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RASPBERRY-PI BASED SECURITY SYSTEM IN SHIP

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Abstract

In this project we are dealing with the security of ship either may be merchant, private or naval ship. Now a day's accidents in ship or shipyards are increasing in numbers. To avoid this we are using authentication based on facial recognition, thumbprints, meanwhile we are using raspberry-pi based centralized system so as to avoid any accident like fire. Seventy percent of the earth's surface is covered by water, in this large area the vessels are trading, fishing and transporting. Whatever the purpose of sailing we can consider it shipping and is relaying and requiring safety navigation, taking into account keeping clean environment. The Shipping plays a vital role in the economics of most countries so the safety and security control and monitoring from shore is significant. This project will explain the maritime vessels security systems and safety and will be concentrated on the integration of the security system devices, safety system devices and transmission through satellite communication systems to the shore side, by other means main office on land, to raise the level of safety and security. The safety by choice not by chance. Over the years the demand for high quality, greater efficiency, and automated machines has increased in the controlling and monitoring purpose. Ship requires continuous monitoring and inspection at frequent intervals. Our project demonstrates a Raspberry Pi based security system in ship. Here we focus on fire sensitive areas, restricted area where few authenticated people are allowed like control room in ship. This project includes fire detection as a safety parameter which is a major issue. We are using sensor to cover entire control room. Second parameter is Face Authentication, in which image of a person will be taken for checking authentication.

Index Terms: Face and thumb authentication, HMI,Fire detection ---

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1. MAIN HEADING

Safety and Security of the passengers and the crew members, plays a vital role in a shipping organization. Shipping companies gives prime importance to all safety measures. A fire on a ship is one of the most dangerous incidents which can lead to the loss of human lives, cargos and other properties in the ship. If the fire is detected at the earliest, the crew can prevent larger damages by taking preventive measures. The number of ships damages due to fire and collision is increasing every year. Electrical short circuits, spontaneous combustion etc are the major causes of shipboard fire. Careless smoking also sometimes leads to countless fires that break out when no one expects. The engine room is at higher risk because of high temperature, oil-fired boilers, overheated bearings, leaky piping's carrying oil, and even the accumulation of other waste.
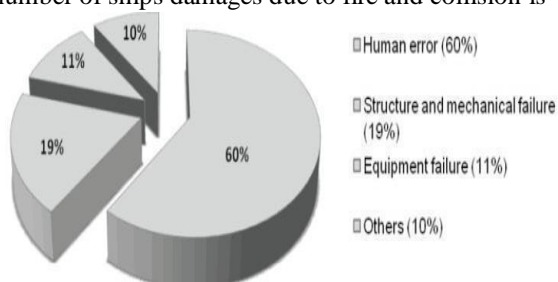
Hence fire safety is given at most importance. Fire fighting at sea consists of three separate stages: detection, alarms and control. This paper demonstrates detection of fire Raspberry Pi Controller. Detectors are the devices that can sense fire, smoke or overheating. Mainly we use three types of detectors - fire sensor, smoke sensor and a thermocouple in this project. The detector input is then fed to the Controller and whenever fire or smoke is detected, an alarm is raised along with a message displayed in on screen and send Email containing short video of exact situation. At the same time a pump will be actuated to control the fire. Security of the ship is also very important. The importance of maritime security has substantially increased with the increase in the number of outsider attacks like sea snatchers. Many such incidents are reported in the past. Authentication of every person in the ship is a difficult task. This project focuses mainly the control room. Today's e-security are in critical need of finding secure, cost-effective and accurate alternatives to personal identification numbers (PIN) and passwords as computer-based fraud such as identity theft and computer hacking is very common. To achieve more reliable identification or verification we should use something that really characterizes the given person. Biometric solutions gives a solution to these fundamental problems, because an

1.1 Sub Heading1

Starting from initial stages Automation is the important area.Automation is largely implemented in various industries, taking into consideration various factors such as reduction in manpower, avoid risk at hazardous places, improve accuracy, increase speed of production, safety measures.Also CCTV cameras are installed in ships if any intruder tries to go into unauthorized place the CCTV (close circuit television) camera won't take any actions, but if we use biometric authentication then the intruder will not be entertained anywhere, so the security will be held at a very high level.
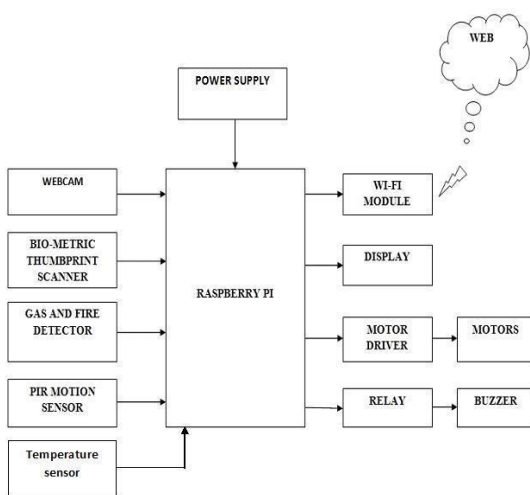
2. MAIN HEADING2

