Design and Implementation of Varmit Control System in Food Storage Facility

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Abstract— Food storage facility have gained plenty of importance over a decades, due to the damages created by the rodents to the food stored in food storage facility unit, billions of people do not have an access sufficient and hygienic food which in turn affects the agricultural and economic growth of the country, hence to overcome these problems a model is designed that incorporates three main techniques to drive away the rodents from food storage unit or agricultural fields. The first technique is using an ultrasonic transmitter which continuously produces frequencies such at 40 kHz to distress the rodents (i.e., rats). The second technique has a voice playback system which generates sounds of cats, snakes etc., at regular intervals of time to frighten the rodents. The last technique is, with the help of a pair of passive infrared sensor (PIR) placed in and around the cage to detect the movement of the rodents. If a movement is detected by the PIR sensor 2 then the rodents is trapped inside the cage by closing the door automatically and simultaneously this information is sent to the monitoring unit and to the person in charge of food storage facility via GSM which displays the message "RODENT TRAPPED" in LCD and an alarm is triggered.

Key words: Food Storage Facility, Varmit Control System

I. INTRODUCTION

India is the world's second largest populated country with 1.34billionpeople. Agriculture is the backbone of Indian economy. Food is essential part of human life. To feed 1.34 billion people with hygienic food Government of India is investing lot on infrastructure and human resources to store the grown food. Eg: grains, Cereals etc. Rodents, in particular rats contribute to a major loss to crops and stored foods. Due to the damage of crops and storage foods, millions of people do not have an access to sufficient food which in turn effects to the growth of the country.A model is designed that incorporates three main techniques to drive away the rodents from fields or from food storage unit. The first technique is using an ultrasonic transmitter which continuously produces variable frequencies such as 40 kHz, 45 kHz and 50 kHz to distress the rodents (I.e. rats). The second technique has a voice record and playback system which generates sounds of cats, snakes etc., at regular intervals of time to frighten the rodents. The last technique is used with the help of a pyro electric sensor placed around the cage to detect the movement of the rodents. If a movement is detected the stepper motor closes the door when the rodent is trapped inside the cage and simultaneously this information is sent to the monitoring unit and to the person in charge of food storage facility via GSM which displays the message "RODENT TRAPPED" in LCD and an alarm is triggered.

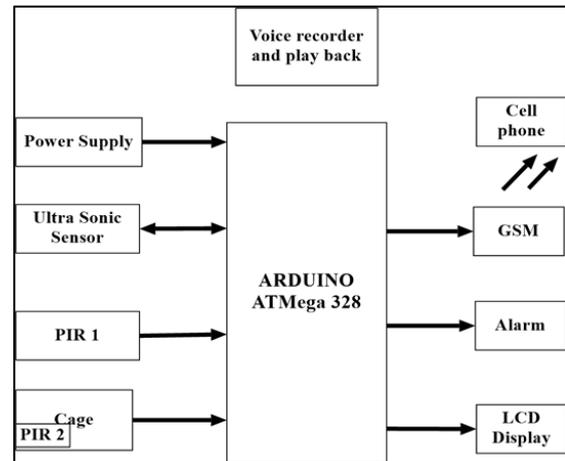## II. IMPLEMENTATION OF THE SYSTEM
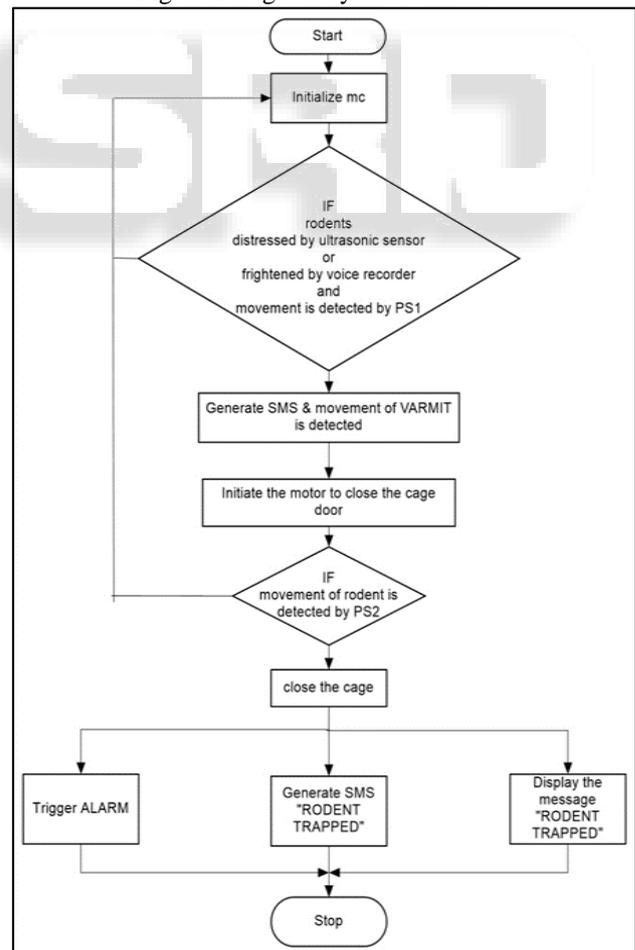

Fig. 1: Design of System hardware

Fig. 2: Implementation of Flow chart

The high range ultrasonic frequencies around 32 kHz - 62 kHz tend to disturb or distress the rats. Hence this proposed

prototype consists of two pyro electric sensors one around the cage and other one inside the cage. The ultrasonic transmitters produce variable frequencies such as 40 kHz, 45 kHz, and 50 kHz so that the rodents don't get habituated to it. Simultaneously voice record and playback system generates sounds of cats, snakes and other animals to frighten the rodents. The Pyro electric sensor placed around the cage is connected to the microcontroller. Pyro electric sensor is triggered when the motion is detected and sends the signal to the microcontroller causing the stepper motor to close the door and hence the rodent is trapped in the cage and simultaneously this information is sent to the monitoring unit and to the person in charge of food storage facility via GSM which displays the message "RODENT TRAPPED" in LCD and Cell phone screen and an alarm is triggered

III. COMPONENTS

The main components required for the functioning of the above proposed solution are elucidated below.

