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Deforestation Management System Using Force and Sound

M.Pandyamanian[1], V. Sai Likhith[2], Dhananjay Narayan[3], C.Ashwini[4]
UG Student[1, 2, 3], Assistant Professor[4]
Department of CSE
SRMIST, Ramapuram, India

Abstract:
Forests are part of the salient and indispensable resources for human survival and social development that protects the balance of the earth. Smuggling of the trees is one of the national issues that need to be curbed. Rare trees are very expensive and are quite less obtainable in the market. Force and Sound technology are exciting areas of research that can be used to assist humans in the mechanical control of manual systems. It is a component of human-computer interaction (HCI) that increases the advances in automatic sound recognition (ASR) with the innovative technologies of natural language processing (NLP). Intelligent systems, such as Force detection Systems, can also allow for flexibility in manual operations. In this research we will investigate interfacing force and sound control operations with Arduino-based hardware platforms that is used to design the prevention of unlawful cutting down of the trees in any forest. The control system includes both force and sound recognition circuit for alerting the logging of trees. Input is taken from the sound from the tree after sensing the force and from the device which senses the sound data. In some conditions, a wireless link facility is provided while the alerts can be received through that medium.

Keywords: Trees, Deforestation, Automatic, Sound, FSR, UART, IOT, Arduino

1. INTRODUCTION

Human-machine interface based on force and sound recognition is attracting attention to mainly solve issues in assisting the forest rangers to perform multitasking operation. Force and sound recognition system use specific range of forces and selected sounds as the input, this input allows the machine to identify specific force, sounds and subsequently process the particular command and execute it. This method helps the forest department to perform the task more efficiently and removes the part of humans to manually monitor the forest. Several applications currently use manual monitoring to perform various tasks. Systems, and personal communications etc. Usually, force sensitive resistor systems are found to have an increased failure to acquire rate due to wavering force received from the sensor, which is highly manipulative and inaccurate. The use of sound recognition system is not solely dependent on the cutting of trees sources but also able to be used for the forest survey on the wildlife present in it.. The use of the sound for performing the operation is increasingly becoming popular due to some reasons such as completely removing manual contact. Therefore, the ability to access the system will always be embedded within the system itself and therefore if any alert is to be thrown the data can be received through an user created interface. This force and sound recognition is 100% accurate when the input falls under the criteria of the specific conditions termed for them.

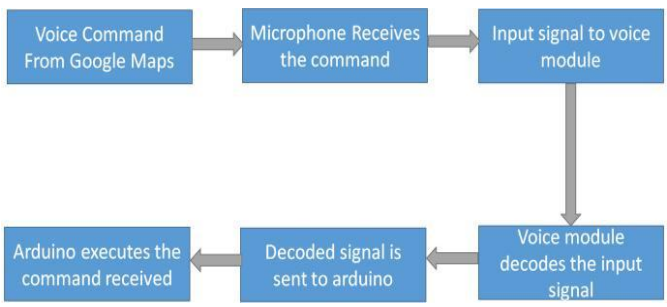

Figure.1. Flow of process

II. PROBLEM STATEMENT

The problems faced by the forest department in today's scenario are they have to maintain the forest properly, protect the wildlife, prevent trees from getting chopped, arrest the smugglers and showcase them in front of the law, In depth each day trees are being cut and smuggling is being done in the forest the patrol officers and the department are trying their level best to serve justice to the country even though at, specific scenarios the department needs some external factor that helps them in an technical aspect. Illegal logging has serious economic and social repercussions for the mankind and animals with millions of dollars worth of timber and other premium wood revenue being lost each year.[1] Tendency on part that while the trees are being cut some amount of force is needed to chop the whole big tree and while that time period the noise or sound is caught by the module Our system is a predefined and interfaced such that if the tree is being cut with some specific force which is not safe for the tree then the system will alert the patrol or the department this is in case for single tree, if there are many trees sound recognition comes under the concept and that recognizes the particular frequency of the sound that arises while the tree is being cut. The data from both the modules alert the user interface developed, which is synced which the forest department or to the patrol

III. EXISTING SYSTEM

Nature has lost approximately half of trees because of deforestation. The World Bank has reckoned in a 2012 report that illegal logging of trees has generated up to $15 Billion a year for criminals involved in the logging of trees.[2] Most of the existing systems for deforestation control is done by manual work by forest rangers and officers. RFID is installed on trees while the forest officers will have the tracking device consisting of RFID reader. This method is not that resourceful as the forest officers have to manually inspect day and night. It

is also quite inefficient as it does not prevent the cutting of trees completely. Many a times, tree logging will be reported only after a tree has been cut down completely. Hence, we are proposing a model to tackle such situations with IOT enables technologies.

