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ELECTRONIC PESTICIDE USING SOLAR ENERGY WITH MOBILE CONTROL ROBOT

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Abstract-Pesticides are most essential factor in the agricultural sector. Chemical pesticides kill the pests & protect the crops. It is necessary to protect the crops for high yield. But chemical pesticides not only bring the problem of health hazards but also problem of pollution such as air, soil & water. Therefore this has been serious issue now days. To solve all these problems we have constructed Electronic Pesticide. In this paper, working principle of Electronic pesticide, its construction details & its effects are discussed.

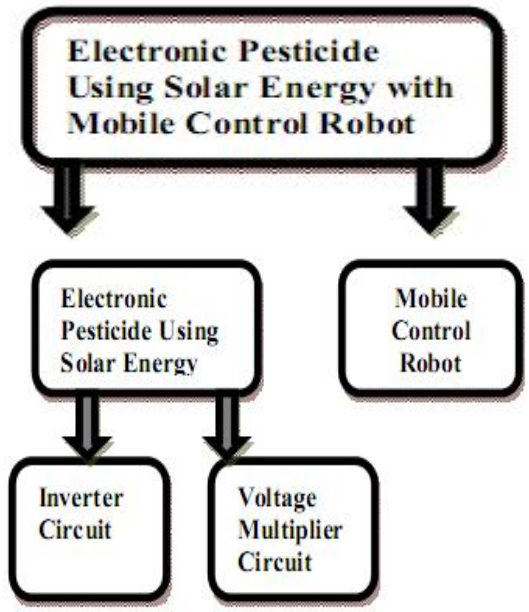
Keywords-*Electronic pesticide, inverter, voltage multiplier, D.T.M.F. Robot, Solar energy*

I. INTRODUCTION

Pesticides are most essential factor in the agricultural sector. Chemical pesticides kill the pests & protect the crops. It is necessary to protect the crops for high yield. But chemical pesticides not only bring the problem of health hazards but also problem of pollution such as air, soil & water. Therefore this has been serious issue now days. In agriculture, mostly chemical pesticides are used to control pests. But chemical pesticides have many harmful effects on human body as well as environment. Again some pests develops resistivity again pesticides & it is difficult to control such pests using pesticides.Therefore Electronic pesticide is the best replacement of chemical pesticides. Electronic pesticide kill pest more effectively than chemical pesticides as well as it is more cost effective than chemical pesticide with less harmful effect on human health as well as environment.

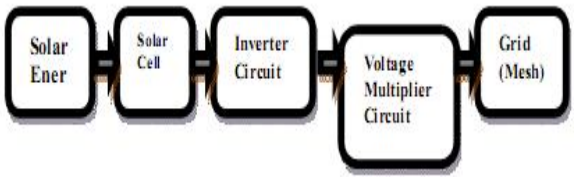
Electronic pesticide works on high voltage. The electronic pesticide is nothing but combination of inverter & voltage multiplier. Inverter converts DC supply to AC supply & voltage multiplier multiply that voltage, high enough to at least break down the dielectric formed when an insect comes close enough to the mesh. An electrical arc is formed when the dielectric breaks down & current flows through the insect's body. The insect is electrocuted & then dried & killed. Solar cell is used as input for inverter. Electronic pesticide Circuit with CFL bulb (to attract the insects) is mounted on Mobile Control Robot. With the help of Mobile Control Robot, we can move electronic pesticide in all fields from remote location also.

