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

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

www.ijsrp.org
# Import required python libraries

```python
import numpy as np
import cv2
import RPi.GPIO as GPIO
```

# Use BCM GPIO references instead of physical pin numbers

```python
GPIO.setmode(GPIO.BCM)
```

# Define GPIO to use on PI

```python
GPIO_PIR=14  # PIR sensor
GPIO.setmode(GPIO.BCM)
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
```

# Initialize to Stop

```python
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"

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### If chain pull by person

```python
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"

```python
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

```python
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"
```

```python
if j==0:
    print "Smoke not Detected"
```

---

### Initialize to Stop

```python
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 "Waiting for PIR to settle…"

```python
Start_time=time.time()
```

---

### Human Detected Open the door & close

```python
GPIO.output(23,GPIO.HIGH)  # Forward the motor
GPIO.output(24,GPIO.LOW)
Time.sleep(2)
GPIO.output(23,GPIO.LOW)
GPIO.output(24,GPIO.LOW)
Time.sleep(2)
```

---

### Reverse the motor

```python
GPIO.output(23,GPIO.HIGH)  # Reverse the motor
GPIO.output(24,GPIO.LOW)
Time.sleep(2)
```

---

Print "Train Stop"

```
```

---

# Read PIR state

```python
Current_State = GPIO.input(GPIO_PIR)
```

```python
if Current_State==1 and Previous_State==0:
    # PIR is triggered
    print "Motion detected!"
    Start_time=time.time()
```

```python
while True:
    # Read PIR
    Current_State = GPIO.input(GPIO_PIR)
    Previous_State = Current_State
    if Current_State==1 and Previous_State==0:
        print "Human Detected Open the door & close"
        GPIO.output(23,GPIO.HIGH)  # Forward the motor
        GPIO.output(24,GPIO.LOW)
        Time.sleep(2)
        GPIO.output(23,GPIO.LOW)
        GPIO.output(24,GPIO.LOW)
        Time.sleep(2)
    else:
        print "Waiting for PIR to settle…"
        Start_time=time.time()
```

---

Print "Train Stop"

```
```

---

Print "Train will stop"

```
```
```python
import numpy as np
import cv2

Cap = cv2.VideoCapture(0)

# Capture frame-by-frame
ret, frame = Cap.read()

# Our operation on the frame come here
Gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

# Display the resulting frame
cv2.imshow('frame', Gray)

# When everything done, release the cap.
Cap.release()

# Reset GPIO settings
GPIO.cleanup()
```

**CAMERA PROGRAM**

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. RESULTS AND CONCLUSION


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

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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.