Fig-1: Block Diagram

A. *Fire sensor* :

        The Fire sensor, as the name suggests, is used as a simple and compact device for protection against fire.The

individual's biometric data cannot be transferred and is unique. There are lots of biometric techniques available nowadays. Here a face and thumb print recognition method is used. After authentication, system allows the person to access the control systems and restricted region of the ship.There are many methods available for ensuring the safety and security of the ship. Initially when we start the system it initiates the motion sensors so as to assure sensors are working. One of the authorized people has to take his face in front of camera so as we can recognize that the person willing to enter in our vessel is authorized or not. If the person is authorized and is mentioned in our system then he may go further for fingerprint scanner else door will not open. When the finger print of person is validated the doors will be opened else wise it will continually ask for valid finger print.Whenever the fire, smoke or gas is detected by the gas/smoke/fire detector sensor, the system will blow buzzer. Also it will start the motion sensors so as to detect location of peoples who are trapped due to fire or other detected hazard. At this instant the system will activate the doors which can be used as safety passages for evacuation.

module makes use of IR sensor and comparator to detect fire up to a range of certain meter. The device, weighing about 5 grams, can be easily mounted on the device body. It gives a high output on detecting fire. This output can then be used to take the requisite action. An on-board LED (Light Emitting Diode) is also provided for visual indication.This fire sensor detects the fire and gives the signal to Raspberry Pi, due to which the buzzer will ring.

B. *Image Processing Circuit :*

In image processing we are storing database images. For authentication, person needs to compare his image with stored database images. Result of comparison will be conveyed to the raspberry pi via serial communication. If person is authorized only then he will be allowed to enter the cabin. A finger print is made up of series of ridges and furrows on the surface of finger. Another feature of a finger print minutiae point. Minutiae points are local ridge characteristics that occur

at either a ridge bifurcation or ridge ending. Fingerprint recognition identifies people by using the impression made by the minute ridge formation or patterns found on the fingertips. Once the image is thinned using the Skeltonization algorithm, it is easy to identify the minutiae points

C. *Raspberry Pi 2 Model B 1GB:-*
        This module is the heart of this project. It carries all operations in the circuit.
Broadcom BCM2837 Arm7 Quad Core Processor powered
        Single Board Computer running at 900MHz
        1GB RAM
        40pin extended GPIO
4 x USB 2 ports

4 pole Stereo output and Composite video port

Full size HDMI

CSI camera port for connecting the Raspberry Pi camera
DSI display port for connecting the Raspberry Pi touch screen display

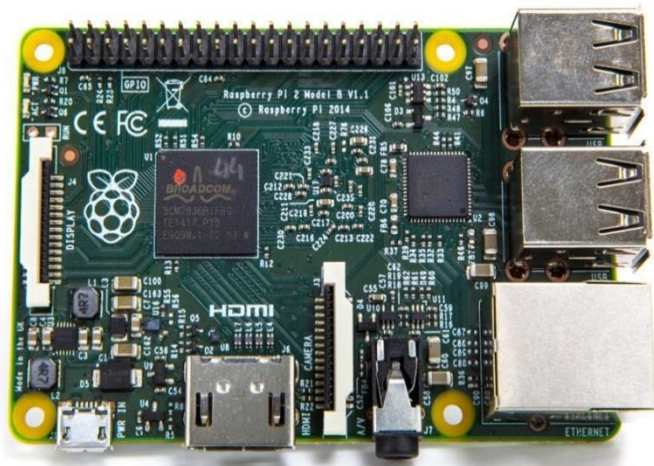Micro SD port for loading your operating system and storing data

