Project Report

Home Automation

ViLoCaD - Video Lock Camera Door

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Introduction

ViLoCaD, is an entirely secured and supervised version of security at any place and at any time.
The main feature of video door entry is that it enables the person indoors to identify the visitor.
The door Lock System comes with an inbuilt video doorbell that combines the functionality of restricting unauthorised access and viewing the visitor before granting access.
This system of monitoring and beholding security comes with very well-equipped and apt technologies as well as hardware systems.
ViLoCad comes with a user-friendly and easy-to-use environment that can be controlled via any device having a web browser. The confined range that can be used to control this system is the Wi-Fi Range
** We can extend the project to the Internet and it can be used from all over the world then.*

Market Research

Emerging technology in video door phones currently available in the market is ready to accept extensions, making the monitor into a small automatic function control centre. From here, the user can view one or several additional cameras installed at other access points, trigger light switches or open a second door, etc. Also, they can be integrated with different access control systems including proximity cards, fingerprint readers, a keypad for secret numbers or even Bluetooth triggered by mobile phones.

What's Different

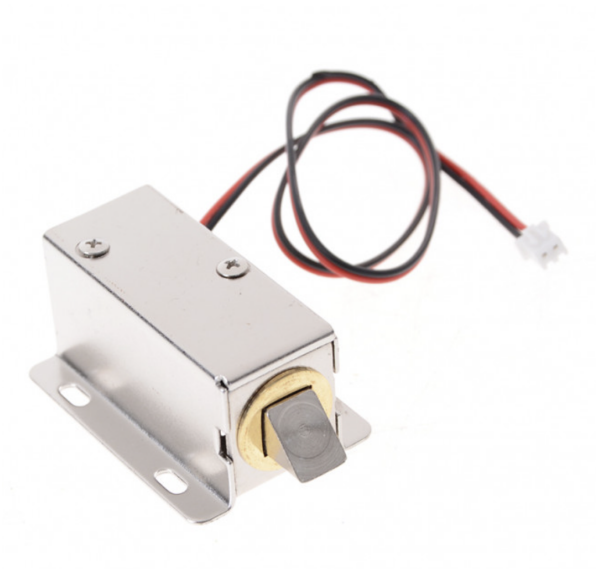
ViLoCaD differs slightly from VDP(Video Door Phone). The video door phone
Is quite different from ViLoCaD. The conventional VDP only allows one to view the video screen inside the house at a place. But ViLoCaD has no such restrictions. Users can view the system on any device having a browser.
Also when talking about further implementation ViLoCaD can be used from any corner of the world while VDP can only be used from inside the house or infrastructure.

Components

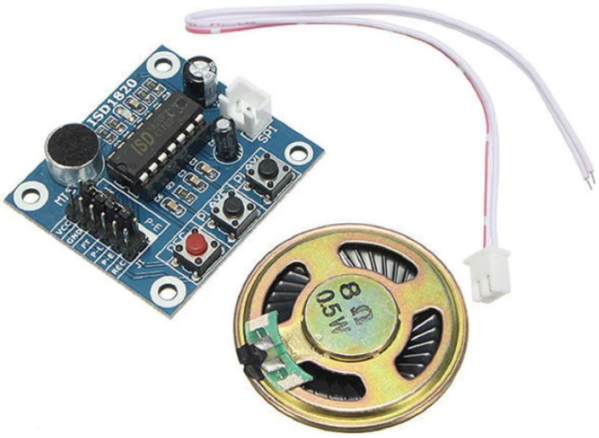
Raspberry Pi (Model 3B)

Web Camera - Logitech C310

Electromagnetic Lock -DC 24V Solenoid Electromagnetic Door Lock



* ***Speaker - Microphone Assembly*** *- 3-5V Voice Module Recording And Playback,Module with Microphone and 0.5W Speaker*

