Power Bank for Train and Automation

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Abstract- The train play a vital role in world i.e. mainly in transporting. The fuel used by train is getting increase in past few year in India and other country's because of population reaching to its height rapidly, so how to utilize the natural energy for our needs is the main question bounce in every human mind .We see many vehicles use a alternator process for generation of electricity for their use, we can use this process of generation of electricity in train but in different manner so that every train single-single bogie can utilized this natural energy and also save the cost of fuel. This energy is utilized further for the safety of passengers in train and for many suitable Automation features which can be helpful for the railway workers in train to manage the safety of train as well as passengers and also backup data for further control.

Keywords- Alternator, Battery, Raspberry Pi-2, Driver Circuit, Smoke & Motion Sensors.

I. INTRODUCTION

Today we are dealing with a 'GLOBAL WORLD'. The population has been reached to 10 million in 2015. But the energy generation is only 15% now is the time to utilize the natural energy for our needs. But how is the important question? Here is project idea for a train to use a wind power for its internal control and passenger safety, comfort utilization by this we will be able to reduce electricity, fuel use by train. This project is based on ARM 11 Raspberry Pi 2 control system and Alternator. This system is capable of all the safety needs and Automation in train bogie. The Circuit will work on the chargeable battery; this battery will be charge by an alternator which is placed in train bogie at top of each bogie with a vertical Mini Mill on outside of train this has to be followed to each bogie separately for more power generation. The main concept of this system is to utilize the natural power to generate Electricity and utilized this energy for Safety in train and for emergency situation. The project can also be BLOCK DIAGRAM OF PROJECT
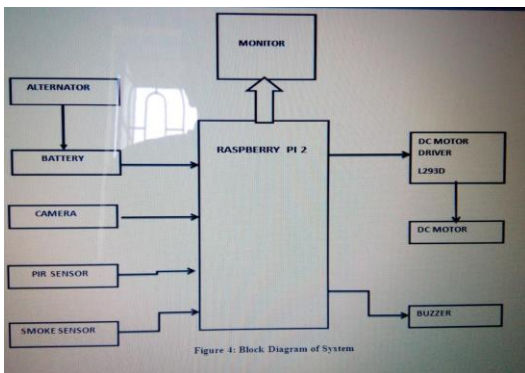

Figure 4: Block Diagram of System

The system consist of the following parts-

1) Alternator- The alternator act as an input for battery, generate the DC supply by the pressure of wind on the mini mill which help the alternator to rotate. The alternator use in project was 12V DC 36amp, 1500rpm.

2) Battery- lithium 12V DC, 1.3amph.

3) Webcam 2.0- Used to take the Images of user & send to the Raspberry Pi. The camera takes continuous video with frame rate of 30 frames per second.

4) Raspberry Pi 2 – the heart of the project used to control all the system. Specifications are as follows:
It has ARM 11 Core with BCM2836 Audio-Video Codec used to provide the GPIO's with operating frequency 900 MHz
1GB RAM
40Pin GPIO
4x USB 2 port
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
Micro USB power source

5) PIR Sensor- Detect the Live Motion of Human, specification are as follows:
Working voltage range: DC 4.5V-20V
Current drain: <60uA
Detection range: <140degree
Voltage output: High/Low level signal: 3.3V TTL output
Detection Distance: 3 to 7m(can be adjusted)
Delay time: 5 to 200s (can be adjusted, default 5s +/-3%)
Blockade time: 2.5s (default)

6) Smoke detector-sense for smoke in train, operating voltage is 5V DC and output when Logic is 1(smoke present) +3.5V DC & for logic 0(smoke not present) 0V DC.

7) Buzzer- Give the emergency signal in form of noise.

8) DC Motor driver L293D- It is used to drive the DC motor in all the direction control through the program, it is also possible to change the power supply polarity from programming. It is having the 600mA current rating.

9) DC Motor- 2 motor are used from which 1st motor is use for open and close operation of the door as per the input from the Raspberry pi.2nd motor is use for train RUN and STOP condition operation. Also it is possible to control the speed of the Dc motor by using L293D DC motor driver.

