SECURITY FOR PROTECTING AGRICULTURAL CROPS FROM WILD ANIMALS USING GSM TECHNOLOGY

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ABSTRACT

India, with vast agricultural lands has different crops ranging from paddy to tomato. But few crops are destroyed due to animal menace and hence a protection is required to save the crops from animal. Virtual fencing that function similar to physical fencing for animals using GSM technology. Virtual fencing for the wild animals is meant to restrict animals to move in only few areas. This facilitates the owners to monitor their farm remotely from anywhere in the world. This comprises of a Microcontroller based monitoring along with IR (Infrared) sensors. When an un-authorized entry is detected, the sends SMS alerts/calls to the farm/field owner automatically and provides audible alerts using buzzer in the prototype and using siren in real time applications. This helps us to keep away such wild animals from the farmlands as well as provides surveillance functionality.

Key Words: Arduino Uno, GSM Module, IR Sensor, Crystal oscillator

I. INTRODUCTION

Animal attacks in India are a common story nowadays. Due to the unavailability of any detection these attacks kill villagers and also destroy their crops. Due to lack of proper safety measures, these villagers are left helpless to their fate. Therefore a proper detection could help save their lives and also to the preservation of crops. Also the crops of villagers are destroyed due to frequent interference of animals. The crops and paddy fields cannot be always fenced. So the possibility of crops being eaten away by cows and goats are very much present. This could result in huge wastage of crops produced by the farmers. To make the best use of mobile communication technology, the objectives of this paper therefore utilizes global for mobile communication (GSM) and provide short message service (SMS). This helps us to keep away such wild animals from the farmlands as well as provides surveillance functionality. It has been found that the odour of rotten egg helps to keep the wild pigs and deer from destroying the crops, hence the farmers manually spray the rotten egg solution on their fields, and firecrackers are used to ward off the wild elephants that destroy the crops. This system is based on surveillance with an animal ward-off employed in farmlands in order to prevent crop vandalization by wild animals. In addition to providing protection this distinguishes between an intruder and an authorized person using RFID's, various PIR sensors are deployed in the area to detect any motion and hence turns ON a camera when movement is detected, thereby providing real International Journal of Research in Advent Technology (IJRAT) (E-ISSN: 2321-9637) Special Issue National Conference "CONVERGENCE 2018", 09th April 2018 2 time monitoring. It involves automation of certain methods used to prevent the wild animals from entering the farmlands and destroying the crops, an electronic fire cracker (for bigger animals, like elephant) and a rotten egg spray (for smaller animals like wild pigs and deer) which have been found useful to ward off the wild animals, used Haar feature based cascade classifiers for object detection to distinguish between the

animal and human. When such intrusions occur, a message will be automatically generated and the cameras employed are turned ON which capture an image and start recording the video for some time which will be stored on the SD card as well as stored on cloud i.e, drop box, the land owner can then view the video on any smart device, as well as access it later. All the sensors and components are interfaced to the Raspberry pi board. Hence we come up with such a product that can be very useful for farmers, it prevents the loss of crops and increases the yield, also protects the farm from intruders.