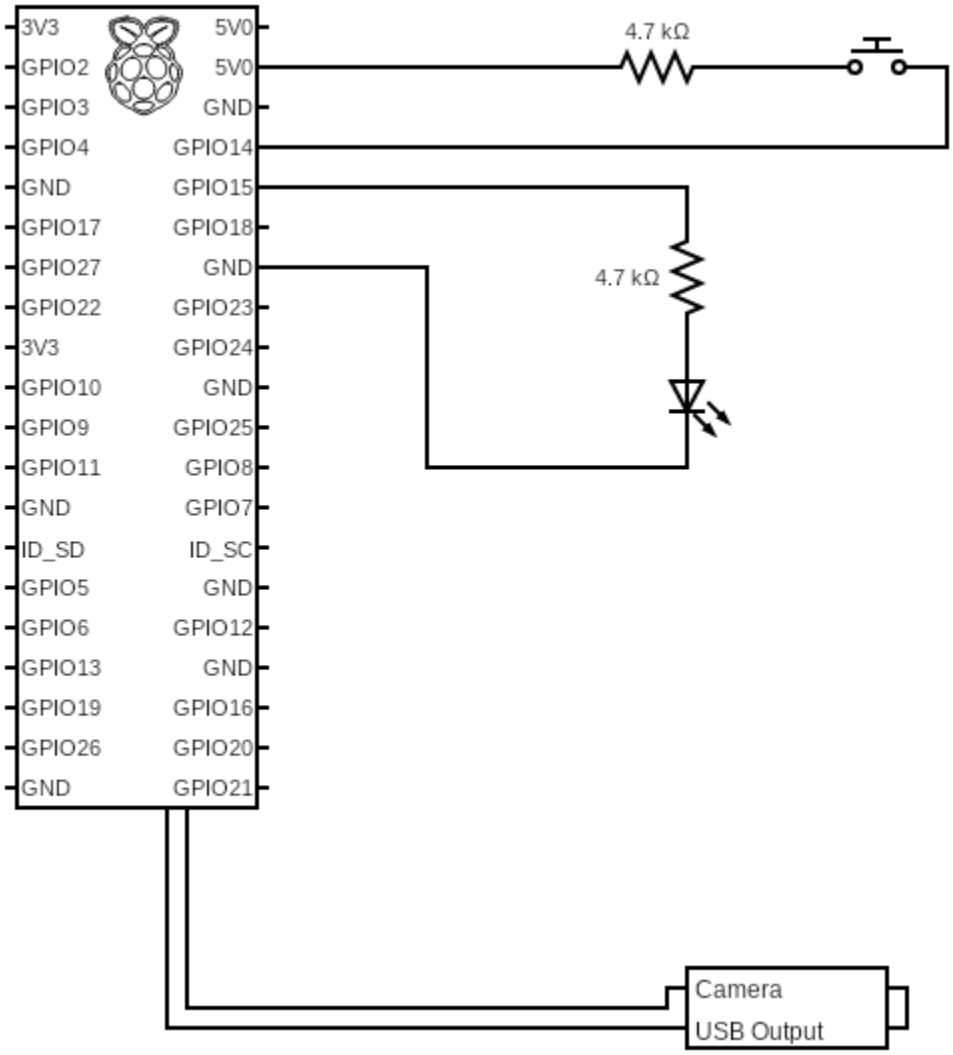


* ***Bell Switch*** *- Momentary Push Button*

Estimated Cost

Component	Price
Raspberry Pi	2400
Camera	2250
Electromagnetic Lock	500
Speaker & Mic	200
Bell Switch	50
Packaging Cost	150
Estimated Cost	5550

Circuit Diagram



Working

Technical Setup & Background Working

Raspberry Pi is a SBC - Single Board Computer, We are using 3 Model B which comes with 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, on-board 802.11n Wi-Fi, Bluetooth and USB boot capabilities.
For the Operating System of SBC, we are using Raspberry Pi OS also known as Raspbian OS. We can extend use to any Linux based - OS for instance Ubuntu 22.04 LTS or Older.
For Camera Streaming to Server, We are utilizing Motion Project of Raspberry for streaming v4l camera devices on Webserver hosting. i.e. Motion Project.
WebServer Hosting and Coding Preferences can be seen in Codes.

We are using Raspberry Pi and a Camera(Logitech HD Camera 720p which provides Udeviceserfacing) and to generate a GPIO signal we have connected an LED and a Bell Button. The operating system of Raspberry Pi is Raspbiaof n which is then connected to SSH or VNC as per the convenience or choice of the user. Normally It is connected to any server i.e. Mobile Hotspot The operating and Connecting the PC or laptop through this server. This mobile hotspot can normally also be used as any other server.
The screening of the camera is by the Motion Project (a project of raspberry - pi that can scan the cameras) through this, we generate HTTP Server which contains the camera-generated image.
Again through another HTTP Server, We make GUI Interface for the User.
For Mailing, we are using SMTP Protocol to mail the Link of WebPage to the user.
Then we set, the Server.py and Mailing.py along with the “Sudo motion” command in bashrc for always running at the startup of Raspberry Pi.

User Working & Interface

Once All Set -
The user just need to Plug in the Setup via Raspberry Pi, and the User will get a Mail saying, Welcome with the URL to Control ViLoCaD.
Users can control the Lock and watch Camera Footage on the Device, a user wants to. I.e. Mobile, PC, or Any Smart Device which is connected to Home Server.