IV. PROPOSED SYSTEM

The proposed system aims to achieve automation of signaling system, and completely remove the manual control of the forest monitoring. Our system is an wireless network system that consists of many small devices called sensors which measure physical parameters such as temperature, pressure, from the environment [3]. The system basically consists of three main components, a microphone, for recording the input from the tree while being cut, sound recognition module compatible with the Arduino. A low-cost microphone commonly used in the computer system is used as a sound sensor to record the sound. The recorded sound is processed in the sound module which will push the alert to the user interface. Force sensitive resistor ,for monitoring the force when the tree is being harmed , the value will be considered such that it satisfies or denies the condition and thus it pushes the alert to the interface, all these alerts and notification pushers are done by nodemcuesp8266 module which is a Wi-Fi controlled and enabled board specially used for the internet of things purposes to push and pull notifications and alerts and to control the things over internet from here the data is sent to googles firebase which is a server that holds the data from there the notifications/alerts are pushed to an user interface or an app which has been developed by the domain mit app inventor thus with the proper working of these modules we come up under the proposed system of the deforestation prevention using force resistive sensor and sound recognition modules

A.Circuit diagram

The Arduino is given an input of +7V ~ +12V. The ground of the Arduino is connected to the ground of the voice module. The voice module is given a +5V input from the Arduino. The receiver (Rx) of the Arduino is connected to the transmitter (Tx) of the voice module. Similarly, the transmitter (Tx) of the Arduino is connected to the receiver (Rx) of the voice module. The left indicator is connected to the 11 and 12 pins and the right indicator is connected to 3 and 4 pins. All the connections are made using male to female jumper cables. The external microphone can be replaced with a small and more effective microphone specially designed for the Arduino.

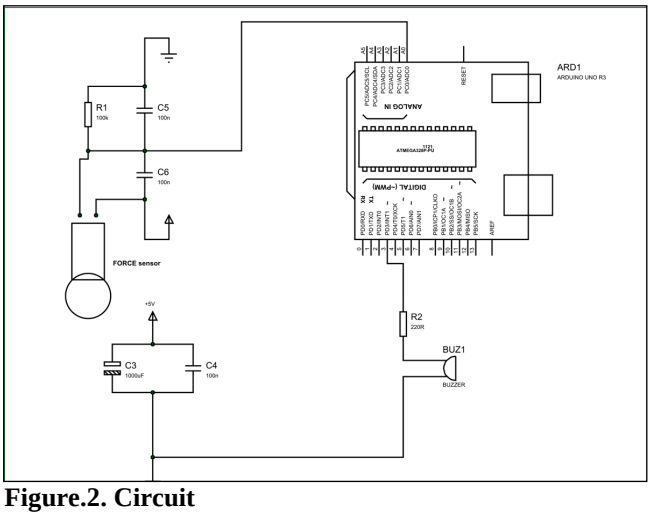

Figure.2. Circuit

B. Voice Module

The 30mm x 47.5mm voice module is a very small and effective. It can store up to 15 pieces of individual voice instructions. Those 15 pieces are divided into 3 groups, with 5 in one group. The voice module has to be paired initially to the Access Port software using the USB CP2012 – UART Module. The connections are shown in fig. Once it is connected successfully, the module can be configured by sending the commands via serial port. The default band rate for the voice module is 9600 but can be changed if required. The serial data format: 8 data bits, no parity, 1 stop bit. The voice instructions for Group 1 are recorded using the 0x11 hex commands one by one until 5 individual voices are accepted. Similarly, the voices for group 2 and group 3 are trained using 0x12 and 0x13 respectively. The voices in Group 1 are imported to the Arduino using serial command before it can recognize the 5 voice instructions within that group. This module is speaker independent therefore it may not identify the instruction, if spoken by a human or if any other device is used. The external microphone can also be replaced with a small and more effective mike that can directly be connected to the GND and VOC present in the voice module.

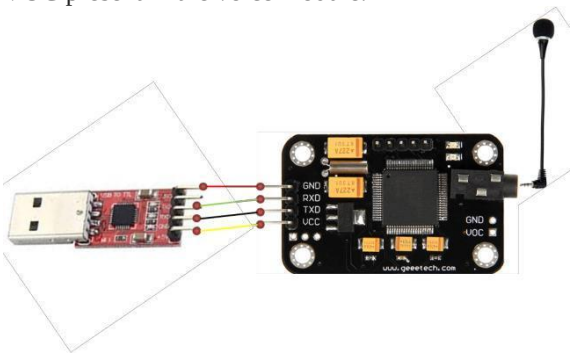

Figure.3. USB CP2012 – UART Module

C. Force Sensitive Resistor Module

The force sensitive resistor module is a very small and effective component that can sense the force that is being pertained on it and can further give out the corresponding value accordingly. The FSR module is to be interfaced with the pins accurately such that it senses the exact force that is being applied over it. The easiest way to measure a resistive sensor is to connect one end to Power and the other to a pull-down resistor to ground. Then the point between the fixed pulldown resistor and the variable FSR resistor is connected to the analog input of a microcontroller such as Arduino.