II. SOFTWARE

On the Raspberry Pi Development Board we need to install Raspbean Operating System (O.S). It is possible to connect 8GB SD card having the Image of the OS. After that it needs to install some image processing related libraries for compilation the code. In this system whole code is written in the new language Python. So it needs to install first the Python libraries for image processing & GPIO's.

PROJECT CODE
###POWER BANK TRAIN AND AUTOMATION

```
# Import required python libraries import

Numpy as np

Import cv2

Import RPi.GPIO as GPIO

#use BCM GPIO references

# instead of physical pin numbers

GPIO.setmode(GPIO.BCM)

# Define GPIO to use on PI

GPIO_PIR=14                    #PIR_sensor

GPIO.setup(15,GPIO.OUT)        #Buzzer

GPIO setup(18,GPIO.IN)         #Switch

GPIO setup(23,GPIO.OUT)        #in1

GPIO setup(24,GPIO.OUT)        #in2

GPIO.setup(7,GPIO.OUT)         #in3

GPIO.setup(8,GPIO.OUT)         #in4

GPIO.setup(12,GPIO.OUT)        #Smoke

GPIO.setwarning(False)

####Initialize to Stop####

GPIO.output(23,GPIO.LOW)#in1

GPIO.output(24,GPIO.LOW)#in2

GPIO.output(7,GPIO.lOW)#in3

GPIO.output(8,GPIO.LOW)#in4


Print"POWER BANK FOR TRAIN AND AUTOMATION"


###########################################################
#################if chain pull by person####################
###check switch###
I=GPIO.output(15,GPIO.HIGH)#Buzzer ON
GPIO.output(7,GPIO.LOW)
GPIO.output(8,GPIO.LOW)
        time.sleep(2)
GPIO.output(15,GPIO.LOW)
        time.sleep(2)
print "Train Stop"
        if i==0:
print "Train in Running Condition"
GPIO.output(7,GPIO.HIGH)
GPIO.output(8,GPIO.LOW)
        Time.sleep(2)
###########################################################
###########################################################
###############check for smoke detection####################
J=GPIO.input(12)
```

```
       If j==1:
Print "Smoke Detected"
GPIO.output(15,GPIO.HIGH)
        time.sleep(2)
GPIO.output(15,GPIO.LOW)
        time.sleep(2)
Print"Emergency at train"
        If j==0:
Print "Smoke not Detected"
###########################################################
###Set pin as input
GPIO.setup(GPIO_PIR,GPIO.IN)              #Echo
Current_State   =0
Previous_State =0
Try:
Print "Waiting  for PIR to settle…"
#Loop until PIR output is 0
While GPIO.input(GPIO_PIR)==1:
Current_state = 0
Print "Ready"
#Loop until users quits with CTRL-
C while True:
# Read PIR state
Current_State = GPIO.input(GPIO_PIR)
If Current_State==1 and Previous_State==0:
# PIR is triggered
Start_time=time.time()
Print "Motion detectiod!"
GPIO.output(15,GPIO.HIGH)
        time.sleep(2)
GPIO.output(15,GPIO.LOW)
        time.sleep(2)
###########Human Detected Open the door & close##############
#Forward the motor
GPIO.output(23,GPIO.HIGH)
GPIO.output(24,GPIO.LOW)
        Time.sleep(2)
GPIO.output(23,GPIO.LOW)
GPIO.output(24,GPIO.LOW)
Time.sleep(2)
#Reverse the motor
GPIO.output(23,GPIO.LOW)
GPIO.output(24,GPIO.LOW)
```

```
        Time.sleep(2)
##########################################################
cap = cv2.VideoCapture(0)
Ret.frame = cap.read()
Cv2.imshow('RGB',frame)
Cv2.imwrite('pic1.jpg',frame)
Cv2.waitkey(500)
Cap.release()
Cv2.destroyAllWindows()
Previous_State=1
Elif Current-State==0 and Previous_State==1;
#PIR has returned to ready state
Stop_time=time.time()
Print"Ready", elapsed_time=int(stop_time-start_time)
Print "(Elapsed time :"+ str(elapsed_time)+ "secs)"
Previous_State=0
Except KeyboardInterrupt:
print" Quit"
#Reset GPIO settings
GPIO.cleanup()
```