II. TECHNICAL ASPECT OF PROPOSED SOLUTION

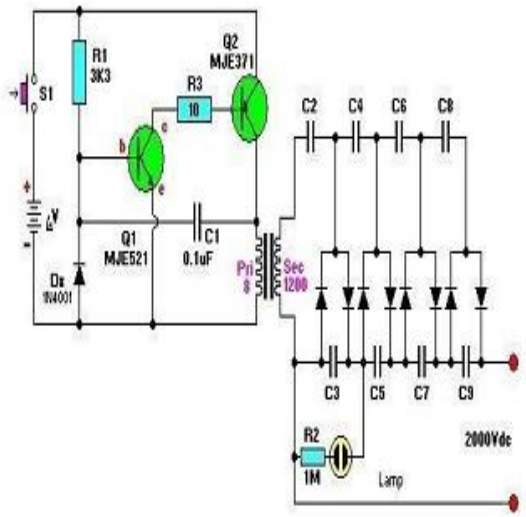


This project i.e. Electronic Pesticide using solar energy with mobile control robot is divided into two parts (1) Electronic pesticide using solar energy (2) Mobile control robot. Further Electronic pesticide using solar energy is subdivided into (a) Inverter circuit & (b) Voltage multiplier circuit.

ELECTRONIC PECTICIDES USING SOLAR ENERGY BLOCK DIAGRAM



INVERTER & VOLTAGE MULTIPLIER CIRCUIT

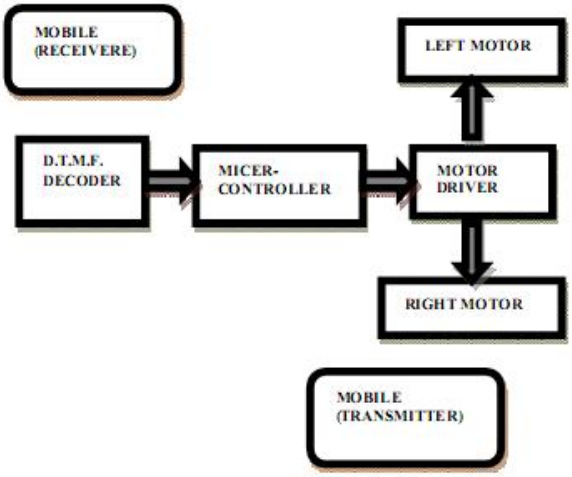


PARTS LIST OF INVERTER & VOLTAGE MULTIPIER CIRCUIT

Q1	MJE521
Q2	MJE371
C1,C2,C3,C4,C5,C6,C7,C8,C9	0.1 uF
Transformer	Step-up
D	1N4001
R1	3K
R2	1M
R3	10
Battery	6V
Switch	S1

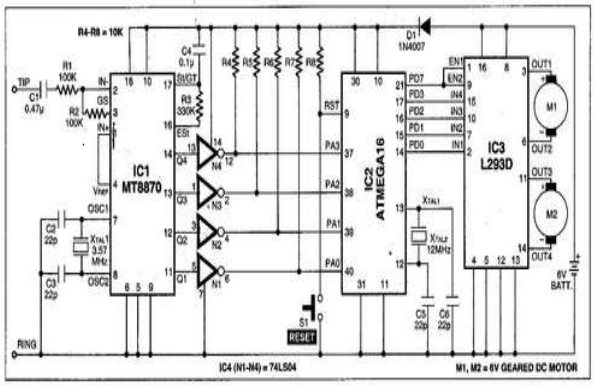
WORKING OF ELECTRONIC PESTICIDES

Electronic pesticide is a device that attracts and kills insects that are attracted by light. A light source attracts insects to an electrical grid, where they are electrocuted by touching two wires with a high voltage between them. A light source is fitted inside, wire meshes designed to emit ultraviolet light, which is visible to and attracts insects. The light is surrounded by a pair of interleaved wire grids or spirals. The distance between adjacent wires is typically about 2 mm. A high-voltage power supply powered by solar cell which may be a simple voltage multiplier circuit made with diodes and capacitors, generates a voltage of 2,000 volts or more, high enough to conduct through the body of an insect which bridges the two grids, but not high enough to spark across the air gap. Enough electrical current flows through the small body of the insect to heat it to a high temperature. The impedance of the power supply and the arrangement of the grid is such that it cannot drive a dangerous current through the body of a larger animal (human, bull,etc).The Inverter takes 6 volt d.c and steps it up to 120 volt a.c. The wattage depends on which transistors used for Q1 and Q2, as well as the "Amp Rating" of the transformer you use for T1. Voltage multiplier circuit is powered by 220v AC. This circuit produces a high voltage but very minimal current.