II. LITERATURE REVIEW

Srikanth N et al [1] proposed Crops in farms are many times ravaged by local animals like buffaloes, cows, goats, birds, and fire etc. This leads to huge losses for the farmers. It is not possible for farmers to barricade entire fields or stay on field 24 hours and guard it. So here we propose automatic crop protection from animals and fire. This is a Arduino Uno based using microcontroller. This uses a motion sensor to detect wild animals approaching near the field and smoke sensor to detect the fire. Sudhir G et al [10]proposed the for monitoring the growing status of the corn (maize) plant continuously and intimate the agriculturist using wireless sensor network (WSN). But in practice, cultivator faces too much effort in the farmland. This paper makes eases the work of the farmer in cultivated land through the usage of different kind of sensors. The two LDR sensors are interfaced with PIC16F877A microcontroller whereas its top array receives solar radiation for supply current and the bottom of the LDR array is for measuring leaf area index (LAI). Dr. Wilson [4] proposed Electric fences can be used to protect farmhouses, farmlands, forest bungalows, etc from animals. In a way, these simulate the job of a cowboy or forest guard. Already popular in countries where manpower is expensive, electric fences are slowly becoming popular in India as well. These control the animals by giving them a short, Sharp but safe shock that teaches them to stay away from the fence. Thus, electric fences are economical and practical solutions to maximize field production through controlled grazing. Electric fencing is safe, as its output is discrete (not continuous). There is certain time duration between two pulses that prevents prolonged shocking to animals or people. In addition, the short ‘on’ -time (normally 1/5000th of a second) prevents heat build-up. T. Day and R. Mac Gibbon, [5] Eradication of invasive vertebrate pests from increasingly large islands has become an important wildlife management and conservation tool internationally. Success on islands has prompted attempts to exclude and eradicate vertebrate pests from mainland sites. Early mainland exclusion efforts often failed due to ineffective or poorly maintained barriers to pest reinvasion. Sneha Nahatkar, [9] proposed a home embedded surveillance which evaluates the development of a low cost security using small PIR (Pyroelectric Infrared) sensor built around a microcontroller with ultra-low alert power. This senses the signal generated by PIR sensor detecting the presence of individuals not at thermal equilibrium with the surrounding environment.

III. PROPOSED

The proposed is to construct a virtual fencing for animals that functions similar to physical fencing. Virtual fencing is an invisible frontier which raises an alarm if an object enters its vicinity. It can be used to restrict wild animals from entering cultivated areas. For example, in recent years we find many instances of wild animals like elephants, cheetahs, tigers, lions, wild boars and bears entering villages and damaging agricultural lands, houses, and even endangering the lives of the villagers. Hence, we can avoid such instances from happening with the help of this method. The proposed is used to restrict animals to the forest itself and establish virtual frontiers of control over them.

Proposed Algorithm:

Step 1: Giving power supply to Arduino from RPS.

Step 2: Checking for the signal in the GSM module.

Step 3: Sending power to IR sensor from RPS via Arduino.

Step 4: Detecting an obstacle near the IR sensor.

Step 5: Raising an alarm due to animal detection.

Step 6: Sending a message/call to the owner of crop via GSM module.

Step 7: Turning on the LED light to indicate the flow of current through fencing.

Step 8: Animal gets a slight shock whenever it touches fencing.

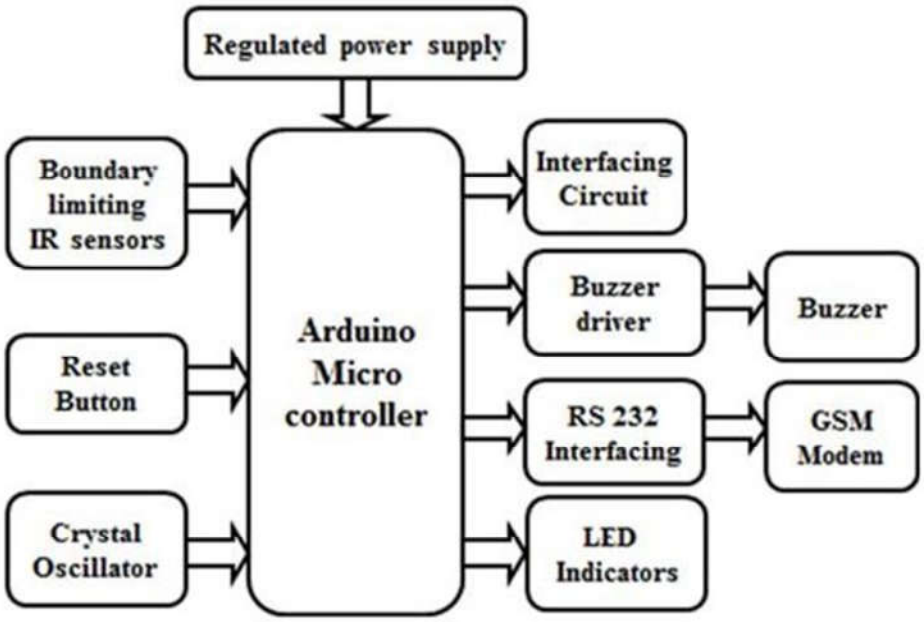

Figure 1: Block diagram of security

Arduino Uno Microcontroller

ATmega328 is a single chip microcontroller created by Atmel in the mega AVR family. The Atmel 8-bit AVR RISCbased microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