Codes

Mailing.py

```python
import smtplib
from email.mime.text import MIMEText
from email.mime.multipart import MIMEMultipart
from email.mime.base import MIMEBase
from email import encoders
import socket
import time

time.sleep(30)
ip_add = [l for l in ([ip for ip in socket.gethostbyname_ex(socket.gethostname())[2]
if not ip.startswith("127.")][:1], [[(s.connect(('8.8.8.8', 53)),
s.getsockname()[0], s.close()) for s in [socket.socket(socket.AF_INET,
socket.SOCK_DGRAM)]][0][1]]) if l][0][0] # Retreiving IP Address of Machine

email_user = "-Send-EmailID-" # Email Id, configured for STMP Mailing Service
email_password = "--Your-Password--" # App Password, to be setup by STMP Service
email_send = "-Recieve-EmailID-" # Mail Id to Send the Mail

subject = "URL to Connect to ViLoCaD" # Mail Subject

msg = MIMEMultipart()
msg["From"] = email_user
msg["To"] = email_send
msg["Subject"] = subject

body = f"""Hi User, We are delighted to welcome you to our ViLoCaD
- Video Lock Camera Door Utility \n Just Open any browser on the Network,
your Raspberry is Connected and Type the below URL \n {ip_add}:8000 """
msg.attach(MIMEText(body,"plain"))

text = msg.as_string()
server = smtplib.SMTP("smtp.gmail.com",587)
server.starttls()
server.login(email_user,email_password)


server.sendmail(email_user,email_send,text)
server.quit()
```

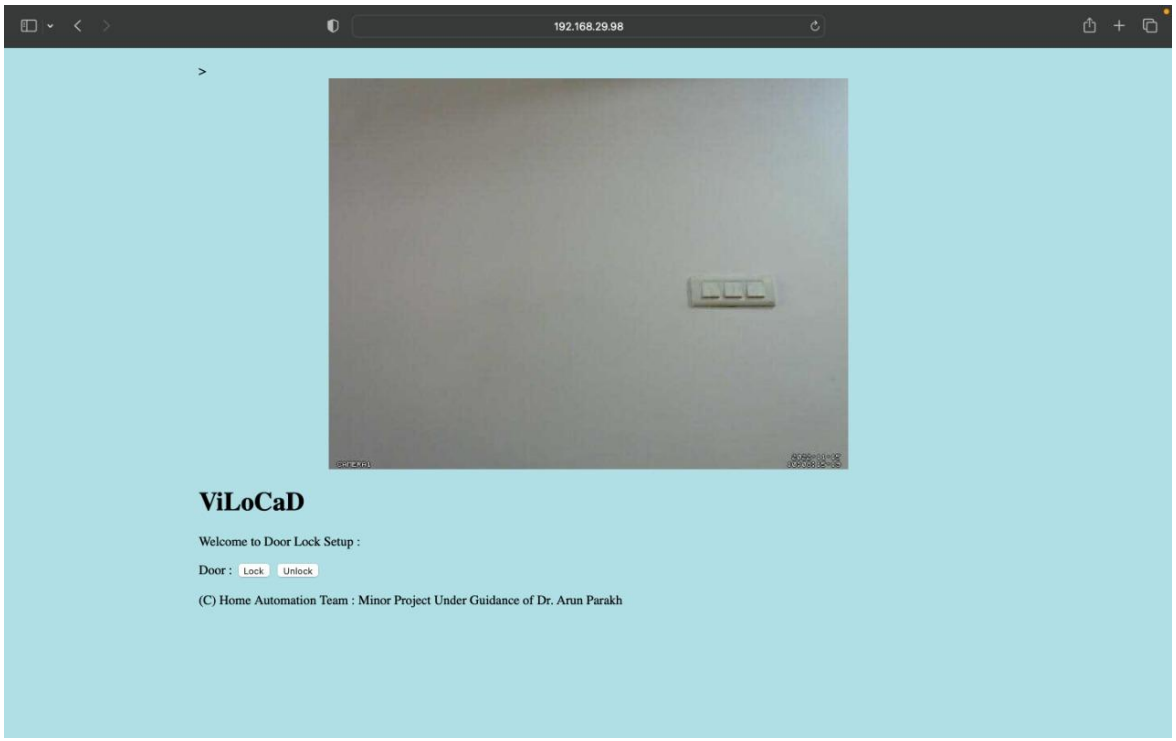
Server.py

```
import RPi.GPIO as GPIO
import os
import time
from time import sleep
from http.server import BaseHTTPRequestHandler, HTTPServer
import socket

ip_add = [l for l in ([ip for ip in socket.gethostbyname_ex(socket.gethostname())[2]
if not ip.startswith("127.")][:1], [[(s.connect(('8.8.8.8', 53)),
s.getsockname()[0], s.close()) for s in [socket.socket(socket.AF_INET,
socket.SOCK_DGRAM)]][0][1]]) if l][0][0]

host_name = ip_add
host_port = 8000

class MyServer(BaseHTTPRequestHandler):

    def do_HEAD(self):
        self.send_response(200)
        self.send_header('Content-type', 'text/html')
        self.end_headers()

    def _redirect(self, path):
        self.send_response(303)
        self.send_header('Content-type', 'text/html')
        self.send_header('Location', path)
        self.end_headers()

    def do_GET(self):
        html = '''
            <html>
            <body style="width:960px; margin: 20px auto;background-color:powderblue;">>
            <img style="display: block;-webkit-user-select: none;margin: auto;background-color: hsl(0, 0%, 25%);" src="http://{}:8081/0/strea
            <h1>ViLoCaD</h1>
            <p>Welcome to Door Lock Setup :</p>
            <form action="/" method="POST">
                Door :
                <input type="submit" name="submit" value="Lock">
                <input type="submit" name="submit" value="Unlock">
            </form>
            <p>(C) Home Automation Team : Minor Project Under Guidance of Dr. Arun Parakh
            </p>
            </body>
```

