

## LEVY'S FENCE – A FANCY FENCE USING ELECTROMAGNETIC WAVES FOR AGRICULTURAL APPLICATIONS

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### ABSTRACT

*A Novel method of design of a fence for agricultural land is presented in this paper. This fence is based on electromagnetic radiation and smart antenna technology. The intensity of radiation and frequency of operation is varied according to the requirement. This invisible and fancy fence is called Levy's fence. It has many advantages when compared with electric fence and existing techniques.*

**Keywords:** *Electric Fence; Electromagnetic radiation; Electromagnetic Agricultural applications; Flying robots; Levy's Fence; Smart Antenna Technology and applications;*

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## I. INTRODUCTION

Honour thy Father and Mother, that it may be well with you and you may live long on the earth is the first commandment from the Scriptures, High Priests and Elders of any Religion in the world. It is the desire of every one on this universe to live long and healthy life. History reports that the ancient age people even lived for thousand years and slowly the average life term of human being was reduced to hundred twenty years. One of the main reason for their good health and long age is along obeying their parents, they all ate very healthy food, fresh food free from pollutants and preservatives. Health is wealth, and there is no doubt in that. But now days due to the population growth and the demand is more than the supply farmers are forced to use the fertilizers and pesticides. Because of the chemicals used in the pesticides and amounting to the continuous usage, the agricultural land becomes polluted slowly. Therefore in spite of obeying the commandments and taking all health precautions, the life term of the human being is reduced. Olden days there used to be a practice. If the agricultural land is used for six years continuously, the seventh year will be the Sabbath year where the full land is given full rest for one complete year. Scientifically this is needed for the land to re-junuvete itself, refresh, recreate and be ready for next years yielding. This is not practical now. The farmers are forced to use fertilizers for nourishing the land, pesticides and insecticides for safeguarding the corps and all this chemicals are having side effects which are dangerous to human beings. There are strong evidences for this from medical side. Researches are on to reduce these harmful effects to reduce as low as possible Another incident where the farmers are greatly affected is the unavoidable entry of some big animals like cows, sheep's, elephants and even some wild animals which enters into the agricultural land causes lot of destruction to the corps. Now the currently used technique is electrical fencing where huge current is passed through some metallic conductors so that any trespasses can be avoided by violent action of electric shocking. History reports that there are incidents where human life is also lost because of electric fencing unknowingly which is very unfortunate. In this paper an attempt has been made to relate all these aspects with the electromagnetic radiation and analysis is made so that some useful result can be derived. Mobile phones and cell phone towers are found everywhere in the world. Especially we can find the cell phone towers in the lands near the agricultural area. An effort is made whether it is possible to link this radiation with the usage of destroying insects and pest attacking the agricultural land thereby the usage of pesticide and insecticides are reduced to a great extent, the use of fertilizers for nourishing can be reduced and the trespassing of animals can be avoided. The latest technology advancement

in antennas called the smart antenna technology is made use of so that the application can be done efficiently.

## II. LEVY'S FENCE

The Power radiated from an antenna at a distance R with the operating frequency f is given by the Friss Transmission Formula