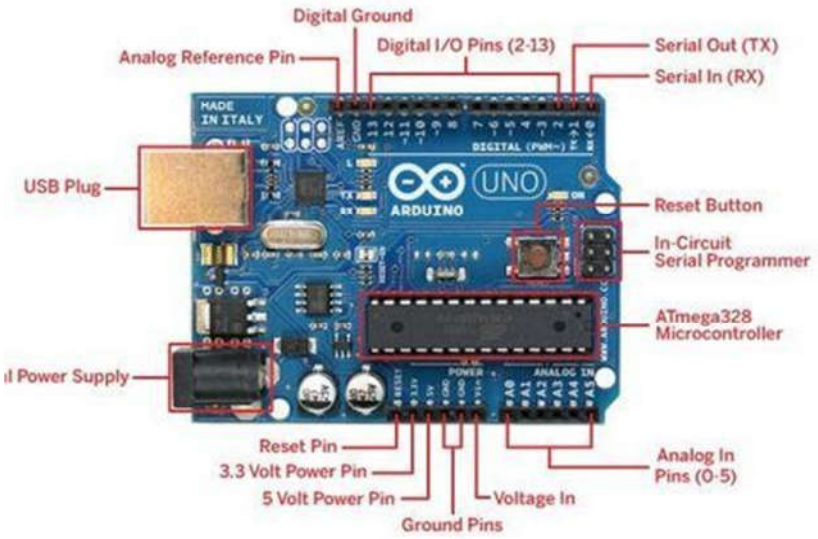

Figure 2: Arduino Uno Microcontroller AT Mega328P

The device achieves throughput approaching 1 MIPS per MHz. GSM Module SIM800 is a quad-band GSM/GPRS module designed for the global market. It work on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz.SIM800 features GPRS multi-slot class 12/ class 10 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.SIM800 has 68 SMT pads, and provides all hardware interfaces between the module and customers' boards.SIM800 integrates TCP/IP protocol and extended TCP/IP AT commands which are very useful for data transfer applications.

GSM Modem

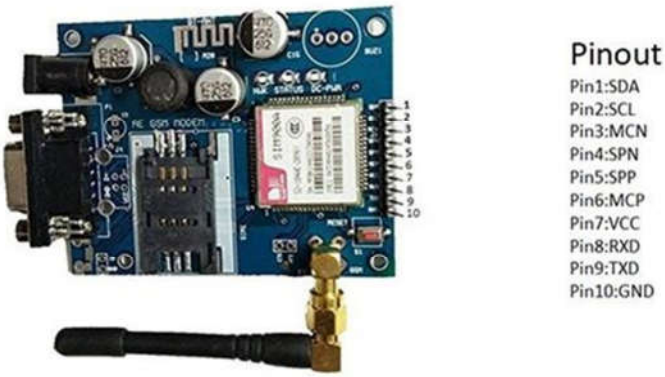

Figure 3: GSM module SIM900A

SIM 900A is a GSM modem with a simple serial interface. SIM 900A modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. With this module one can send/receive SMS, connect to internet via GPRS and receive calls. The modem can either be connected to PC serial port directly or to any microcontroller. When purchasing, purchase the entire board. As it comes with RS232 to TTL converter and ethernet port Also do check the module by calling a few times when in the shop.SIM 900A GSM modem works for supply voltages from 3.4V to 4.5V. This voltage is difficult to generate as we don't get a standard regulator at this voltage. Do not give 5V directly to the modem as it is above its absolute maximum ratings.

Crystal Oscillator:

XTAL1 and XTAL2 are input and output, respectively, of an inverting amplifier which can be configured for use as an On-chip Oscillator, Either a quartz crystal or a ceramic resonator may be used. The CKOPT Fuse selects between two different Oscillator amplifier modes. When CKOPT is programmed, the Oscillator output will oscillate a full rail-to-rail swing on the output. This mode is suitable when operating in a very noisy environment or when the output from XTAL2 drives a second clock buffer. This mode has a wide frequency range. When CKOPT is un programmed, Oscillator has a smaller output swing. This reduces power consumption considerably. This mode has a limited frequency range and it cannot be used to drive other clock buffers. For resonators, the maximum frequency is 8 MHz with CKOPT un programmed and 16 MHz with CKOPT programmed. C1 and C2 should always be equal for both crystals and resonators. The optimal value of the capacitors depends on the crystal or resonator in use, the amount of stray capacitance, and the electromagnetic noise of the environment.

