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Maritime Border Alert System and Shutdown of Outboard Motors

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Abstract:
Border alert system for fisherman using GPS describes about a system which helps the fishermen by notifying the country border. Global Positioning System (GPS) is used for this purpose. Here, GPS receiver is used to find the current location of the fishing boat. Using GPS, present latitude and longitude values are sent to Raspberry Pi Controller unit. The controller unit later compares the present location of the boat with the preset coordinates programmed into the controller. Based on the comparison, various sets of warnings are provided. According to the level of border crossed, the respective warnings are provided from the controller. The warnings include LED indication, Text messages to the base station, etc. On further advancement of the boat, the outboard motor of the boat is shutdown. On shutdown, the camera is switched on and the pictures of both inside and outside the boat are taken for rescue operation purposes. The entire GPS system is made compulsory to start the motor, with the help of Python programming.

Keywords: Border alert system, Fishermen, GPS, Low cost maritime border crossing alert system, Maritime border crossing.

I. INTRODUCTION

This Project focuses on getting a resolve by giving multi-tier warnings and automatic – shutdown of motors. It includes three levels of warning signs and a final event which is automatic shutdown of motor. The developed prototype comprises a pile of hardware – GPS[1] System, Raspberry Pi Zero, Relay, Camera, and Motor. Programming is done using Python. The GPS system tracks the live co-ordinates/location of the boat. The individual RFID tag of the GPS installed in the boat helps in identifying the boat near the border and tracks them from the base stations. The sets of boundary coordinates B1, B2, B3 are pre-set and fed into the Raspberry Pi Zero, each leading to various warning indications. When the boat crosses pre-set value B1, it activates a basic alarm and LED indication (W1) on the boat itself to notify the fishermen that they are nearing the maritime border between the respective countries. On crossing B2, it sends a TEXT alert (W2) to ground based stations in order to facilitate rescue operations and further on crossing B3, motor is shut down (W3) by motor drive to confine further movements. The proposed work ensures that only if GPS is ON the motor starts. Which forces the fishermen[4] to use this system on shutdown of the motor, the two-way camera is turned ON and the pictures of the crew-members are taken and transmitted to the base stations. This enables us to determine the status and the number of crew members in the boat.

II. METHEDOLOGY

a. Hardware

i. RASPBERRY PI

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards, mice and cases). However, some accessories have been included in several official and unofficial bundles. The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support. This block diagram depicts Models A, B, A+, and B+. Model A, A+, and the Pi Zero lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the Pi Zero, the USB port is connected directly to the SoC. On the Pi 1 Model B+ and later models the USB/Ethernet chip contains a five-point USB hub, of which four ports are available, while the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port. Processor, RAM, Networking, Peripherals, Video, Real Time Clock.

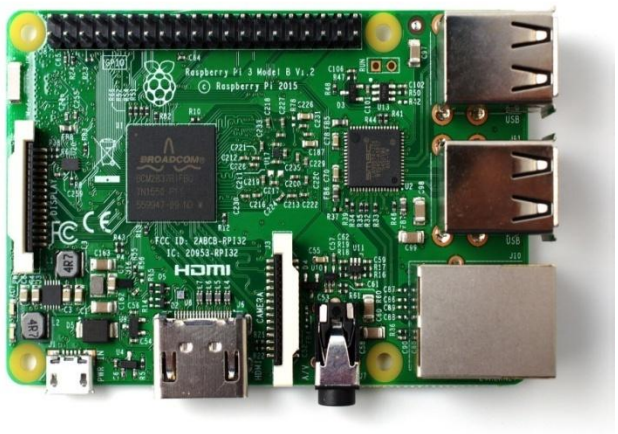

Figure.1. Raspberry Hardware

ii. GPS System

The GPS, originally Navstar GPS, is a satellite-based radio navigation system owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system that provides geo-location and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more

GPS satellites. Obstacles such as mountains and buildings block the relatively weak GPS signals. GPS Antenna and Receiver.

Figure.2. GPS Receiver and Antenna

The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning[2] capabilities to military, civil, and commercial users around the world.

b. Software

i. Raspbian OS

Raspbian is a Debian-based computer operating system for Raspberry Pi. There are several versions of Raspbian including Raspbian Stretch and Raspbian Jessie. It has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers. Raspbian was created by Mike Thompson and Peter Green as an independent project. Raspbian is highly optimized for the Raspberry Pi line's low-performance ARM CPUs. Raspbian uses PIXEL, Pi Improved Xwindows Environment, Lightweight as its main desktop environment as of the latest update. It is composed of a modified LXDE desktop environment and the Openbox stacking window manager with a new theme and few other changes. The distribution is shipped with a copy of computer algebra program Mathematica and a version of Minecraft called Minecraft Pi as well as a lightweight version of Chromium as of the latest version.

ii. Python

Python is a wonderful and powerful programming language that's easy to use (easy to read and write) and with Raspberry Pi lets you connect your project to the real world. Python syntax is very clean, with an emphasis on readability and uses Standard English keywords.The easiest introduction to Python is through IDLE, a Python development environment. Open IDLE from the Desktop or applications menu. IDLE gives you a REPL (Read-Evaluate-Print-Loop) which is a prompt you can enter Python commands in to. As it's a REPL you even get the output of commands printed to the screen without using "print". Two versions of Python are available: Python 2 and Python 3. Python 3 is the newest version and is recommended, however Python 2 is available for legacy applications which do not support Python 3 yet. IDLE also has syntax highlighting built in and some support for auto completion. You can look back on the history of the commands you've entered in the REPL with Alt + P (previous) and Alt + N (next).

