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A MINI-PROJECT REPORT

ON
**"ANDROID LIVE STREAMING
USING IPWEBCAM IN PYTHON"**
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2019-2020

CERTIFICATE

This is to certify that the mini project work titled **"PROCESS ANDROID MOBILE LIVE STREAMING IN PYTHON"** is carried out by **VISHNU TEJA PERLA(17BTRDS037), Y SREE HARI RAO(17BTRCT044), GADIGE MANI KIRAN(17BTRCS032),** a bonafide students of Bachelor of Technology at the School of Computer Science and Engineering, Jain Deemed-to-be University, Bangalore in partial fulfillment for the award of degree in Bachelor of Technology in Computer Science and Engineering (Data Science-Honours) during the year **2019- 2020**.

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Acknowledgement

This project has taken a considerable amount of time and resources and I would like to acknowledge the help of all of those who have made the project possible. In particular I would like to thank my supervisor and HOD sir Mr.Zabeeulla for his time,patience and guidance, and also for allowing the idea to be pursued originally. I would also like to thank our Dean Mr.Kuldeep Sharma sir for his consideration.

Further to these people I would like to thank the members of the Computer Support Group for their technical help in setting up various software and applications . Also, I would like to thank all people who have designed IP Web Cam application without whose efforts this project would have not been possible.And finally the various blogs that have guided us to complete this project in a smooth way.

Abstract

This document report is for the group project on Android Mobile Live Streaming. The project is an attempt to stream the video captured by a mobile into a computer using IP WEBCAM application and python so that they can be used by numerous purposes to communicate visually within small organizations that are connected through same network.

This project can be used :

1) as medium of communication in small organizations without any internet connection.
2) to turn your mobile as a security camera instantly whenever required and so on.

The main base for this project is the IP WEBCAM application that helps to connect the two devices using a common network. It is likely that the usage of this application will increase in coming future,particularly in small organizations,offices and in schools where a single person want to communicate his message to a group connected to same network. By creating a standard way to access the device camera and some basic functionality of the connected mobile. This is a small experimental work that we have done to access a mobiles camera without any physical connection and there is more work going to come in the future with some additional features.There are some additional features that IP WEB CAM application provides beyond just the video.It also had an option to share audio.And we are trying to include this in our project in the coming future.

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Introduction

This project is basically to stream a live video captured by a mobile camera into a computer/laptop.As discussed in the abstract part the main base for this is the IP WEB CAM application.It is an application that is freely down loadable in Google Play Store/Apple Store whatever you use.The work of this application is to act as a bridge between the mobile and the laptop.But there is no need to install this app in the laptop.The way we connect the mobile and the laptop will be discussed in the further pages.

Background

This project started with an idea of extracting frames from videos using some python libraries like Open CV.So when we talk about a video,its a combination of frames that are joined one after the other with a specific speed so that it appears as a moving picture. And this is the known fact that movies came into existence with this idea.So our idea is also the same but when it comes to extract frames from a live video its a different story, it requires more advanced packages and devices that simultaneously stream the video with a least possible lag.

And after the idea to extract the video frames it comes to how to connect the two devices.There came this IP Web Cam application.This is not a easy thing to connect two devices wireless and get the access of its camera unless you were a pro developer.But luckily we have this IP Web Cam application that came with a easy way to connect these two devices.

Requirements

Hardware :

1) Mobile Phone(that has hotspot and Wi-Fi connectivity)
2) Laptop with 4GB or above RAM
3) Network Router(if connecting through hotspot)

Software :

1) Python IDE
2) IP Web Cam Application
3) A web browser to open URL(NO internet connection required)

Libraries :

1) Urllib
2) Numpy
3) Open CV

Python IDE:

There are various IDE's for python available and most of them are free.We have used Pycharm by Jet Brains Community version 2019.You can use Anaconda,Spyder etc.

Pycharm:

PyCharm is an integrated development environment (IDE) used in computer programming, especially for the Python language. It is developed by the Czech company JetBrains. It helps in code analysis, a graphical debugger, an integrated unit tester, integration with version control systems, and supports web development with Django as well as Data Science with Anaconda.
PyCharm is available in Windows, macOS and Linux versions.
Other IDE's that you can choose were Anaconda and Spyder,VS code.

fig 1

IP Web Cam:

IP Web Cam application is freely available in both Google Play Store and Apple store.IP Web Cam is a Internet Protocol Camera application,it is just like a webcam.That is it puts the functionality of a webcam into the mobile that we use. which transmits and receives data over a network or the internet. Unlike an ordinary webcam it is a standalone unit with its own IP address that requires nothing more than a network connection in order to transfer images.

IP cameras capture images in much the same way as a digital camera, and compress the files to transmit over the network. IP cameras can be connected wirelessly via a Wi-Fi router or a mobile hotspot.