CAMERA PROGRAM-

```
Import numpy as np import cv2
Cap = cv2. VideoCapture(0)
While(True):
# Capture frame-by-frame ret,frame=cap.red()
# Our operation on the frame come here
Gray = cv2.cvtColour(frame, cv2.COLOUR_BGR2GRAY)
# Display the resulting frame cv2.imshow('frame'.gray)
Cv2.imshow('RGB'.frame) cv2.imwrite('pic1.jpg',frame)
Cv2.imwrite('pic2.jpg',gray)
If cv2.waitkey(1) & 0XFF ==('q'): break
# When everything done, release the cap.relese()
Cv2.destroyAllWindow()
```

End of program.

The below figure show the connection of the Raspbean PI 2 Model with

label

GPIO Pinout Diagram
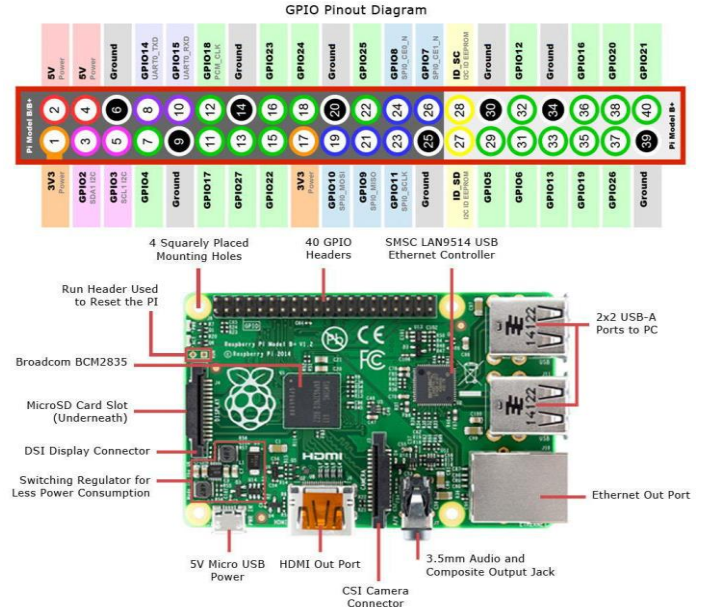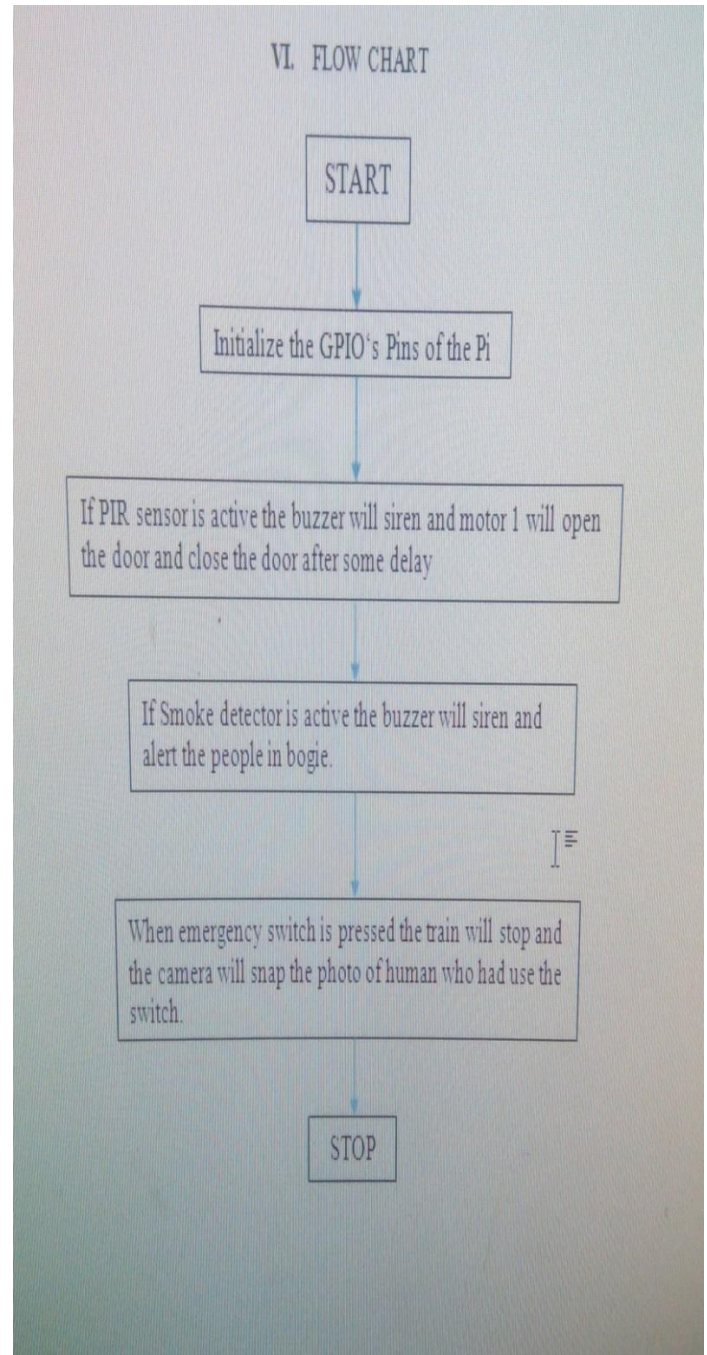
III.   DESIGN OF HARDWARE OF THE SYSTEM

