current is pulsating (not live) and passing at every 1 to 1.2 second and only for a milli-second (1000th of second) of time, the animal gets enough time to get away from the fence. The pulsating current will not grab the animal which generally happens in continuous current which causes contraction of muscles / cramps and prevent the animal from moving away from the fence.

b. Lower cost
Electric fencing requires less set-up and material than conventional fences (barbed or woven wire). Animals are less likely to damage the electric fence as they usually don't touch it more than once which reduces maintenance. It is important to invest in quality components for fewer maintenance problems and greater fence life-expectancy, increasing value for money.

c. Ease of construction
Relatively simple and easy to build, electric fences can be installed quickly and with minimum tools, saving time and money.

d. Flexibility
Wire spacing and fence design can be modified to control a variety of animals.

e. Long life
Electric fences can last a long time – up to 40 years– when built with quality components and material.

f. Assurance of protection
The traditional fencing does not assure 100% protection of the fenced area from wild animals and monkeys, while solar power fencing assures maximum protection. [2,6]

IX. CONCLUSION

The project Farmer friendly IOT controlled solar fence for agriculture purpose is based upon the concept of IOT control and renewable solar energy. It uses solar energy as well as electrical energy to power the fencing around our fields so that cattle's are not able to enter and destroy our crops. With the implementation of IOT control and IR obstacle sensor there will be the assurance of high security and safety for the human beings. With the implementation of IOT control the process have become still an easy process to control the ON/OFF controls by the owner of the farm. [5]

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REFERENCE

[1] Aparnparik ujra strot, Maharashtra Energy Development Agency (MEDA), pp:11
[2] Aparnparik ujra sadhananchi dekhdal, pp:35-43
[3] Leaflet of Solar photovolartic system, MEDA, pp:1-3
[4] Scope for solar energy utilization in the Indian textile industries. Solar energy, 42(4):311- 318
[5] Prashant Kharat and Jayashree Kharat, "Wireless Intrusion Detection System Using Wireless Sensor Network:A Conceptual Framework," International Journal of Electronics and Electrical Engineering Vol. 2, June, 2014
[6] wikipedia.org
[7] Emad Felemban, "Advanced Border Intrusion Detection and Surveillance Using Wireless Sensor Network Technology," Int. J. Communications, Network and System Sciences, 2013, 6, 251-259
[8] Marcelo Giovanni B. De Martino, Fernando S. dos Reis, Guilherme A, D.Dias , Study and Implementation of an Electric Fence Energizer, IEEE Transactions on Power Electronics Specialists Conference, PP. 1-7, June 2006.

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