III. WORKING

This Project focuses on getting a resolve by giving multi-tier warnings and automatic – shutdown of motors. It includes three levels of warning signs and a final event which is automatic shutdown of motor. The developed prototype comprises a pile of hardware – GPS System, Raspberry Pi Zero, Relay, Camera, and Motor. Programming is done using Python. The GPS system tracks the live co-ordinates/location of the boat. The individual RFID tag of the GPS installed in the boat helps in identifying the boat near the border and tracks them from the base stations. The sets of boundary coordinates B1, B2, B3 are pre-set and fed into the Raspberry Pi Zero, each leading to various warning indications. When the boat crosses pre-set value B1, it activates a basic alarm and LED indication (W1) on the boat itself to notify the fishermen that they are nearing the maritime border[3] between the respective countries. On crossing B2, it sends a TEXT alert (W2) to ground based stations in order to facilitate rescue operations and further on crossing B3, motor is shut down (W3) by motor drive to confine further movements. The proposed work ensures that only if GPS is ON the motor starts. Which forces the fishermen to use this system on shutdown of the motor, the two-way camera is turned ON and the pictures of the crew-members are taken and transmitted to the base stations. This enables us to determine the status and the number of crew members in the boat.

IV. RESULT

Hardware Components are assembled and programmed in such a way that only if the GPS is ON, Motor will start. Hardware Components are tested and the corresponding warning signs for each event has been received. The coordinates of the present location (12.4944 N, 80.0252 E) are determined and is taken as reference value for these events as shown in Fig.3.

```
pi@raspberrypi:~ $ stty -F /dev/ttyUSB0 raw 115200 cs8 clocal -cstopb
pi@raspberrypi:~ $ cat /dev/ttyUSB0
0$GPGGA,000323.099,,,,,0,0,,,M,,M,,*4A
$GPRMC,000323.099,V,,,,,0.00,0.00,060180,6.13,W,N*0D
$GPGGA,000323.199,,,,,0,0,,,M,,M,,*4B
$GPRMC,000323.199,V,,,,,0.00,0.00,060180,6.13,W,N*0C
$GPGGA,000323.300,,,,,0,0,,,M,,M,,*49
$GPRMC,000323.300,V,,,,,0.00,0.00,060180,6.13,W,N*0E
$GPGGA,000323.400,,,,,0,0,,,M,,M,,*4E
$GPRMC,000323.400,V,,,,,0.00,0.00,060180,6.13,W,N*09
$GPGGA,000323.500,,,,,0,0,,,M,,M,,*4F
$GPRMC,000323.500,V,,,,,0.00,0.00,060180,6.13,W,N*08
$GPGGA,000323.599,,,,,0,0,,,M,,M,,*4F
$GPRMC,000323.599,V,,,,,0.00,0.00,060180,6.13,W,N*08
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$GPGSA,A,1,,,,,,,,,,,,,,,*1E
$GPGSV,1,1,00*79
$GPRMC,000323.699,V,,,,,0.00,0.00,060180,6.13,W,N*0B
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$GPGGA,000324.599,,,,,0,0,,,M,,M,,*48
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Figure.3. GPS Location

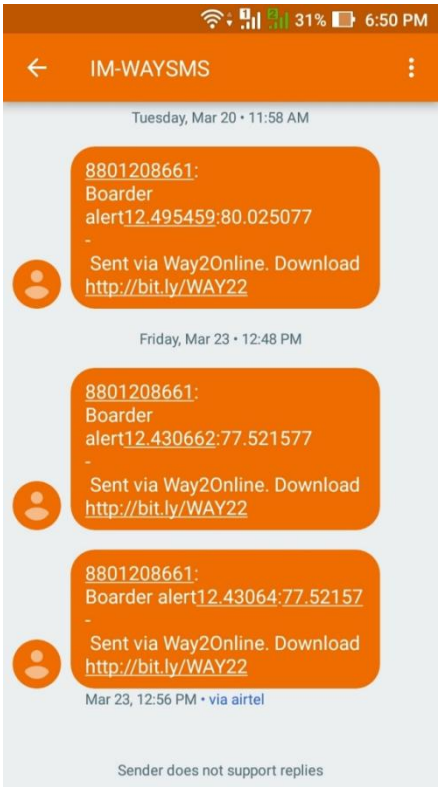

Figure.4. SMS Alert

SMS alert received via a free SMS Service Provider. It contains the location of the boat which has crossed the preset border and any updates can also be obtained as shown in Fig 4.

V. CONCLUSION

This model not only saves lives and property but also ensures the fishermen to not cross the IMBL since there are incidents being reported that they involve in smuggling activities also.The objective of the project is to help the fishermen not to navigate beyond country's border which has been accomplished, now. Thus, the system serves to be advantageous for avoiding conflicts among the countries and also restricts the illegal entry between the borders. It enables the government to ensure control over the traffic between the maritime borders and also aids in rescue operations. The proposal proffers not only an effective solution but also an economical one.

VI. REFERENCE

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