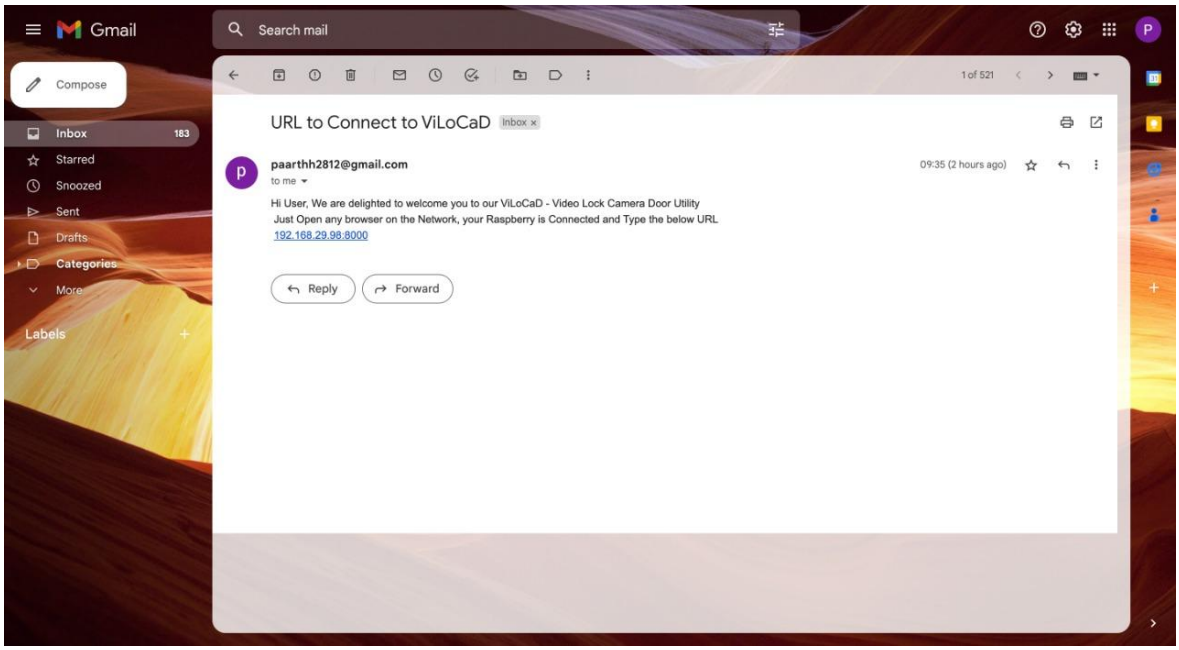
– Explore full codes on GitHub - QR Code, given Above

Result

Server - http://(ip-address):(port-address)



Mail Received



Conclusion

In this Minor Project, We have learnt to use Raspberry Pi, different OS, GPIO Pins, v4l Camera Devices Interfacing, and Electronic Components i.e. LED Switching, Resistor, Bell Switch, and Lock.
We got to know about different Protocols and used them such as HTTP, SMTP, SSH, and VNC for different parts of our Project.

* *- Means Components and Project Details planned for further Implementation*