IV.   WORKING OF PROJECT

When the Alternator run due to the wind strike the mill which is placed flat horizontally above the bogie and rotate on vertical axis. This alternator will charge the battery. The battery power 12v and 1.3amp is use to run the whole circuit. The raspberry pi 2 is the heart of the system which will perform the action as per software program in its external

memory. It will read the input from GPIO which are PIR motion sensor, Smoke detector sensors and emergency train stopping switch. If Motion detected by PIR sensor which is placed outside of train and on head of train door then Siren the Buzzer & open the door of train. In the boggy when some human smoke or there is fire in bogie the raspberry pi 2 will siren the buzzer. The other advantage of system is if some unwanted happen or some want to stop the train in emergency the person should press the switch the system will noise the siren and the camera placed hidden above the switch will snap the picture of the human and save the image in system external memory. These will help to find the intrusion who utilizes the system and also the feature will helpful for the worker working in train.

V.   FLOW CHART

VI. FLOW CHART

```
                    START

                      ↓

          Initialize the GPIO's Pins of the Pi

                      ↓

   If PIR sensor is active the buzzer will siren and motor 1 will open
   the door and close the door after some delay

                      ↓

   If Smoke detector is active the buzzer will siren and
   alert the people in bogie.

                      ↓

   When emergency switch is pressed the train will stop and
   the camera will snap the photo of human who had use the
   switch.

                      ↓

                    STOP
```

VI. RESULTS AND CONCLUSION

THE ALTERNATOR RUN BY THE SPEED OF THE TRAIN/WIND STRIKES THE MINI MILL. THE ALTERNATOR OUTPUT CHARGES THE BATTERY. THE RASPBERRY PI2 OPERATE ON THE ALTERNATOR POWER AND CHECK FOR THE INPUTS. WHEN THE PIR SENSOR DETECT THE MOTION IN ITS RANGE THE DOOR OF THE TRAIN BOOGIE OPEN AND CLOSE AFTER 2SEC DELAY WHICH IS INDICATED BY 1ST MOTOR , ALSO THE TRAIN IS IN RUNNING CONDITION WHEN NO EMERGENCY PUSH BUTTON IS PRESSED THIS IS INDICATED BY THE 2ND DC MOTOR. IF THE EMERGENCY BUTTON IS PRESSED THE EMERGENCY MESSAGE IS DISPLAYED ON THE SCREEN OF TRAIN GUARD WITH A NOISE OF BUZZER AND THE PERSON SNAP SHOT IS TAKEN BY THE HIDDEN CAMERA WHICH IS ALSO DISPLAY ON TRAIN GUARD BOOGIE THE SYSTEM WILL STOP THE TRAIN IN EMERGENCY CONDITION.