Figure.4. Force Resistive Sensor

D. Arduino

An Arduino-Uno is an open sourced microcontroller having worldwide use and acceptance. It has sets of various analog as well as digital analog pins that can be interfaced with the other devices and circuits. It is programmed with IDE developed by Arduino and it can be powered with USB cables connected to a

computer or easily through a set of external batteries**.** A program written with the Arduino IDE is known as a sketch.[4]

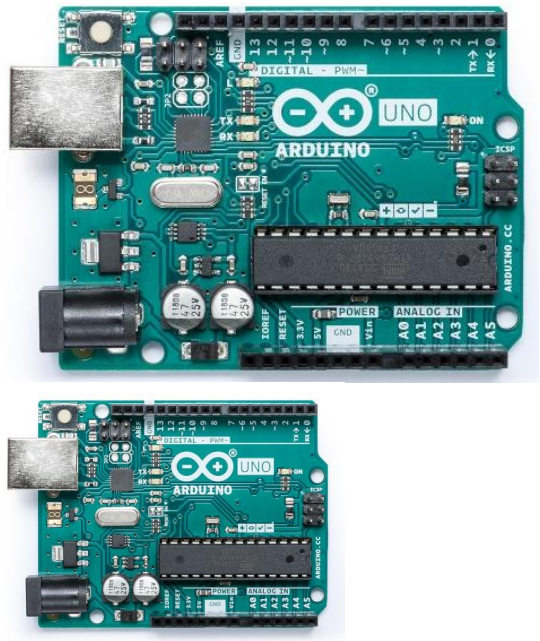

Figure.5. Arduino

E. Node MCU

Node MCU is an IOT platform that is Open Source and involves firm wares that runs on ESP8266. It is basically an Wi-Fi Module that is low cost and efficient. It is an System on Chip

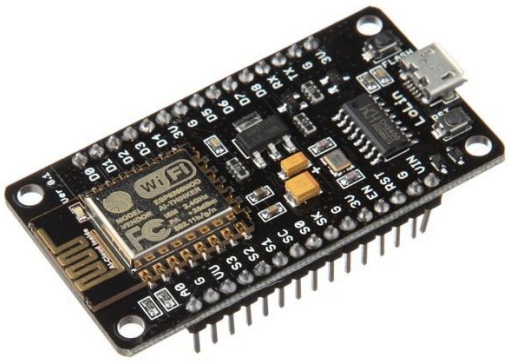

Figure.6. Node MCU

Particularly to provide full internet access in a small setup of sensor based networks. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espress if Systems, and hard ware which is based on the ESP-12 module.[5]

V. EXPERIMENTAL RESULTS

The effectiveness of the proposed system has been tested by implementing the proposition on a micro-model and the observations have been recorder. The pictures of the implemented circuit and the raw signals of the output has been given.

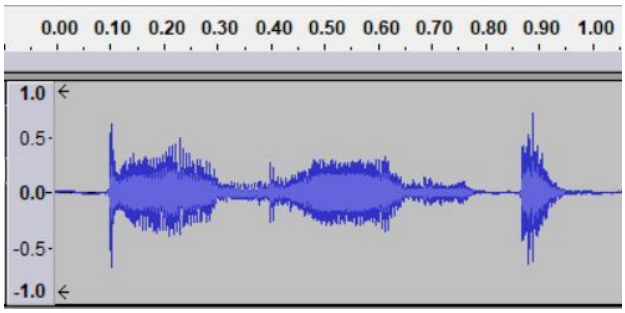

Figure.7. Raw Signal A– Tree Being Cut

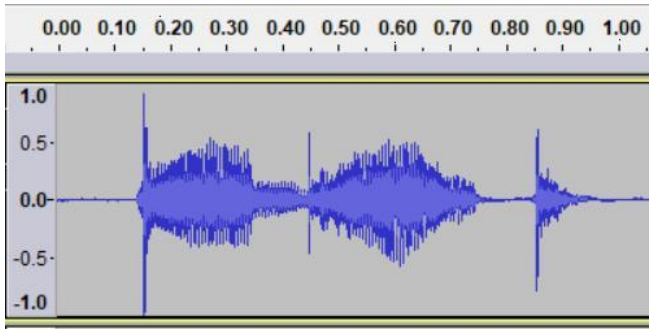

Figure.8. Raw Signal B– Tree Being Cut

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