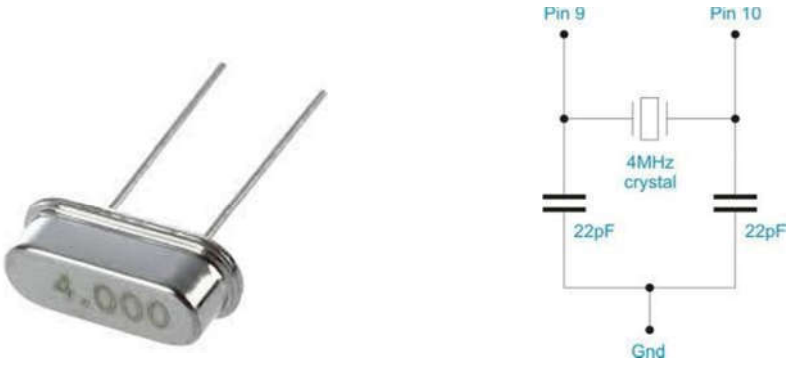

Figure 4: 4MHz Crystal Oscillator and pin diagram

IR Sensor

IR sensors use infra-red light to sense objects in front of them and gauge their distance. They usually have an emitter and a detector. A pulse of infra-red light is emitted from the emitter and spreads out in a large arc. If no object is detected, then the IR light continues in that direction forever and no reading is recorded. However, if an object is nearby then the IR light will be reflected and some of it will hit the detector. This forms a simple triangle between the object, emitter and detector. The detector is able to detect the angle that the IR light arrived back at and thus determine the distance to the object.

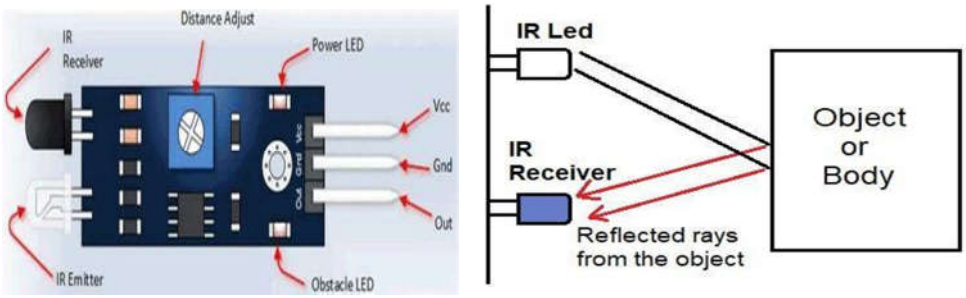

Figure 5: IR sensor components and working

IV. RESULTS

The "Fencing Security for Protecting Agricultural Crops from Animal Attacks Using GSM Technology" is designed to provide a way out for fencing security using GSM technology. This is mainly used to facilitate the owners for monitoring their farm remotely from anywhere in the world. Whenever an un-authorized entry was detected, this sends SMS alerts/call to the farm or field owner automatically along with the activation of alarm unit.