Mobile Control Robot Block Diagram

CIRCUIT OF MOBILE CONTROL ROBOT



PARTS LIST OF MOBILE CONTROL ROBOT

DECODER	MT8870 DTMF
MICRO-CONTROLLER	ATmega16 AVR
MOTOR DRIVER	L293D
NOT GARE	74LS04
RECTIFIER DIODE	1N4007
RESISTANCE (R1,R2)	100-kilo-ohm
RESISTANCE (R3)	330-kilo-ohm
RESISTANCE (R4-R8)	10-kilo-ohm
CAPACITORS (C1)	0.47µF ceramic disk
CAPACITORS (C2,C3,C5,C6)	22pF ceramic disk
CAPACITORS (C4)	0.1µF ceramic disk
XTAL1 crystal	3.57MHz
XTAL2 crystal	12MHz
Push-to-on switch	S1
DC MOTOR (M1,M2)	12V, 50-rpm geared
BATTERY	12V, 4.5Ah

CIRCUIT DISCRIPTION OF MOBILE CONTROL ROBOT

In this project, the robot is controlled by a mobile phone that makes a call to the mobile phone attached

to the robot. In the course of a call, if any button is pressed a tone corresponding to the button pressed is heard at the other end of the call. This tone is called 'dual-tone multiple-frequency' (DTMF) tone. The robot perceives this DTMF tone with the help of the phone stacked in the robot. The received tone is processed by the ATmega16 microcontroller with the help of DTMF decoder MT8870. The decoder decodes the DTMF tone into its equivalent binary digit and this binary number is sent to the microcontroller. The microcontroller is pre programmed to take a decision for any given input and outputs its decision to motor drivers in order to drive the motors for forward or backward motion or a turn. The mobile that makes a call to the mobile phone stacked in the robot acts as a remote. So this simple robotic project does not require the construction of receiver and transmitter units. DTMF signaling is used for telephone signaling over the line in the voice-frequency band to the call switching centre. The version of DTMF used for telephone tone dialing is known as 'Touch-Tone.' DTMF assigns a specific frequency (consisting of two separate tones) to each key so that it can easily be identified by the electronic circuit. The signal generated by the DTMF encoder is a direct algebraic summation, in real time, of the amplitudes of two sine (cosine) waves of different frequencies, i.e., pressing '5' will send a tone made by adding 1336 Hz and 770 Hz to the other end of the line. The tones and assignments in a DTMF system are shown in Table

TONES & ASSIGNMENTS IN ASSIGNMENT IN D.T.M.F. SYSTEM

Frequencies	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

D.T.M.F. DATA O/P

Low Group (Hz)	High Group (Hz)	Digit	OE	D3	D2	D1	D0
697	1209	1	H	L	L	L	H
697	1336	2	H	L	L	H	L
697	1477	3	H	L	L	H	H
770	1209	4	H	L	H	L	L
770	1336	5	H	L	H	L	H
770	1477	6	H	L	H	H	L
852	1209	7	H	L	H	H	H
852	1336	8	H	H	L	L	L
852	1477	9	H	H	L	L	H
941	1336	0	H	H	L	H	L
941	1209	*	H	H	L	H	H
941	1477	#	H	H	H	L	L
697	1633	A	H	H	H	L	H
770	1633	B	H	H	H	H	L
852	1633	C	H	H	H	H	H
941	1633	D	H	L	L	L	L
---	---	ANY	L	Z	Z	Z	Z