$$P_R = \frac{P_T G_T G_R \lambda^2}{(4\pi R)^2}$$

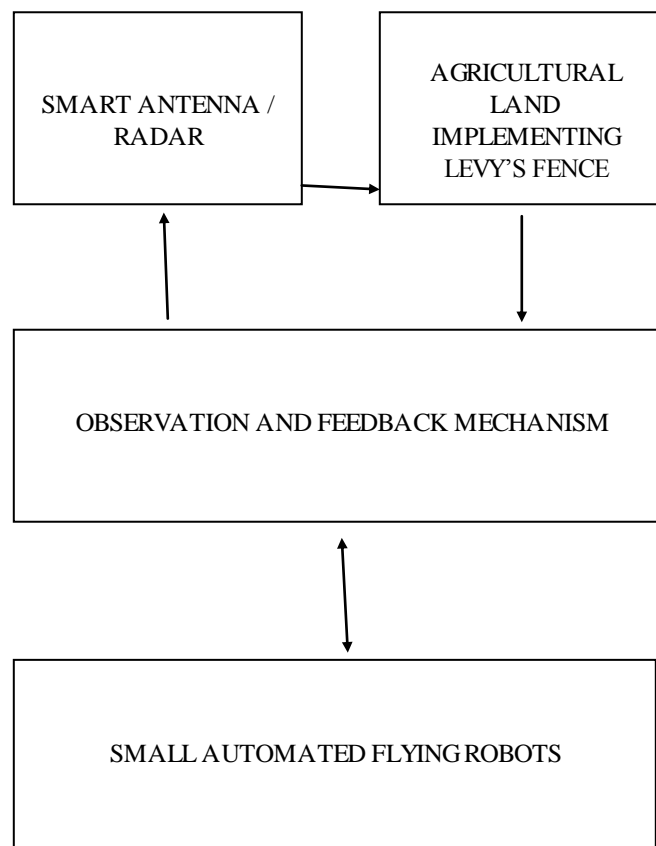
Where R is in meters,  $P_t$  and  $P_r$  are power transmitted and power received in watts. The study of pests and insects on the different frequency and power has to be made thoroughly. Novel radar can be applied to picture the arrival of insects and ground penetrating radar can be applied to estimate the movement of pests and even some hazardous animals. The antenna can be scanned from different frequency range and with different powers in different directions to study carefully which different frequencies and different power levels are annoying and arousing to them. The smart antenna can be scanned in different directions electronically. This is called electronic beam scanning. At the initial stage mechanically scanning radars can also be used. The concept applied here is without applying any chemicals to the ground and to the grains, to get rid of all insects and pests and animals by the application of electromagnetic radiations. The agricultural science colloquium animal science colloquium and electromagnetic science colloquium can come forward to apply their research efforts united, so that the purpose can be achieved. Another added advantage of this technique is since we have already established cell phone towers use can be made of that. The only constraints are the bandwidth and power operating capacity of the antenna. Since we need large frequency covering range and large power levels to be emitted. Careful design techniques have to be applied so that it should not affect the already existing wireless systems and mobile phones. Once Levy's fence is well established and operated, a careful study can be done so that everything can be automated. The characteristics of the soil can be studied and the frequencies which nourish the land can be studied and those frequencies can be propagated under normal operating conditions. Days are not so far to link the study of characteristics of the soil with the electromagnetic radiation properties as each and every material is having some form of electromagnetic properties. Sand mainly consisting of silica is mostly having the properties of silica. Days are not so far to do a atomic level study and even change the orientation of the atoms in the sand so that it can be nourished and can give good yield. All this can be achieved once we properly link electromagnetic property with

agricultural, animal and insect science. A great future is waiting for the budding researchers who are interested in inter-technical departmental research.



**Fig 1. An agricultural land where levy's fence can be applied. Courtesy: Farm fresh photos**

### III. LEVY'S FENCE IMPLEMENTATION



**Fig. 2. Block diagram of Levy's Fence**

The Block diagram shows the different blocks involved in the implementation of Levy's Fence. The antenna is used to radiate the electromagnetic waves. The isotropic radiator can also be used but if

the insects impinge in only certain directions then directional antennas are preferred. This will reduce the power radiated in the unwanted directions. For nourishing the soil omni-directional radiators can be used. For scanning purpose either the mechanically scanned radar can be used or the electronically scanned smart antennas can be used. The most important requirement is the power level and frequency band constraint. High power antennas with large bandwidth capability are needed. The invisible fence is acting as the priory, the Guardians of the land protecting the land from every attack. The observations have to be done very carefully and for this the image scanning radars can be used. The images obtained can be analyzed and the counteractions taken can be recorded. The image processing section plays a very vital role in identifying the attacking insects. Ground penetrating radars can be used to analyze the pests attacking the Land. If any big animals like elephants try to attack the land some diverting mechanism can be used to scare the animal and made it run away instead of using electric fence which gives enormous shocks and sometimes even makes the animal dead. Unfortunately some human beings are also victims to this incident. By using levy's Fence this can be avoided completely. The diverting mechanisms include making some lights on so that it appears as flames of fire to the animals or to make a big sound which alarms the animal, make it fear and scary so that it will run from the place immediately. Moving one step further, the Robotics science can employ small flying robots which will fly and give a mild attack to huge animals to make them run away instead of causing major damage or killing them.

#### **IV. SEVEN OPEN CHALLENGES**

Levy's fence poses seven open challenges for the research world with respect to electromagnetic radiation. The first one is the study of land properties the soil, the ground the layers of penetration. The second one is the study of grain, wheat, paddy and any other crops properties. The third one is the study of insect property. The fourth one is the study of pest's property. The fifth one is the study of trespassing animal's property. The sixth one is the design of antenna with proper bandwidth and power radiating capacity. The seventh one is the proper collaboration between all of them so that the defined purpose is achieved. This invisible fence fascinated history for a long time and now the idea came out openly and soon a reality.

#### **V. CONCLUSION**

A novel method of fencing called Levy's Fence is presented. This method is proved to be completely safe and secure when compared to existing electric fence and other techniques. The usage of fertilizers, insecticides and pesticides can be reduced to a great extent and the trespassing

of animals causing loss to the farmers is avoided. The land can be safe, the nourishment regained, the animals safe, the pollution is reduced thereby a longevity of the human life can be increased.

## **REFERENCES**

The concept of Levy's Fence is the Authors original thinking and hence no references are cited. It is based on the application of existing and evolving technologies available and reported in literatures.