Step 1: Giving power supply to Arduino from RPS

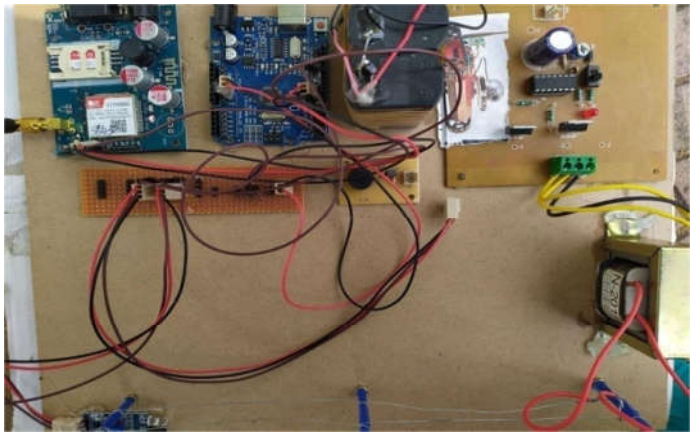

Figure 6: Activation of Arduino

Step 2: Checking for the signal of GSM port

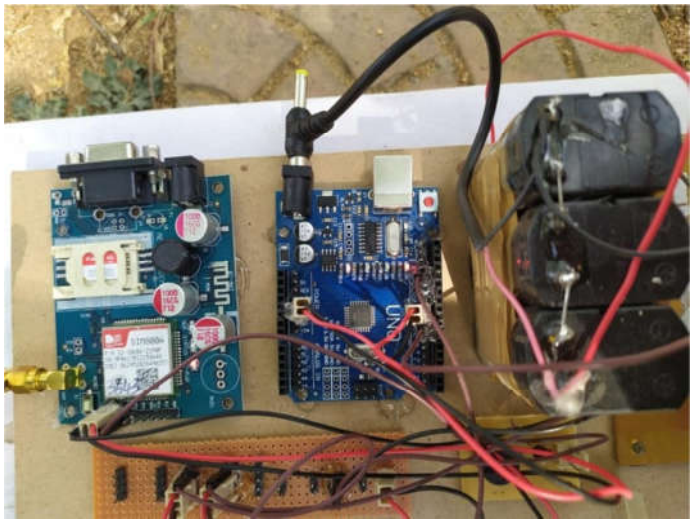

Figure 7: GSM module waiting for signal

Step 3: Sending power to IR sensor from RPS via Arduino

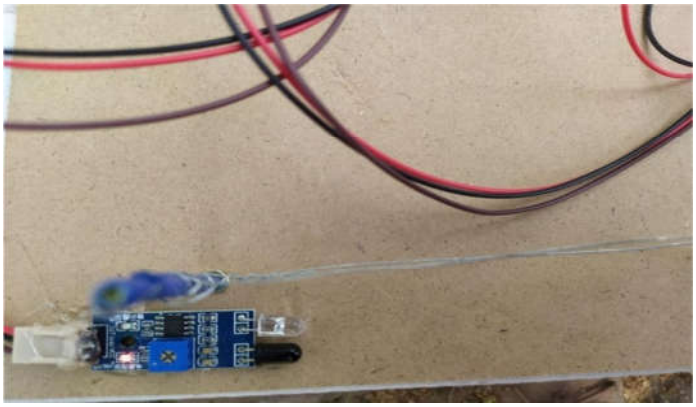

Figure 8: IR sensor activated and ready

Step 4: IR sen **Fig 9. Obstacle detection by IR sensor**

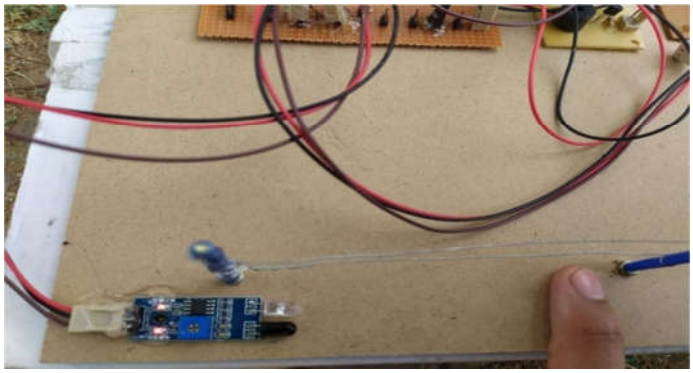

Figure 9: Obstacle detection by IR sensor.