Micro USB power source

Fig-2: Raspberry-Pi Module

D. Fingerprint Scanner Device GT (511C1R) :-

Fig-3: Fingerprint Scanner Device

We chose the Fingerprint Scanner Device GT (511C1R) because it is very cheap and provides a well-documented manual, a Linux-compatible module as well as a good price/quality relation. More precisely, it provides a high-speed, high-accuracy fingerprint identification using the SmackFinger 3.0 Algorithm. It provides a 32-bit CPU at 72MHz (ARM Cortex M3) and a database which can store up to 20 different fingerprints. It is able to recognize a fingerprint in whatever 360◦ position. Downloads and uploads of fingerprint scans can be done by using the RS-232 serial interface. It provides a UART (Universal Asynchronous Receiver/Transmitter) connector (Default 9600 baud). Communication based on an UART communication protocol can operate through a serial RS-232 cable, the one chosen for this project. Power is supplied through a JST-SH connector.
The Fingerprint communicating protocol is based on packet handshaking. There are three kinds of packet:

Command packets: Used to order the device to carry out operations (i.e., check for finger-button pressing).
Response packets: They indicate operation success/failure. The opcode of the command field can be ACK(0x30) and NACK(0x31), indicating operation success and failure respectively. In case of failure, the ERROR code is also provided.
Data packets: The data field does not have a static length because this packet is used to send extra information, fingerprint images, etc. With the help of Fingerprint Scanner Device fingerprint of the person is compared and he/she can be allowed to access.

E. Smoke Sensor :-

Fig-4: Smoke sensor Module

Monitoring of produced gases is important in every scenario. Smoke or Gas sensor plays an important role in the detection of different type of gases from home appliances, vehicles and different type of industries. Smoke sensor is a built in module that can detect smoke of various concentration. Smoke sensor module mainly consists of MQ gas sensor, LM358N comparator, Resistors, Potentiometer, and Indicator Power LED.The important part of the smoke sensor module is MQ gas sensor. The gas sensor module includes a steel exoskeleton under which a sensing element is situated. The module also includes six connecting leads. Heating current is passing through this connecting leads to the sensing element .When the gases coming close to the sensing element, the gases are absorbed by the sensing element and get ionized. As a result the resistance of the sensing element varies which changes the amount of the current going out of it.
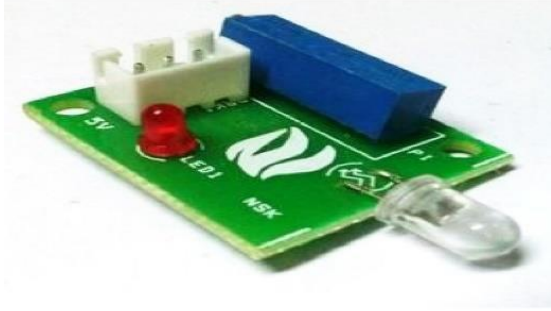
F. Fire Sensor :-

Fig-5: Fire sensor Module

The Fire sensor is a built-in module used for detecting the fire up to a range of 1 meter. The module consists of IR sensor, comparator, potentiometer and an on-board Light Emitting Diode (LED) for visual indication. The module is weighing about 5 grams and it can be easily mounted anywhere that needs protection against fire. The sensor module gives a high output when it is detecting the fire. The potentiometer is used for adjusting the sensitivity of the module.The fire sensor module has got 3 pins VCC, GND and output. The Working voltage of the sensor is 5V.The module consists of IR sensor, comparator and an indicating LED. When the IR receiver LED detects the fire, the output pin of the sensor goes high and indicating LED glows. The output pin can be connected to the input of the controller and the same can be used for any fire detection applications.

G. PIR sensor:-

Fig-6: PIR Sensor

PIR sensor (passive infrared sensor) is an electronic sensor that measures infrared light radiating from object in its field of view. They are most offend used in PIR based motion detector. All object with temperature above absolute zero emit heat energy in the form of radiation. Usually this radiation is not visible to the human eye because it eradiated at infrared wavelength. The term passive is this instance refers to the fact that PIR device do not generate or radiate any energy for detection purpose. They work entirely by detecting the energy given off by other objects. PIR sensor don't detect or measure 'heat', instead they detect the infrared radiation emitted or reflected from the object.

The PIR sensor detects the presence of person. And authentication is processed.A PIR based motion detector is used to sense movement of peoples, animals or other objects. They are commonly used in burglar alarms and automatically activated lighting system. They are commonly called simply "PIR" or Sometimes "PID".as a passive infrared detector.

3. CONCLUSION

As explained, this automated system ensures a more accurate and reliable solution for early fire detection and security. Fire, smoke and high temperature at engine room are detected by the sensors and necessary control actions are taken using Controller. The system is very user friendly as it displays all the status or parameters on screen. It also Capture the short video for exact situation analysis for Rescue Team. Authentication ensures only authenticated people can access the control room actions.In the project the parameters are considered, namely fire detection and face and thumb recognition. Many such parameters can also be used to make the system more accurate and more predictive. A cost effective CCTV can be used for capturing real images and authentication.

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