A. Microcontroller

The ATmega328 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328 achieves throughputs approaching 1 MIPS per MHz allowing the System designer to optimize power consumption versus processing speed.

B. GSM SIM 900

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the applications. The SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design.

1) SIM900 is designed with a very powerful single-chip processor integrating AMR926EJ-S core.
2) Quad - band GSM/GPRS module with a size of 24mmx24mmx3mm.
3) An embedded Powerful TCP/IP protocol stack.

C. LCD

We are using a high quality 16 characters by 2 line display module, with back lighting.

1) 16 Characters x 2 Lines
2) HD44780 Equivalent LCD Controller/driver Built-In
3) 4-bit or 8-bit MPU Interface
4) Standard Type
5) Works with almost any Microcontroller

D. Pyro electric sensor HC-SR501

1) Ultra-high sensitivity – 154dBm
2) Extremely fast TTFF (time to first fix) at low signal level
3) Low power consumption max 40mA at 3V
4) Operating voltage range 2.85 V to
5) Operating temperature range -40 to 85 degree Celsius

E. Ultrasonic sensor GH-311

1) Centre frequency – 40 KHz
2) Sound pressure level >=115 dB
3) Sensitivity>= -65 dB

4) Beam angle 80 degree
5) Capacitance 2100+/-20%pF
6) Working temperature -20 to 70 degree Celsius

IV. RESULTS AND DISCUSSIONS

Due to the damage of crops and storage foods from Rodents, in particular rats contribute to a major loss to crops and stored foods and millions of people do not have an access to sufficient food which in turn effects to the growth of the country. To overcome these problems, a model will be designed that incorporates three main techniques to drive away the rodents from agricultural fields or from food storage unit.
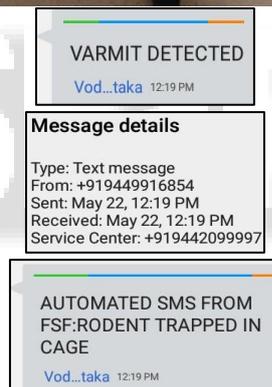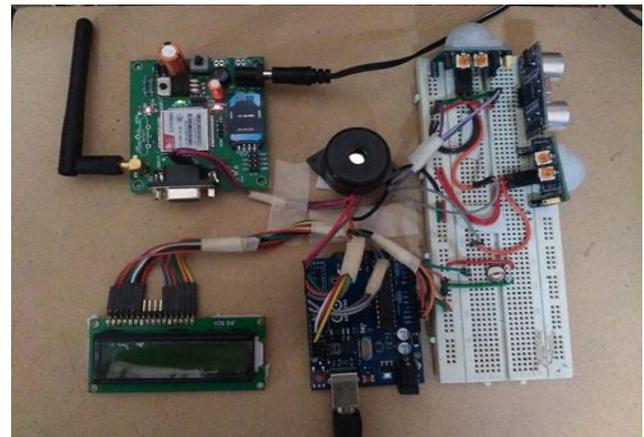

Fig. 3: Experimental output

V. CONCLUSION

The project presents the prototype model of ARDUINO Based Real Time System for Rodent Control in Food Storage Facility. The main component in this prototype is the PIR sensor which generates the signal based on the Varmit movement in its range and displays it in text form on display screen. Since we are using two PIR sensor1, one is outside the cage i.e., PIR1 and one more is present inside the cage i.e., PIR2. Once the rodent movement detected by PIR1 the detection message is displayed on LCD. If the rodent enters the cage it is detected by PIR2 and the rodent trapped message is sent to monitoring in charge cellphone via GSM Module. Since we are using the automatic cage, the door of the cage closes and the rodent will get trapped. In future all Food Storage Units can implement this system which provides the safety and protect the food damage caused due to rodents. The system which is designed here is totally to be effective, accurate and reliable than any other recent methods in controlling and trapping of rodents. By designing and

implementation of the above prototype the detection of rodents will be more accurate, safe and damage caused by the rodents in the food storage unit can be controlled.

VI. FUTURE ENHANCEMENT

There are lot of applications in this project mainly in the field of controlling and trapping of rodents in food storage unit. Since we are using the PIR sensor which is available in different range of operation we can also use this model for theft detection in food storage unit. Since the food storage area is too vast and it may be acres together in its area, by implementing web GIS technology we can find the exact location, where the rodent got trapped by maintaining the predefined databases regarding the locations of storage unit. Since this model is portable we can port it wherever it required.

VII. APPLICATIONS OF VARMIT CONTROL SYSTEM IN FOOD STORAGE FACILITY

1) Food storage facility.
2) Agriculture field.
3) Food industries.
4) Textile industries.

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