Paper ideas -

Constrants: budget, time

Electricity

* The use of electricity in these toy-like devices makes it particularly dangerous to young children. These devices are often carelessly placed near power lines or flammable gas, and they hang even during lighting storms and when the underlying grass is wet.
* Young children will be drawn to the bright lights of a zapper.
* If an unsupervised child pushes a finger through the mesh, he will experience a painful electric shock.
* A bug zapper left outside in the rain could spark and ignite on fire.

Disease

The bright lights and chemicals of a bug zapper actually draw more insects to your yard than might normally be there.

When an insect is killed by the bug zapper, its body explodes. Pieces of the bug are sprayed around the area. They could land on a child's clothing, hands or even food. This is a major health hazard as insects can carry many diseases.

<https://www.ted.com/talks/nathan_myhrvold_could_this_laser_zap_malaria?language=en#t-2606>

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Project Proposal

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STONY BROOK UNIVERSITY

ELECTRICAL and COMPUTER ENGINEERING

SENIOR DESIGN PROJECT (2016-2017)

Title: Mosquito zapper

Supervising Professor: David Westerfeld

Description:

The world’s deadliest animal is the mosquito (Figure 1). Recent concerns about the Zika virus have attracted a great deal of media attention, but other mosquito borne diseases, particularly Malaria, remain far bigger threats worldwide with an annual fatality count of 725 000 people.

Bug zappers are one method of insect control. Bugs are typically attracted into the device using an ultraviolet light and, sometimes, chemical bait. Once inside the trap they are killed with a high voltage electric shock. The problem with this approach is that while many bugs are attracted to UV light, mosquitoes are not. As a result, many harmless or even beneficial bugs are killed in bug zappers with minimal effect on the mosquito population. A study by the University of Delaware cited by Wikipedia found that only 31 of 13 789 insects killed in traps were biting insects.

This project involves the creation of a better mouse mosquito trap. Since mosquitoes find their victims by tracking exhaled carbon dioxide, a suitable attractant might be a simple candle, CO2 cartridge, or chemical bait from a commercial zapper.

What will make this project different is the addition of a microphone and digital signal processing (DSP) capability that will only activate the high voltage if a mosquito is detected by sound. Mosquitoes find mates using sound – the pitch of their wing beats identifies both the sex and the species of the mosquito. Your system will record the number, sex, and species of mosquitoes killed in the trap. A probable kill will be recorded if:

⦁ a mosquito sound is detected

⦁ a current surge (or perhaps zapping sound) is detected

⦁ the mosquito sound ceases

Statistics will be displayed on the unit. Optionally, if a large team is available, the data will be wirelessly relayed to a cell phone application.

The high voltage utilized in this project (typically 4kV) presents a safety risk. In addition to mechanical barriers, the high voltage generator must be designed to limit the current so that large animals (e.g. students) are not injured by accidental contact.

Figure 1: http://www.businessinsider.com/bill-gates-mosquitoes-deadliest-animals-2016-2

Requirements: Analog electronics for the microphone amplifier, DSP for the detection algorithm, power electronics for intrinsically safe high-voltage source, applications programming for the cell phone interface.

Project cost: $250

Suitable for

\_\_\_X\_\_\_ Computer Engineering

\_\_\_\_\_\_ Microelectronics Track in EE

\_\_\_X\_\_\_ Telecommunications Track in EE