Step 5: Alarm generated due to animal detection

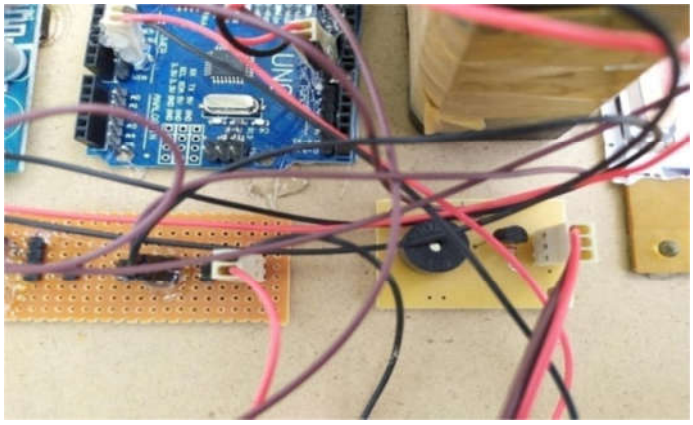

Figure 10: Buzzer alert due to animal detection

Step 6: Call received by the owner about the animal intrusion

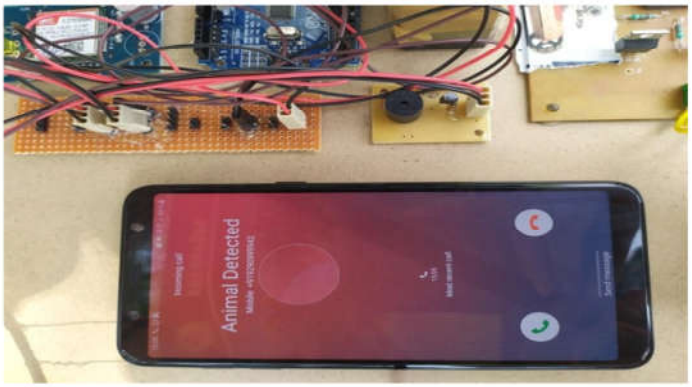

Figure 11: Owner receiving a call via GSM module

Step 7: LED indicates the flow of current through fencing

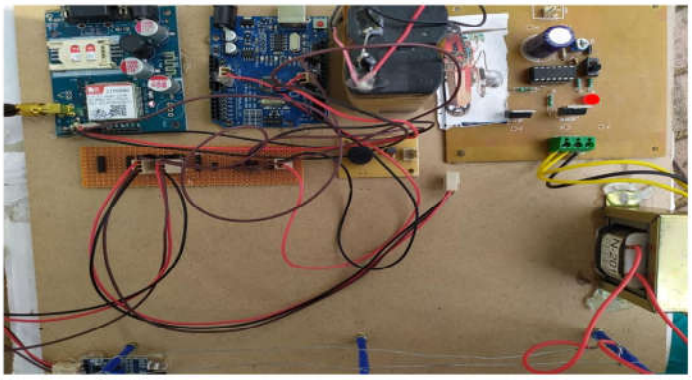

Figure 12: Current flow 'ON' shown by LED

Step 8: Animal gets a slight shock whenever it touches the fence.

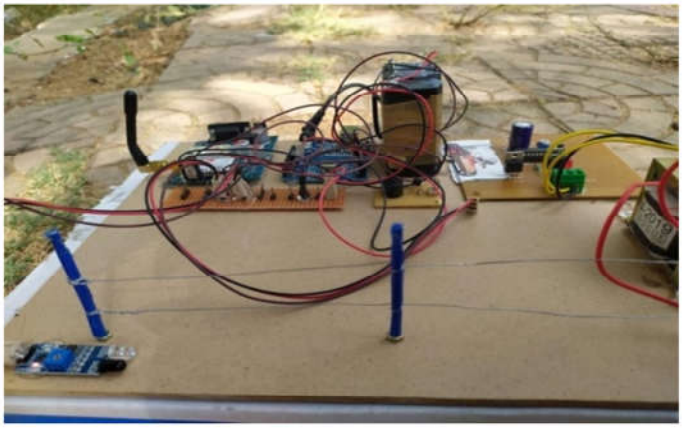

Figure 13: Prototype fence

V. Conclusion:

Integrating features of all the hardware components used have been developed by using this methodology. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. This system has been successfully implemented using highly advanced IC's with the help of growing technology. Thus, the system has been successfully designed and tested.

VI. Future Scope:

Further this can be developed in such a way that the identification details are known to differentiate between an animal and a human. We can add RFID reader and tag through which the identification details of the man or an animal can be known. We can add GPS module, which gives the exact location of the detection and can send alerting messages/calls along with location in case of emergencies etc. We can interface a wireless camera through which the pictures and video of the location can be recorded for future reference purposes.

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