HENCE, IT CAN BE CONCLUDED THAT THE SYSTEM DESIGNED AND DEVELOPED SET UP WORKS SATISFACTORILY AND CAN BE USED IN DAY TODAY LIFE IN OLD OR NEWLY LAUNCH TRAIN.
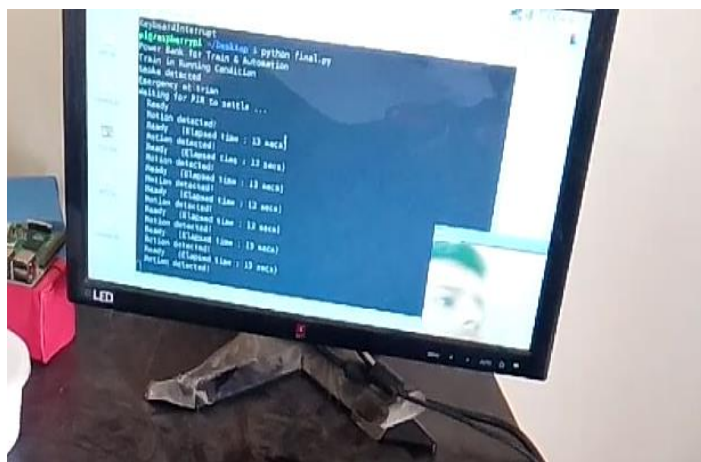

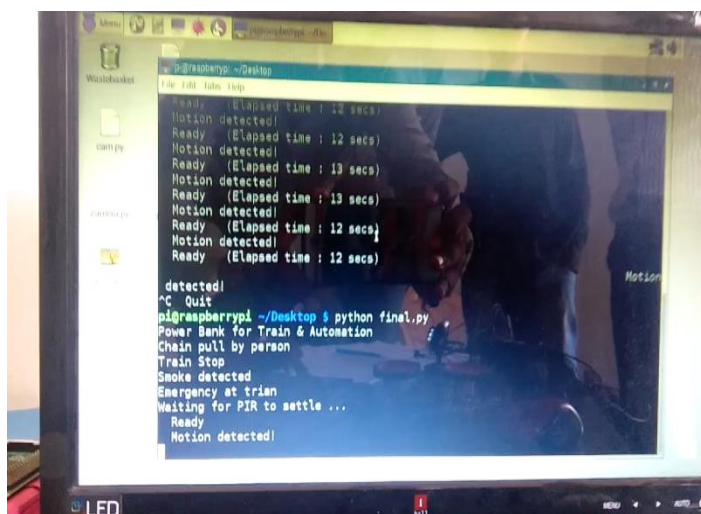FIG. 2 (A): DISPLAY OUTPUT WHEN MOTION AND SMOKE IS DETECTED

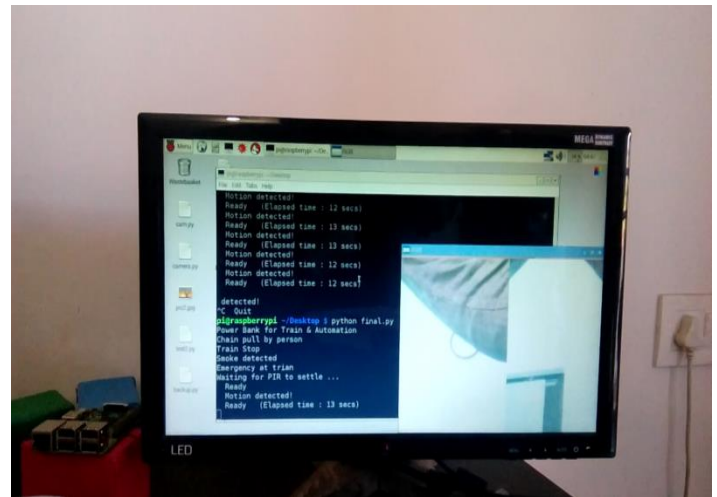Fig. 2 (B): Output when Emergency switch is pressed.

Fig. 2 (C): Final output with snap shot on Display.

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