Fig 2

Urllib:

Urllib module is the URL handling module for python. It is used to fetch URLs (Uniform Resource Locators). It uses the urlopen function and is able to fetch URLs using a variety of different protocols.
Urllib is a package that collects several modules for working with URLs, such as:
urllib.request for opening and reading.
urllib.parse for parsing URLs etc.
urllib.request
This module helps to define functions and classes to open URLs . One of the most simple ways to open such URLs is :
urllib.request.urlopen(url)

NumPy:

NumPy is the fundamental package for scientific computing with Python. It contains among other things:

- ✓ a powerful N-dimensional array object
- ✓ sophisticated functions
- ✓ tools for integrating C/C++ and Fortran code
- ✓ useful linear algebra, Fourier transform, and random number capabilities

Besides its obvious scientific uses, NumPy can also be used as an efficient muti-dimensional container of generic data. Arbitrary data-types can be defined. This allows NumPy to seamlessly and speedily integrate with a wide variety of databases. NumPy is licensed under the BSD license, enabling reuse with few restrictions.
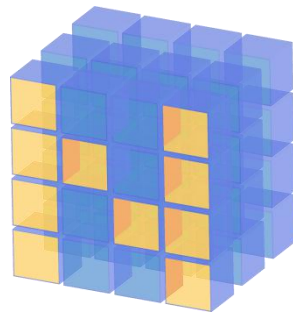
Fig 3

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Literature Survey

The early works on this project is carried on using various protocols such as RTSP and RTMP.The details of these two protocols were discussed below:

RTSP Protocol
Real Time Streaming Protocol is a networking protocol mainly used to stream real time media data like audio or video. It establishes a streaming session between client and server. In this tutorial we use this protocol while sending video stream from android mobile to streaming server.

RTMP Protocol
Real Time Messaging Protocol was developed by Adobe for Flash Player to transmit the real time media (audio, video) between server and flash player. This protocol we use to receive video stream from server to flash player.

The previous researchers have worked with the above algorithms and had used Wowza an streaming media server.

Below diagram is a high level architecture diagram of android video streaming. First android streams camera video to wowza media engine. Second wowza decodes the video and starts a streaming channel. Thirst web page consumes wowza stream and plays the video on the page.
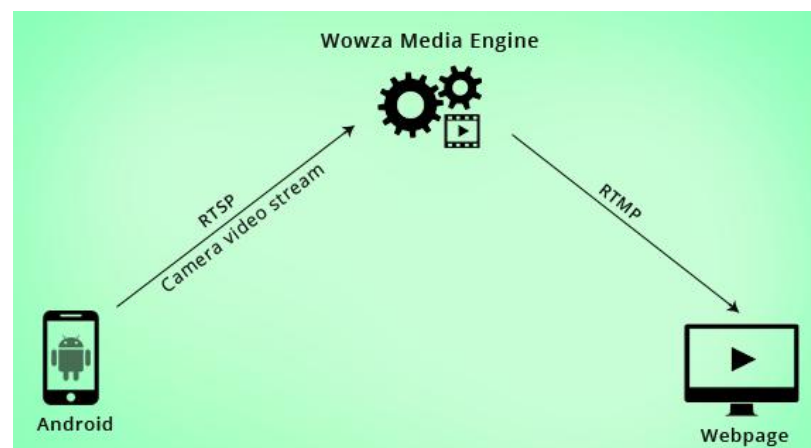

Fig 4

There were many applications available that helps to use your android mobile into a security camera.Some of them were :Manything,Sailent Eye,Dormi etc.

Design

The design of this project is so simple and can be easily impediment.It starts with setting up the connection between the two devices.An important thing to remember here is that the two devices should be connected with same network.A detailed procedure about the design of this project is explained by the following steps:

Step 1: Setting up the connection between the mobile and the laptop.That is both the devices should be connected to the same network.

Step 2: Getting the IP Address from the IP Web Cam Application and get the stream of the video stream into the browser using the IP address.

Step 3: get the URL of the stream, into Python IDE.

Step 4: Reading the URL and converting the URL into image.

Step 5: Converting the image into a byte stream.

Step 6: Convert the byte stream into numpy array.

Step 7: The Numpy array is then converted into CV2 image.

Step 8: Display the image.

Step 9: To obtain the video iterate the steps using a loop,so that you obtain a refresh image with a given fps.

Implementation

When it comes to the implementation part as discussed above requirements install the required packages into the python IDE using pip or install and package name.The required packages are urllib and for python 3 use urllib.request as we are acting as a client to the web,numpy and Open CV packages.

Then open IP Web Cam application in the mobile assuming that the mobile and laptop were connected to same network.And select the start server option in it.Now enter the following in your browser:

`http://192.168.43.36:8080/`

NOTE: The ip address is avaliable when the start server option is selected.

Here the last 8080 is the port numbe.Now add any name to the shot with .jpg extension to the localhost link.i.e;

http://192.168.43.36:8080/shot.jpg

Here I gave shot as the name ,it can be any name with .jpg extension.Now copy the above link.The reaason that I gave .jpg extension because we want to get the image of the streaming not the video directly.