ACTION PERFORMED CORRESPONDING TO THE KEY PRESSED

Number Pressed By Users	O/P of HT9170 DTMF Decoder	I/P to Micro-controller	O/P from Micro-controller	Action Performed
2	0x02 00000010	0XFD 11111101	0x89 10001001	Forward Motion
4	0x04 00000100	0XFB 11111011	0x85 10000101	Left Turn
6	0x06 00000110	0XF9 11111001	0x8A 10001010	Right Turn
8	0x08 00001000	0XF7 11110111	0x86 10000110	Backward Motion
5	0x05 00000101	0XFA 11111010	0x00 00000000	Stop

The block diagram of the microcontroller-based mobile phone operated land rover. The important components of this rover are a DTMF decoder, microcontroller and motor driver. An MT8870 series DTMF decoder is used here. All types of the MT8870 series use digital counting techniques to detect and decode all the 16 DTMF tone pairs into a 4-bit code output. The built-in dial tone rejection circuit eliminates the need for pre-filtering. When the input signal given at pin 2 (IN-) in single-ended input configuration is recognized to be effective, the correct 4-bit decode signal of the DTMF tone is transferred to Q1 (pin 11) through Q4 (pin 14) outputs. Table shows the DTMF data output table of MT8870. Q1 through Q4 outputs of the DTMF decoder (IC1) are connected to port pins PA0 through PA3 of ATmega16 microcontroller (IC2) after inversion by N1 through N4, respectively. The ATmega16 is a low-power, 8-bit, CMOS microcontroller based on the AVR enhanced RISC architecture. It provides the following features: 16 kB of in-system programmable Flash program memory with read-while-write capabilities, 512 bytes of EEPROM, 1kB SRAM, 32 general-purpose input/output (I/O) lines and 32 general-purpose working registers. All the 32 registers are directly connected to the arithmetic logic unit, allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code-efficient. Outputs from port pins PD0 through PD3 and PD7 of the microcontroller are fed to inputs IN1 through IN4 and enable pins (EN1 and EN2) of motor driver L293D, respectively, to drive two geared DC motors. Switch S1 is used for manual reset. The microcontroller output is not sufficient to drive the DC motors, so current drivers are required for motor

rotation. The L293D is a quad, high-current, half-H driver designed to provide bidirectional drive currents of up to 600 mA at voltages from 4.5V to 36V. It makes it easier to drive the DC motors. The L293D consists of four drivers. Pins IN1 through IN4 and OUT1 through OUT4 are input and output pins, respectively, of driver 1 through driver 4. Drivers 1 and 2, and drivers 3 and 4 are enabled by enable pin 1 (EN1) and pin 9 (EN2), respectively. When enable input EN1 (pin1) is high, drivers 1 and 2 are enabled and the outputs corresponding to their inputs are active. Similarly, enable input EN2 (pin 9) enables drivers 3 and 4.

SOFTWEAR DESCRIPTION

The software is written in 'C' language and compiled using Code Vision AVR 'C' compiler. The source program is converted into hex code by the compiler.Burn this hex code into ATmega16 AVR microcontroller. The source program is well commented and easy to understand. First include the register name defined specifically for ATmega16 and also declare the variable. Set port A as the input and port D as the output. The program will run forever by using 'while' loop. Under 'while' loop, read port A and test the received input using 'switch'Statement. The corresponding data will output at port D after testing of the Received data. To charge the battery we can use solar energy.

Source program:
Robit.c

```
#include <mega16.h>
void main(void)
{
unsigned int k, h;
DDRA=0x00;
DDRD=0XFF;
while (1)
{
k =~PINA;
h=k & 0x0F;
switch (h)
{
case 0x02: //if I/P is 0x02
{
PORTD=0x89;//O/P 0x89 ie Forward
break;
}
case 0x08: //if I/P is 0x08
{
PORTD=0x86; //O/P 0x86 ie Backward
break;
}
case 0x04:
{
PORTD=0x85; // Left turn
break;
}
case 0x06:
{
PORTD=0x8A; // Right turn
break;
}
case 0x05:
{
PORTD=0x00; // Stop
break;
}
}
}
}
```