Now open the python IDE and assign the URL copied to a variable as a string.Open the URL using the urlopen(url_variable) method in urllib library and assign it to a variable.

Now conver the above opened image file in to a byte stream by reading the image file.i.e; give opened_image.read() and read it as a byte stream. The output of this byte stream will be as follows:

(b'\xff\xd8\xff\xe0\x00\x10JFIF\x00\x01\x01\x00\x00\x01\x00\x01\x00\x00\xff\xdb\x00C\x00\x10\x0b\x0c\x0e\x0c\n\x10\x0e\r\x0e\x12\x11\x10\x13\x18)\x1b\x18\x16\x16\x182$&\x1e)

The above obtained is the byte stream format of the image file.This byte stream obtained is then converted into a numpy array with dtype=uint8 I.e; unsigned integer 8. This numpy array will look as:

[255 216 255 ...   63 255 217]

Then finally the numpy array is decoded into cv2 image by using imdecode(numpyarray,-1) from Open CV library.

The '-1' in the parameter represent the mode we want to extract the image.Any value lesser than 0 reproduce the image as is.While 0 gives the Grey scale image and greater to 0 represents a 3- channel colour image and display the image using imshow(image_name).

Our job is not yet done by doing the above all steps we obtain a image but this is not we want out objective is to get the video.So to stream a video put the above steps starting from reading the URL to displaying the image into a loop.Beacuse every time we read a image from the URL the new refreshed image of the stream is obtained and as we are using a loop these images will run one by one in a sequence that gives video as output.Now our objective is achieved and the video will be streaming until you give a break point to the loop.Hence we used our concept of obtaining video from images frames.

Testing/Result and Analysis:

At the end this project set out the way we can access the mobile device as a camera. When it comes to testing the project we have the screen shot of one sample experiment done by following steps that were discussed in the implementation part.
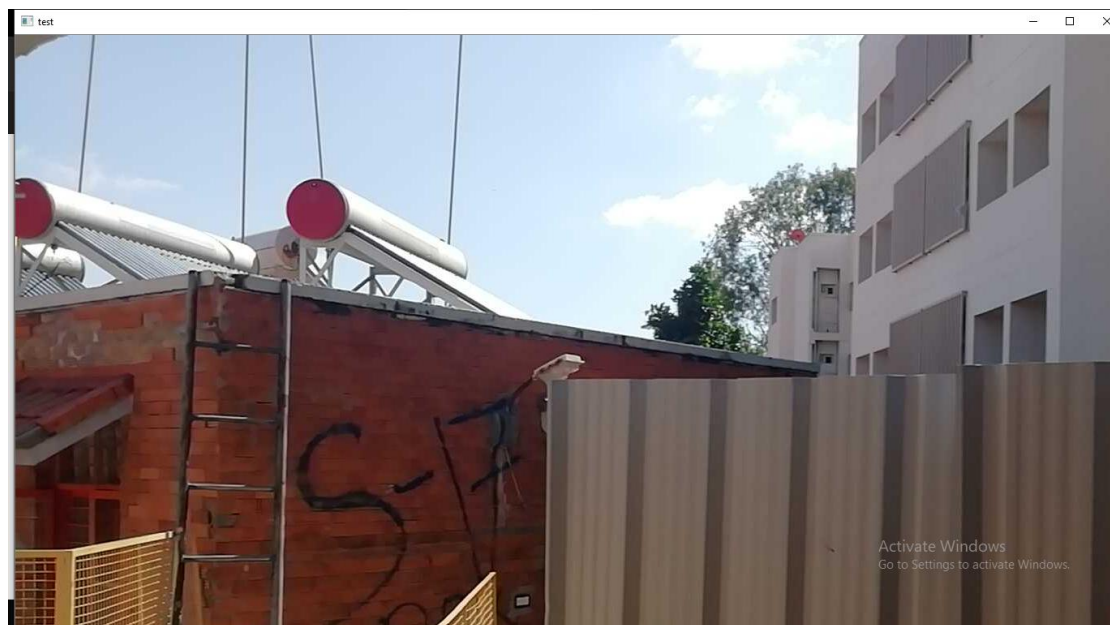

Fig 5 : Stream from mobile

Fig 6 : Computer output

Conclusion and Future enhancements

The project had worked smoothly and had given the expected output.

Finally we were able to stream the live video from a mobile to a laptop without internet and is the easiest way avaliable in my opinion.We had just streamed the video but there is a option to stream the audio also we were working on that and can implement it soon.The only drawback is that as we were getting the video from the video frames it sometimes produces breaks in between but not always.Its possible as there were no breaks in between the video in IP Web Cam local host but it takes some time to adjusting the frames when it comes to python.

We also had an idea to design an application as IP Web in python making the project completely in python.

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