WORKING

In order to control the robot, you need to make a call to the cell phone Attached to the robot (through head phone) from any phone, which sends? DTMF tunes on pressing the numeric buttons. The cell phone in the robot is kept in 'auto answer' mode. (If the mobile does not have the auto answering facility, receive the call by 'OK' key on the rover-connected mobile and then made it in hands-free mode.) So after a ring, the cell phone accepts the call. Now you may press any button on your mobile to perform actions as listed in Table III. The DTMF tones thus produced are received by the cell phone in the robot. These tones are fed to the circuit by the headset of the cell phone. The MT8870 decodes the received tone and sends the equivalent binary number to the microcontroller. According to the program in the microcontroller, the robot starts moving. When you press key '2' (binary equivalent 00000010) on your mobile phone, the microcontroller outputs '10001001' binary equivalent. Port pins PD0, PD3 and PD7 are high. The high output at PD7 of the microcontroller drives the motor driver (L293D). Port pins PD0 and PD3 drive motors M1 and M2 in forward direction (as per Table III).Similarly, motors M1 and M2 move for left turn, right turn, backward motion and stop condition as per table.

CONSTRUCTION OF MOBILE CONTRO ROBOT

When constructing any robot, one major mechanical constraint is the number of motors being used. You can have either a two-wheel drive or a four-wheel drive. Though four-wheel drive is more complex than two-wheel drive, it provides more torque and good control. Two-wheel drive, on the other hand, is very easy to construct. Top view of a four-wheel-drive land rover is shown in Fig. 3. The chassis used in this model is a 10×18cm2 sheet made up of parax.Motors are fixed to the bottom of this sheet and the circuit is affixed firmly on top of the sheet. A cell phone is also mounted on the sheet as shown in the picture. In the four-wheel drive system, the two motors on a side are controlled in parallel. So a single L293D driver IC

can drive the rover. For this robot, beads affixed with glue act as support wheels.

PERFORMANCE ESTIMATION OF THE SOLUTION

Sr. No.	Part Of Project	Cost
(1)	Electronic Pesticide (Inverter Circuit + Voltage Multiplier Circuit)	Rs 1000
(2)	Mobile Control Robot (without cost of mobile)	Rs 1000
(3)	Solar Cell	Rs 1500
	Total	Rs 3500

PROS & CONS OF SOLUTION

Advantages:-

(1) Harmful effect on human health due to chemical pesticides, completely avoided by electronic pesticide.
(2) Electronic pesticide also helps in reducing pollutions like air, water & soil.
(3) Solar energy is used to give input to the inverter. So energy conservation is there.
(4) Mobile control robot is mounted on mobile control robot; it helps to control motion of Electronic pesticide from remote area.
(5) Single Electronic pesticide Circuit is used in whole field along with mobile control robot, it reduces the cost .So it also helps in money saving.
(6) Electronic pesticide kills the pest effectively than chemical pesticide .It also kills non-flying pest by attracting them using hormones, but it requires manual operation.
(7) It also helps to control MALERIA in villages as it works better than DDT powder.

DISADVANTAGES:-

(1) Electronic pesticide kills useful insects also.
(2) CFL is used to attract the pests. Therefore this pest control method used only night hours only.
(3) During rainy season due to mud it is difficult to use mobile control robot.Hense it is better to mount Electronic pesticide on a pole in the field. As a result of this sufficient no. of poles are required to control pest in the whole field .So it is somewhat costlier than mobile control robot, but cheaper than chemical pesticide .

RESULT

Electronic pesticides kill almost all flying pest as result of it we can break life cycle of pests & we can control 60% pest in next generation. Simultaneously we can reduce harmful effect of chemical pesticides on human health as well as environment (water, air& soil pollution).

CONCLUSION

Electronic pesticide is the best replacement of chemical pesticides. Electronic pesticide kill pest more effectively than chemical pesticides as well as it is more cost effective than chemical pesticide with less harmful effect on human health as well as environment.

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